St Georges Basin / options report. / [prepared by] Mitchell McCotter.

SHOALHAVEN CITY COUNCIL

ST GEORGES BASIN / JERVIS BAY

REGIONAL EFFLUENT DISPOSAL

OPTIONS REPORT

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TABLE OF CONTENTS

Page No.

1.0 SUMMARY

This report presents a number of possible options for the regional disposal of treated effluent from existing and proposed sewage treatment plants in the St Georges Basin/Jervis Bay area.

The options fall into the categories of land disposal, re-use, ocean discharge, discharge into sand dunes and discharge into Jervis Bay and/or St Georges Basin.

The report gives a basis for discussion by the local community, interested groups and relevant State and Commonwealth government authorities.

It forms an important part of the environmental impact assessment presently being undertaken for the Department of Public Works and Shoalhaven City Council.

2.0 INTRODUCTION

Over recent years Shoalhaven City Council and the New South Wales Department of Public Works have carried out numerous studies of optional schemes for the disposal of treated effluent from the St Georges Basin/Jervis Bay area. The areas included in these studies range from Sussex Inlet in the south through the villages making up the St Georges Basin area, Huskisson, Vincentia and Hyams Beach, Callala Bay, Callala Beach and Myola to Currarong and Culburra in the north east.

This paper has been prepared to publicise the options available in order to permit informed public discussion. It is also designed to allow early identification of any other options or combination of options that may so far have been overlooked.

Naturally, at this early stage, the environmental implications are not yet fully known. However, key environmental issues are briefly outlined to provide a better understanding of the various options. More detailed environmental work will be undertaken as part of the environmental impact statement.

A glossary of terms used is appended.

3.0 BACKGROUND

On 19 September 1988 the State Pollution Control Commission issued a statutory approval under Section 17K of the State Pollution Control Commission Act for the construction of a sewage treatment plant to serve the residential area of St Georges Basin. The approval was for Stage I of the plant, that stage having a capacity to serve a population of some 16,000 persons. It was issued to the New South Wales Department of Public Works on behalf of Shoalhaven City Council.

The plant is presently under construction. A range of options is possible to dispose of treated effluent from the plant and these options are the subject of an environmental impact statement (EIS) which was commissioned by the Public Works Department on behalf of Shoalhaven City Council. The EIS could play a major role in examining alternatives and assessing the impacts of the favoured scheme. It will address all viable, optional strategies for the construction of sewerage and sewage treatment and disposal facilities generally in the area.

An existing treatment plant serves Huskisson and Vincentia. Culburra and Sussex Inlet are also sewered and treatment plants serve these two locations.

Strategic planning for the area dates back to before 1972 when Council published an environmental impact statement for the Huskisson sewerage scheme. That document also addressed future sewerage of the St Georges Basin area and examined optional disposal schemes including disposal to inland waters, disposal on land and discharge to the ocean.

Shoalhaven City has experienced a high population growth over the last 20 years, with a compound increase of about 4.5 per cent per annum. Key elements in that growth are as follows:

- between 1971 and 1986 its population doubled from 30,000 to 60,000;
- almost 80 per cent of its growth is attributed to migration, mainly from the south and south western sectors of Sydney;
- by the year 2001, the population of the City could be almost 100,000 with concentrations at Nowra, St Georges Basin/Jervis Bay and Ulladulla;

- Jervis Bay/St Georges Basin is already the third largest population centre in Shoalhaven City after Nowra/Bomaderry and Milton/Ulladulla;
- growth rates between 1981 and 1986 in the St Georges Basin and Callala areas were 10.7 and 8.7 per cent, respectively, amongst the highest in the State; and
- populations in the summer holiday season in the area can be as high as 250 per cent of winter populations.

Given this scenario, it is vital that decisions on future sewerage in the area be made soon but with careful consideration of all factors, environmental and economic.

The existing situation is summarised as follows:

i) St. Georges Basin

This area comprises six urban settlements – Basin View, St. Georges Basin, Sanctuary Point, Old Erowral Bay, Erowral Bay and Wrights Beach. There are currently about 4,200 dwellings giving rise to a population of 13,300 during the summer. This summer population is expected to rise to around 21,000 by year 2005 and 35,000 by the year 2030. The treatment plant now being constructed has a Stage I capacity of 16,000 persons.

The area is presently served by septic tanks, pump outs and sanitary pans. There exists the potential for public health problems because of the outmoded arrangements for the disposal of domestic wastes. The waters of St Georges Basin are also reportedly suffering from the nutrients associated with leached septic tank effluents.

ii) Huskisson/Vincentia

This area also includes Hyams Beach. It is sewered and secondary treated effluent is polished by ponding and then discharged to Jervis Bay at Plantation Point. In 1986 the permanent population was 2,950 but the summer peak loading on the plant was equivalent to 7,500 persons. The capacity of the existing treatment plant is 8,000 persons so the capacity of the plant has already been approached during the summer holiday season.

It is expected that the holiday population in this area will rise to 13,000 by the year 2005 and

20,000 by 2030.

iii) Callala

This area includes Callala Bay, Callala Beach and Myola. Again, the population in the area increased significantly during summer.

At present, during summer, the population is around 3,600 but this is expected to increase to 6,500 by the year 2005 and around 11,000 by 2030.

The three villages are served by septic tank systems. There is a mix of absorption trench and pump–out systems. At Callala Bay, for new developments, septic tanks must have pump–out systems because of the poor absorption qualities of the clay soil. There are, however, old absorption trenches that cause some pollution in surface drains.

At Callala Beach and Myola, for new developments, septic tanks may have absorption trenches because of the porosity of the sandy soil.

The strategies being considered by Council and the Department of Public Works will cover the provision of sewerage and sewage treatment and disposal facilities for the Callala, Huskisson/Vincentia, St. Georges Basin and Currarong areas. They will address existing and projected population growths.

4.0 AN OVERVIEW OF AVAILABLE OPTIONS

The options available can be categorised as schemes involving land disposal, re–use, disposal into sand dunes, ocean discharge and discharge into Jervis Bay and/or St Georges Basin. Because the townships presently sewered or to be sewered in the future are spread out over a wide area, a range of combinations is possible. Not all possible combinations are addressed in this report but a sufficient number of possible options are discussed to permit combinations to be considered during the reviews and discussions.

5.0 OPTIONS FOR DISPOSAL OF TREATED EFFLUENT

A number of optional schemes are discussed briefly below.

There is no ranking of preferences implied in the order in which they are addressed.

OPTION I – Figure 1

This option assumes that the St. Georges Basin and Callala Point areas will be served by two plants with the total discharge of treated effluent being to Jervis Bay at Plantation Point. One would be at St. Georges Basin (presently under construction). The other would be at the present treatment plant site at Vincentia. This plant would be augmented to allow it to cater for the growing population in Huskisson/Vincentia/Hyams Beach as well as the growing populations at Callala Bay, Callala Beach and Myola.

The scheme would involve pumping raw sewage progressively to reticulation catchments from Callala Bay to Callala Beach and then via Myola to the Huskisson/Vincentia plant.

The sewerage system, pump wells and pumps could be designed to cope with ultimate development of the area. Particularly under existing loadings, residence times in some of the rising mains would be long enough for the sewage to become septic. Some form of treatment using proven septicity controls could be used.

The rising mains would cross Callala Creek, Currambene Creek and Moona Creek. The largest of these is Currumbene Creek. The route in the Currumbene Creek area could follow an electricity power pole route through the wetland area. In this case tree loss could be minimised as the area has already been cleared by the Illawarra County Council. The actual crossing of the creek would be via twin polyethylene pipes with valve pits at each end to allow isolation of either pipeline. The pipes would be laid about two metres below stream bed level. At Moona Creek the route could also follow the electricity power pole route and a twin pipeline crossing could also be made.

Twin pipelines could also be used to cross Callala Creek; they could be laid adjacent to an existing trunk water main.

The existing Huskisson/Vincentia plant would be augmented to cope with the projected populations of both the Huskisson and Callala areas. Facilities could be included for a high percentage removal of phosphorus.

Treated effluent from the St. Georges Basin plant would be pumped across to the storage basin at the Huskisson/Vincentia plant and would also join the effluent pumped into Jervis Bay at Plantation Point. Phosphorus removal facilities could also be operated at the St. Georges Basin treatment facility.

The Manly Hydraulics Laboratory of the Department of Public Works undertook studies into dilution and bacterial decay for an outfall running in a north easterly direction off Plantation Point. It was found that, at ultimate development (around 180 litres per second under dry weather conditions), an outfall about 1250 metres from Plantation Point containing one discharge nozzle about 150 millimetres in diameter would yield the following results based upon the bacteriological quality being similar to the present quality of effluent discharged from the Huskisson/Vincentia plant:

- the initial dilution would be about 20 or 25 to one;
- the outfall plume would not be visible;
- at Nelsons Beach the geometric mean of faecal coliform counts would be about two per 100 millilitres;
- the chance of a single sample having a faecal coliform count greater than 200 per 100 millilitres is about four or five per cent; and
- there would be a one per cent chance of the faecal coliform counts exceeding 400 per 100 millilitres in three samples taken in the period November to May.

The studies showed that there would also be minimal impact at Barfleurs Beach.

One of the underlying assumptions in computing initial and subsequent dilution is that the effluent is, in fact, mixing with unpolluted seawater. This assumption could be violated if the tidal exchange between the Bay and the ocean was not sufficient to remove the effluent. The volume of ocean water entering the Bay is around 100 million cubic metres per tide. This is some 6,000 times the daily volume of treated effluent at ultimate development.

OPTION II – Figure 2

Under this option, treated effluent from the Huskisson/Vincentia and St. Georges Basin plants would be disposed of through an outfall at Plantation Point and treated effluent from a separate plant serving Callala would be discharged to the ocean via a separate outfall. At ultimate development, the average dry weather flowrate would be about 150 litres per second. The investigations undertaken by the Manly Hydraulics Laboratory indicate that an outfall about 1000 metres into the Bay would yield satisfactory results.

Sewage from the Myola, Callala Beach and Callala Bay villages would be pumped north to a third treatment plant on Currarong Road. At ultimate development (11,000 persons) the volume of treated effluent from this third plant would be around 30 litres per second. A small ocean outfall would be constructed at either Kinghorn Point or Currarong. The latter location would have the advantage of being able to serve a treatment plant that would be constructed some time in the future to serve the village of Currarong.

OPTION III – Figure 3

In this scheme two plants would serve the whole area and all treated effluent would be discharged to the ocean. This scheme is similar to Scheme I in that two treatment plants would be operational. The Huskisson/Vincentia plant would cater for the Callala villages with raw sewage being pumped to the plant as described in Option I.

At both the Huskisson/Vincentia and St. Georges Basin plants two day maturation (polishing) ponds would be provided. At each pond pumping stations would be constructed with capacities equal to twice the average dry weather flowrate. At each plant wet weather flow balancing ponds would be provided.

The scheme would involve laying pressure mains from each plant as shown in Figure 3 to meet at a point at the bottom of the ridge along Jervis Bay Road.

A common rising main would then take the combined effluents to the top of the ridge, a rise of some 103 metres above the Huskisson treatment plant and about 86 metres above the St. Georges

Basin plant. From the top of the ridge a gravity main would carry the combined effluents to an ocean outfall at Governor Head.

The distances involved would be:

- top of the ridge to the ocean – 11 kilometres;
- base to the top of the ridge – 3.4 kilometres;
- Huskisson treatment plant to the base of the ridge – 2.4 kilometres; and
- St. Georges Basin treatment plant to the base of the ridge – 4.7 kilometres.

A number of options for pumping stations were examined and it would be proposed to use only two, one at each treatment plant.

The pipelines would be sized to handle the ultimate capacities of the two treatment plants but the pumps would be installed in stages. Initially, the capacity of the pumps would be adequate for flows up to the year 2005; they would then be replaced with larger pumps.

The 11 kilometre gravity line from the top of the ridge to the ocean would probably be 500 millimetres in diameter. A similar diameter rising main would be used from where the separate pipelines join at the base of the hill to the top of the hill where it meets the gravity outfall. The separate lines from each plant to the 500 millimetre common rising main would be 375 millimetres in diameter.

Figure 3 shows that the common main carrying effluent from both plants (both rising and gravity) would be some 14.3 kilometres long; about 10 kilometres would be in Commonwealth (Jervis Bay) Territory.

Air vessels or surge tanks would be installed at strategic points along the pipeline to counter water hammer.

Earlier studies examined a number of possible outfall locations on the Bhewerre Peninsula. These were, from south to north, at Cape St. George, Moes Rock, the ruined lighthouse and

Devils Elbow. Factors that could influence a decision on the choice of a location, if an outfall option on this Peninsula were chosen, include the need to minimise construction through the Jervis Bay Nature Reserve. This might mean that any outfall site would need to be in the north of the Reserve where advantage could be taken of the existing roads. In the north, possible constraints include popular diving sites and the penguin colony on Bowen Island. However, northern options allow better dispersion of effluent into well mixed and deep water.

In the oceangraphic studies undertaken by the Manly Hydraulics Laboratory, a possible site was located at a vertical rock ledge, about 300 metres north of Devils Elbow. Very deep water exists here.

In order to achieve a high initial dilution, an underwater discharge through a nozzle, acting as a high speed jet, would be proposed. The site that would be used would permit reasonably simple construction by drilling. The outfall itself would consist of a tank that would fill and then empty through the high speed nozzle via a syphon arrangement. The nozzle would be three to five metres beneath the surface. The facilities would be designed so as not to be visible either on top of the cliff or from the ocean. No power would be required to operate the facility. The construction area would be rehabilitated and revegetated using plant species native to the area. Access to the dosing tank would be at ground level, small, secure and unobstructive.

The jet itself would point downwards at an angle of 35 degrees.

Taking the discharge volumes in the year 2000, as an example, studies have shown that the plume would reach the surface of the ocean about 30 metres from the cliff face. The mixture would be the treated effluent diluted 90 to one by entrained seawater. The surface patch would be about 15 metres wide and it is probable that it will not be noticeable.

The amenity of the diving areas at Governor Head Wall, Spider Cave and Bowen Island would have to be considered. At sites further afield, including the dive areas at Moes Rock, the ruined Lighthouse and Stoney Creek Wall and bathing beaches at Murrays Beach, Stoney Creek and Steamers Creek the effluent is not expected to be detectable. Under this option, it may be possible to include effluent from HMAS Creswell into the regional scheme. This effluent presently discharges into Jervis Bay.

This was the option proposed by Council in its Notice of Intention (December 1988) prepared under the Commonwealth of Australia Environment Protection Act, 1974.

OPTION IV - Figure 4

Like Option II, this scheme involves treatment of sewage from the Callala villages in that area, probably near Currarong Road. All treated effluents would be discharged through a common ocean outfall on Beecroft Peninsula.

Unlike Options I and II, however, there would be no continual discharge of treated effluent to Jervis Bay from the Huskisson/Vincentia plant; nor would the St. Georges Basin plant effluent be discharged through the Plantation Point outfall.

Instead, a rising main would be constructed to allow effluent from the plants at St. Georges Basin and Huskisson/Vincentia to be pumped north to an ocean outfall on Beecroft Peninsula, most likely at Eves Ravine. An alternative site might be near Moores Inlet. A jet nozzle outfall would be used and studies by the Many Hydraulics Laboratory have shown that its performance would be similar to that at Devils Elbow, as described in Scheme III. Treated effluent from the plant near Currarong Road (serving the Callala area) would also be pumped into this common outfall. Effluent from any future plant at Currarong would also use this outfall.

The northern end of Beecroft Peninsula contains Abrahams Bosom Reserve with the most sensitive areas on the northern side. The region leading to an area midway between Beecroft Head and Drum and Drumsticks has a network of tracks through coastal heath. Some of these tracks could be used for a pipeline route. The existence of aboriginal sacred sites or areas of archaeological importance could influence pipeline routing and hence outfall siting. The region around Moores Inlet offers considerable buffer distance to all nominated diving areas.

The region near Eves Ravine about 250 metres north of Moores Inlet could provide a possible site because of deep water close to the cliff line. It would be possible to construct a jet outfall by a shaft and tunnel method, as at Devils Elbow described in Option III.

OPTION V - Figure 5

This scheme would be a variation on Option IV. As in Option I, raw sewage from the Callala area would be pumped to the Huskisson/Vincentia plant and treated there.

The treated effluents from that plant and the St. Georges Basin plant would be combined and, as in Option IV, pumped north to an ocean outfall at Eves Ravine or Moores Inlet on the Beecroft Peninsula. Effluent from any future plant at Currarong would drain to the same outfall.

OPTION VI – Figure 6

This scheme would be a variation on Options IV and V in that the outfall would be at Penguin Head, near Culburra, where an existing ocean outfall serves the treatment plant in the village of Culburra.

OPTION VII – Figure 7

The existing Sussex Inlet sewerage scheme relies on the disposal of treated effluent by exfiltration into the secondary sand dunes behind Cudmirrah Beach.

It may be possible to use a similar technique to dispose of treated effluent from the St Georges Basin area into dunes behind Bherwerre Beach. This is in Commonwealth Territory. The location is shown in Figure 7.

Estimates based on reliable data indicate that exfiltration rates of up to 100 litres per second might be achievable. Allowing for the increased volumes during wet weather, this rate might be sufficient to cope with the population in the St Georges area up to the year 2020.

The augmented works at Huskisson/Vincentia would continue to discharge to Jervis Bay at Plantation Point. Sewage from the Callala villages could be treated there as well or in a separate plant near Currarong Road (as in Option II).

OPTION VIII – Land Disposal, Figure 8

Land disposal by irrigation can be an effective method of effluent disposal. The disposal of effluent may be total or the land may be used to further treat an effluent before disposal to a watercourse.

The land disposal process consists of a number of physical, chemical and biological actions which include:

- plant uptake of water, evaporation and transpiration of water to the atmosphere, percolation of water through the soil to groundwater and runoff to surface waters;
- filtration and retention of solids by soils and plant matter;
- biological breakdown of organic material; and
- the assimilation of nutrients and dissolved salts by plants or their accumulation in the sub-soil.

The design of a land disposal scheme is dependent upon a knowledge of the climate and the soils characteristics of the proposed area. Effluent disposal by irrigation is most successful on sites having deep, well drained soils, while on areas with soils having a high clay content disposal by this technique is difficult because of the soils' low permeability and infiltration capacity.

The system is normally designed so that runoff is absent and the precipitation, evaporation and transpiration parameters are calculated from the available meteorological records for the particular location. Percolation values are highly variable and are dependent on the soil underlying conditions. The determination of percolation rates requires extensive site investigation and testing.

The following points define a site which is considered ideal for land disposal of effluent:

- located in a region of low rainfall and high evaporation;
- sloping no more than fifteen percent;
- having permeable, well drained soil to a depth of at least 1.5 metres;
- lacking major geological discontinuities that might short circuit to groundwaters;

- having a minimum depth above groundwater of 1.5 metres;
- not prone to flooding;
- located at least 50 metres from dwellings or public roads; and
- well removed from natural watercourses and at least 250 metres from any well used for domestic water supply.

Land disposal of secondary effluent has definite advantages in that it can further purify effluent, alleviate surface water pollution and recharge groundwater supplies. Problems with this method of disposal include the initial availability and cost of land, and the cost of developing buffer storages, irrigation systems and drainage and erosion controls.

As the balance of evapotranspiration to precipitation is very important the land disposal technique is usually more suited to inland areas than coastal areas, but it still may be a feasible method of effluent disposal in the St Georges Basin area.

Two possible land disposal sites have been identified. One is located about three kilometres west of Vincentia and the other is located about three kilometres north west of Tomerong (see Figure 8).

A firm of agricultural consultants was engaged by Council to investigate the feasibility of land disposal in the area. The pilot study undertaken by the consultants concentrated on the area in the Moona Creek catchment but the consultants considered that the principles developed and the general design of an irrigation system would be applicable to other sites of similar topography, such as at Tomerong, with little modification.

The initial results showed that the site in the Moona Creek catchment could probably cope with the Stage I development (16,000 persons). An area of about 280 hectares would be required. As well, a storage pond occupying an area of around 16 hectares would be required at the treatment works site to allow storage during wet weather.

The consultants concluded also that, in the longer term, it would probably be necessary to convert the scheme from woodland to pasture irrigation to cope with the phosphorus loadings. This was due to high tree mortality caused to native forests. They also concluded that the Moona Creek catchment runoff would increase slightly due to greater runoff of rainfall from the irrigated area, but believed that runoff quality should have no real effect on water quality at the Moona Creek bridge due to the low concentrations of nutrients, the additional filtering system provided by the marshes and the tidal mixing and dilution. These conclusions must be critically examined because of the high ecological value of these wetland areas.

It is emphasised that this projection would handle only the effluent from a population of 16,000 persons. In order to cope with the ultimate projected populations at Callala, Huskisson and St. Georges Basin a total area of around 1200 hectares would be required. These areas are shown in Figure 8.

Investigations at other possible locations are presently being considered. Any such investigation would include irrigation of crops and pastures; although forests can often accept higher unit hydraulic loading rates, the ease of biomass removal in pastures and crops may make them more attractive for longer term land application.

OPTION IX - Disposal to St. Georges Basin

Disposal of treated effluent to St. Georges Basin off Macleans Point was considered at an early stage in the investigations, but has been effectively eliminated as a feasible option due to the enclosed nature of the Basin and its poor tidal flushing characteristics.

In addition, it would only serve the St. Georges Basin treatment plant leaving the discharge to Jervis Bay from the Huskisson Plant. It would not appear logical to transport treated effluent from Huskisson to the ocean, for example, while continuing a discharge to St. Georges Basin.

OPTION X - Effluent Re-Use

An alternative to the discharge of effluent to rivers, bays or the ocean is some form of re-use of treated effluent.

Effluent re-use is a desirable method of solving wastewater disposal problems.

Potential exists for re-use in industrial and agricultural activities, on parks, gardens and grassed sports areas such as ovals and golf courses and even on home lawns and gardens.
At the present time there are no major industries in or near the study area which could utilise the quantities of treated effluent which will be produced.

It needs to be recognised, also, that:

- this coastal area experiences high rainfall and low evaporation and therefore large areas of land would be required to accept the quantities of treated effluent which will be available;
- suitable farmland and recreation areas are too scattered and it is unlikely that enough area would be available;
- the scattered nature of re-use sites would present problems for general management of the system and control of runoff etc;
- small farms might not be able to justify the cost of the required on-site buffer storage;
- reticulation to areas of re-use could be cost-prohibitive;
- preliminary correspondence with foresters, farmers and graziers in the region surrounding the study area indicated that difficulty may be encountered in finding landowners who will accept treated effluent;
- an alternative method of disposal would probably be required during wet periods, thus incurring additional costs; and
- treatment costs would be higher as extra detention time is required in the effluent ponds to minimise transmission of pathogenic micro-organisms.

Effluent re-use may, therefore, be able to account for some portion of the effluent produced in the area, but it may not be a viable alternative to dispose of all of the effluent at all times because of the reasons listed above.

Nevertheless, effluent re-use possibilities will be examined carefully, particularly as it may prove feasible to combine re-use during dry weather (by some means or another) with an acceptable disposal scheme when re-use would be incapable of dealing with the total volume. Council has already sought expressions of interest from organisations wanting to use treated effluent from the area.

Two re–use options are as follows.

1. Re–use on Home Lawns and Gardens

Shoalhaven City Council is already undertaking pilot scale trials involving the reticulation of treated effluent from its Shoalhaven Heads treatment plant. About 20 homes are using the water for irrigation of lawns and gardens.

It is too early yet to draw conclusions but it is interesting that re–use in this way has increased from six to 30 kilolitres per household per week, although the higher figure represents consumption over the hotter months. Visually, the trials have been successful, the lawns and gardens at this stage benefitting from the dissolved nutrients and ready availability of water. The re–use scheme has been encouraged financially by Council and the Interdepartmental Water Recycle Committee.

The existing number of dwellings in the Callala, Huskisson/Vincentia and St. Georges Basin areas is around 8000. It is expected that, at ultimate development, that number will be around 20,000. If treated effluent were reticulated to only those homes yet to be constructed (12,000), the total volume of treated effluent during dry weather could be re–used in this manner if an application rate of about 10 kilolitres per week per household could be maintained throughout the year. If the existing homes were provided with irrigation systems by retrofitting, that rate would decrease to less than six kilolitres per dwelling per week.

On the face of it, the scheme looks attractive but:

- pumping, rising mains and reticulation would be expensive;
- it may be impractical to compel home owners to use the system; and
- unless carried out under some form of automatic control, substantial numbers of home owners might use the water only for a part of the year when they were in residence in the area. (There is a high propertion of holiday residences in the area).

A possible combination of options that could involve re-use in this way might involve:

- constructing a separate treatment works for the Callala area, providing reticulation for irrigation re-use and discharging unused portions through an extended outfall into Jervis Bay at Callala Point;
- reticulating the Huskisson/Vincentia area and discharging unused effluent at Plantation Point (but through an extended outfall); and
- reticulating the St. Georges Basin area and discharging the unused fraction to the sand dune area at Bherwerre Beach.

To put this scheme in perspective, if at ultimate development:

- the total volume of treated effluent discharged to Jervis Bay were to remain as it is at present;
- a reasonable dune exfiltration limit of 60 litres per second were not to be exceeded; and
- an irrigation application rate, year round, of 10 kilolitres per household per week could be sustained, then

65 percent of the 20,000 dwellings (at ultimate development) would need to be re-using effluent for garden irrigation.

It is emphasised that the feasibility of effluent re-use in this manner, including the costs, would need close examination. In addition, the full scale use of effluent in this manner would require the support of State and Local Government public health authorities.

2. Re-use as Drinking Water

Direct reuse of treated effluent as drinking water is rare. Objections on cultural and health grounds would need to be overcome before more widespread recycling of effluent were to become a reality. Treatment to drinking water standard has been carried out for a number of years in the desert city of Windhoek, the capital of Namibia. The treated effluent is blended with water obtained from other surface and groundwater sources.

It is noted, however, that, when first suggested in the late 1960s, there was considerable resistance from the community. While the technology now exists to recycle water in this way it is expensive. Finally, even if permission were granted by the local health authorities, some form of epidemiological monitoring of the population would, almost inevitably, be necessary.

6.0 CONCLUSIONS

It is clear that, because of the large area of the region and the scatter of villages, a wide range of options is available. It is considered that the most viable of these have been addressed in this report but, clearly, there exists an even wider range of variations and combinations.

It is hoped that feedback from the community resulting from publication and dissemination of this report will permit preferred schemes and their environmental implications to be identified.

GLOSSARY OF TERMS

Air Vessels Or Surge Tanks

These are devices used on pressure pipelines to reduce the effect of shock waves on the pipeline and associated structures that can occur when a pump or valve is suddenly turned off. (See Water Hammer in this Glossary.)

Dilution And Bacterial Decay

These are terms used to describe what happens when treated sewage effluent mixes with seawater. Mixing and dilution occurs and bacteria die off due to the combined effects of salt in the seawater and the bactericidal effects of sunlight.

Dry Weather Conditions

A term used to qualify the volumes of domestic sewage originating from WCs, bathrooms and kitchens. Under wet weather conditions, the volume of sewage flowing in the pipes increases because of leakage in through joints and, in some cases, illegal connections to sewers from stormwater drains.

Entrained Seawater

When a treated effluent is discharged into the sea, the energy of the discharge causes the surrounding seawater to be pulled in and mixed with the jet, thus diluting the discharging effluent.

Evapotranspiration

The total loss of water from soils due to a combination of natural evaporation to the atmosphere and the water taken up by plants and trees in their natural growth processes.

Faecal Coliforms

A group of bacteria, the presence of which in water indicates the possibility of contamination by warm blooded animals.

Geometric Mean

A normal (or arithmetic) mean of a set of figures is calculated by adding the values and dividing the total by the number of figures in the set. A more realistic way of counting bacteria during any sampling period is to use a geometric mean. This is the arithmetic mean of the logarithms of a set of numbers.

The arithmetic mean of the two numbers 4 and 50 is 27, while the geometric mean is 14.

Hydraulic Loading Rates

A term used in irrigation design meaning the volume of water applied to a unit area of land over a given time. It is usually expressed in cubic metres per hectare per day.

Initial Dilution

This is the extent to which a treated effluent is diluted when discharged, say, to the ocean due to the entrainment of seawater into the discharge. Further dilution of the mixture then takes place as a result of currents and natural dispersion.

Maturation (Polishing) Ponds

A form of tertiary treatment where secondary treated effluent is held in a relatively shallow pond. This provides additional biological treatment, settling out of fine solids and disinfection.

Phosphorus

One of the two main substances (the other is nitrogen) that occur in sewage and whose presence in treated effluent can result in the overfertilisation of naturally occuring plants in the water into which the effluent is discharged. It originates naturally from body wastes but its presence can be increased when phosphorus based detergents are used in kitchens.

Plume

The area of water containing a mixture of treated effluent and entrained seawater, resulting from the initial dilution, before further dilution takes place from currents and dispersion.

Precipitation

The amount of water actually reaching the ground as a result of rain.

Residence Times

In the context of this Options Report, the time elapsed from the entry of sewage into a sewer and its exit at some other point (such as a sewage treatment plant).

Rising Main

A pipeline carrying sewage, treated effluent or drinking water which rises from point A to a higher point B. It is therefore under pressure and pumps must be used to move the liquid.

Water Hammer

The shaking of pipes, and the noise often associated with it, when a pump or a valve is turned off. This can cause such a sudden stop of liquid flow that shock waves are generated.

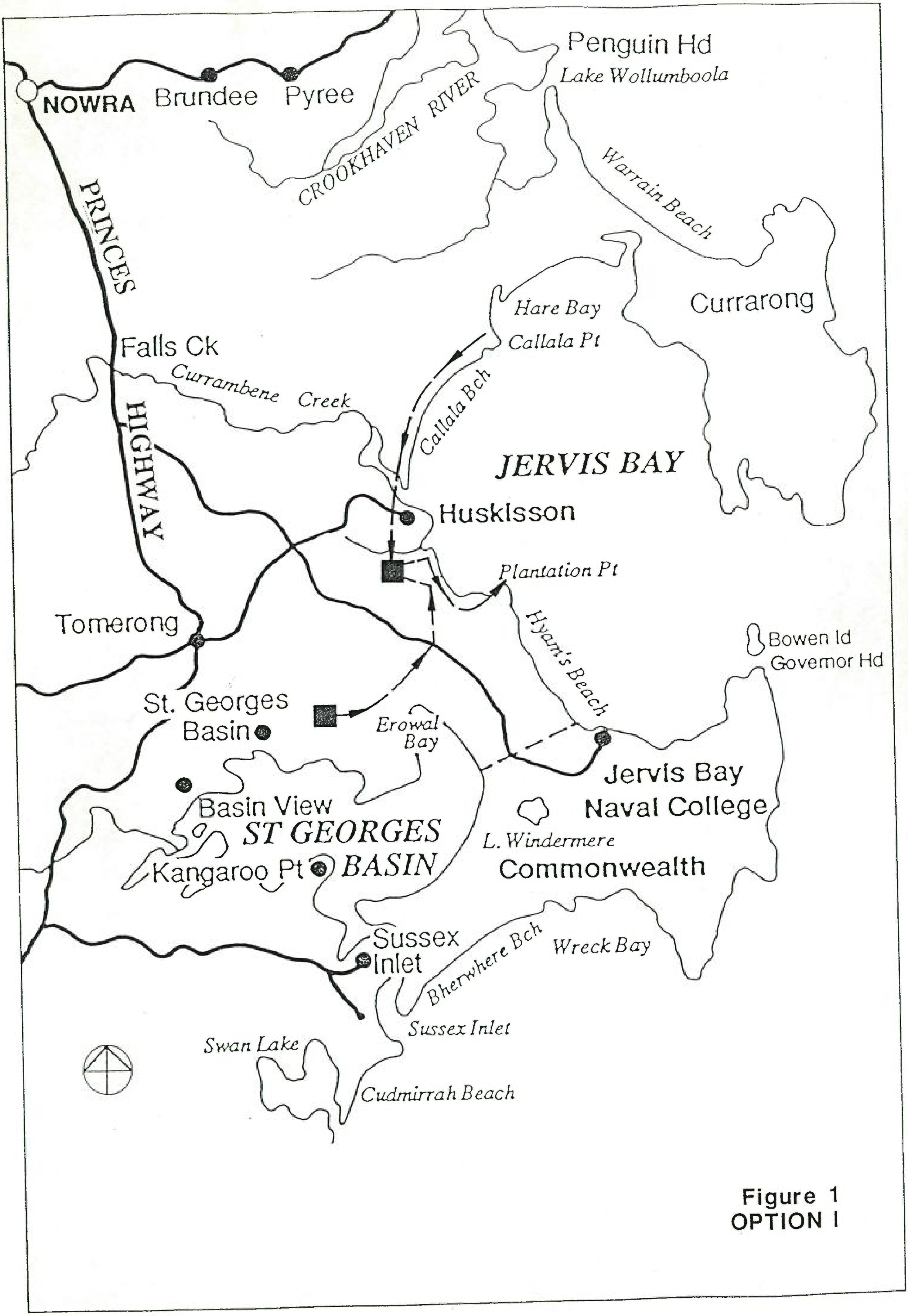


Figure 1
OPTION I

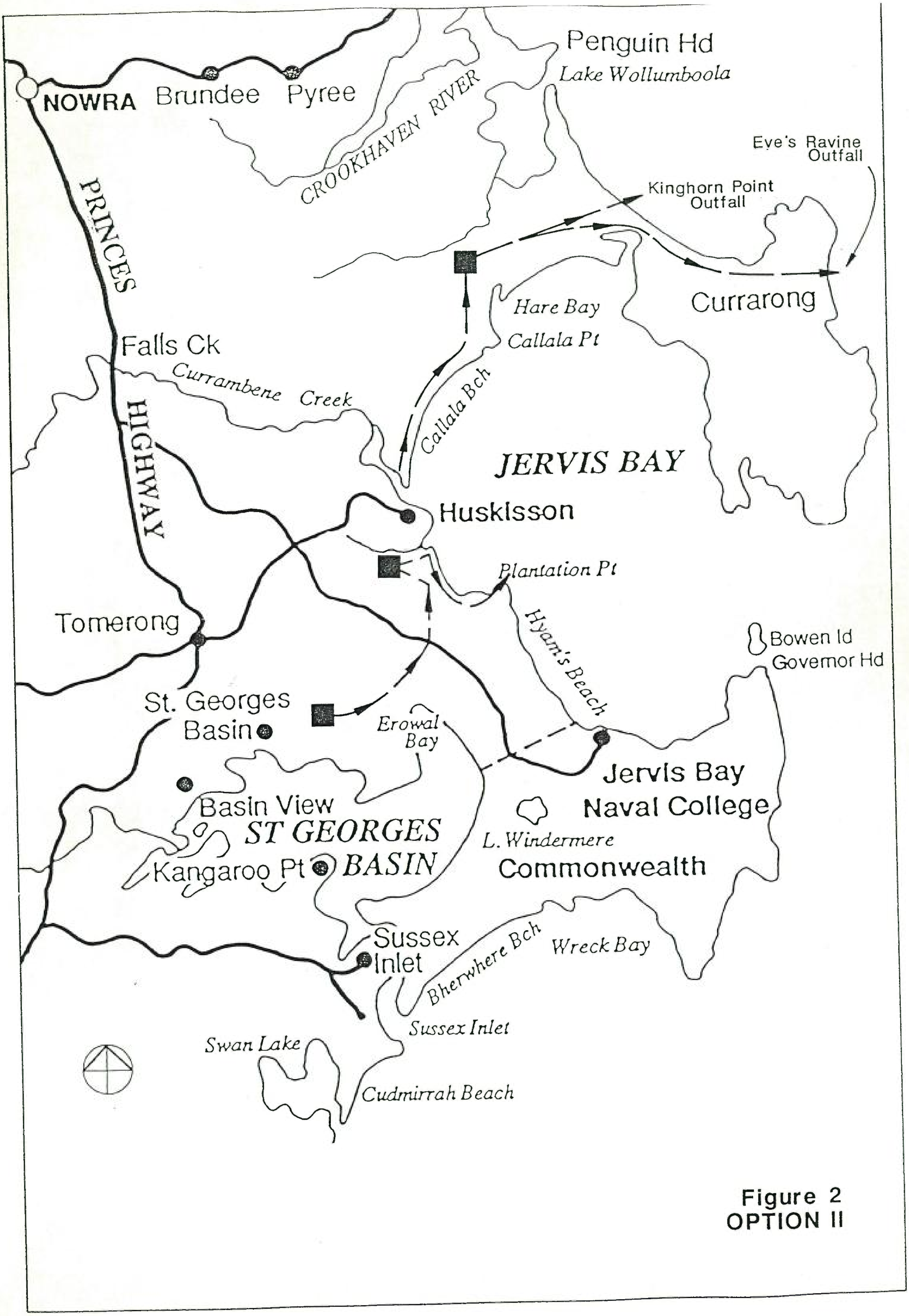


Figure 2
OPTION II

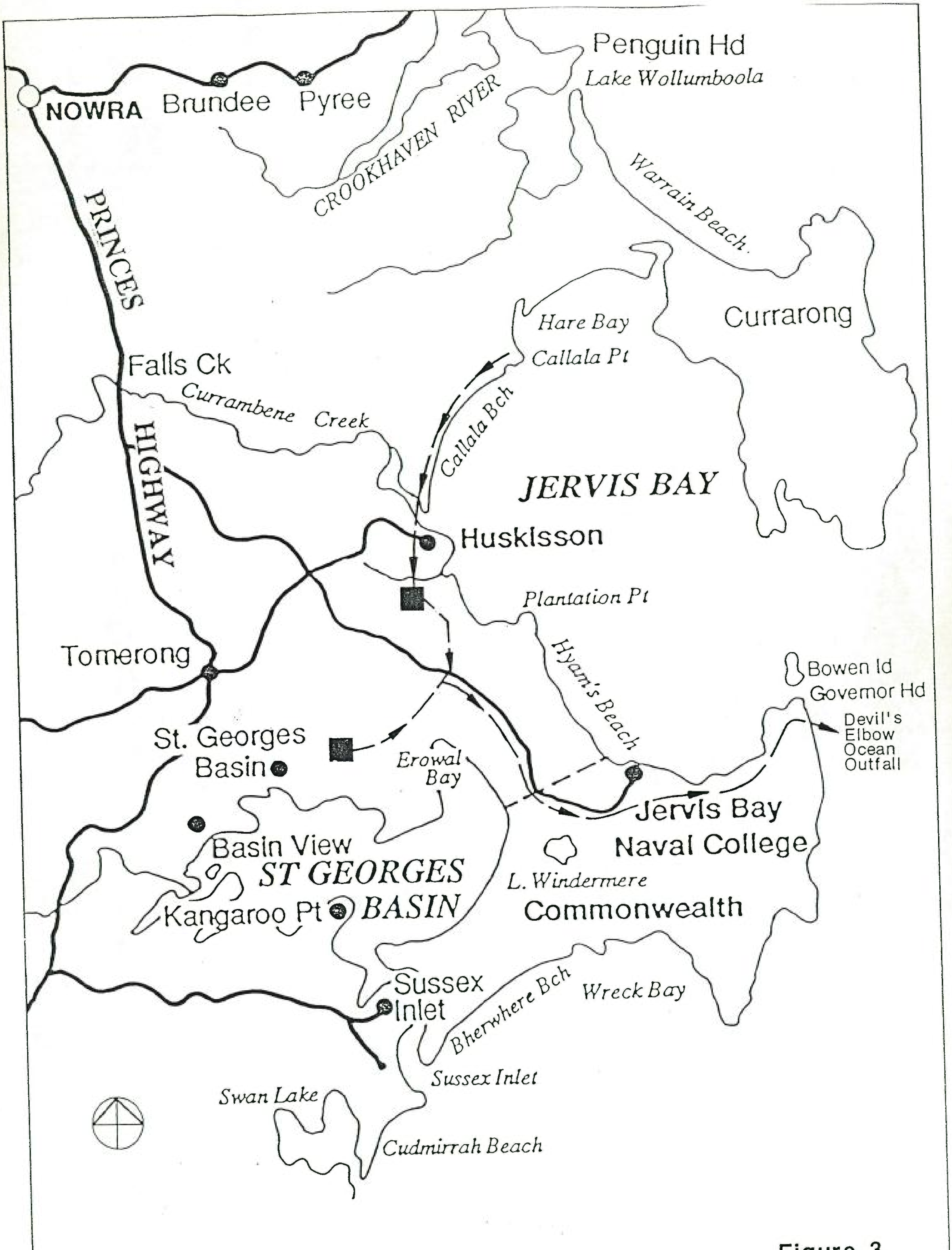


Figure 3
OPTION III

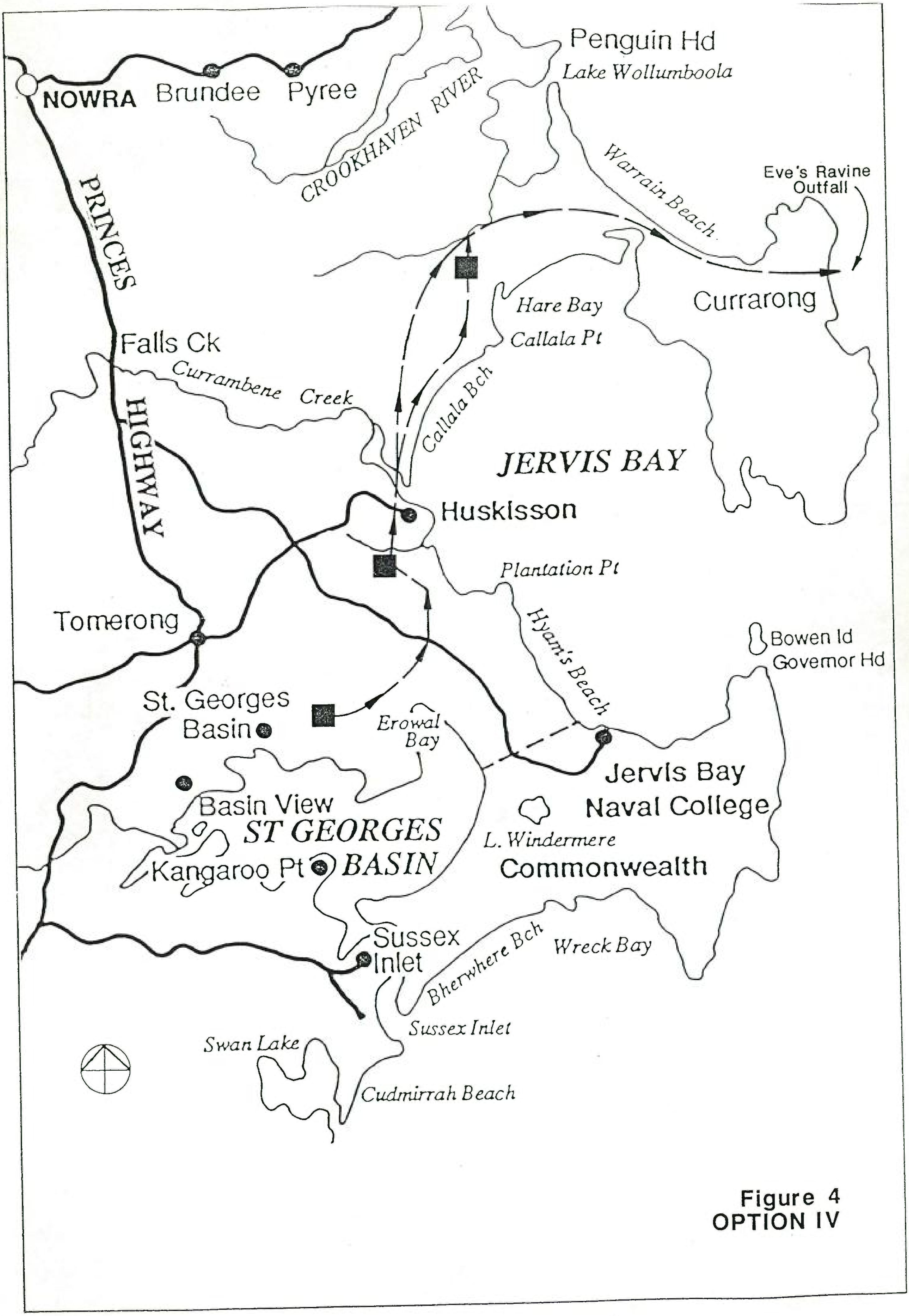


Figure 4
OPTION IV

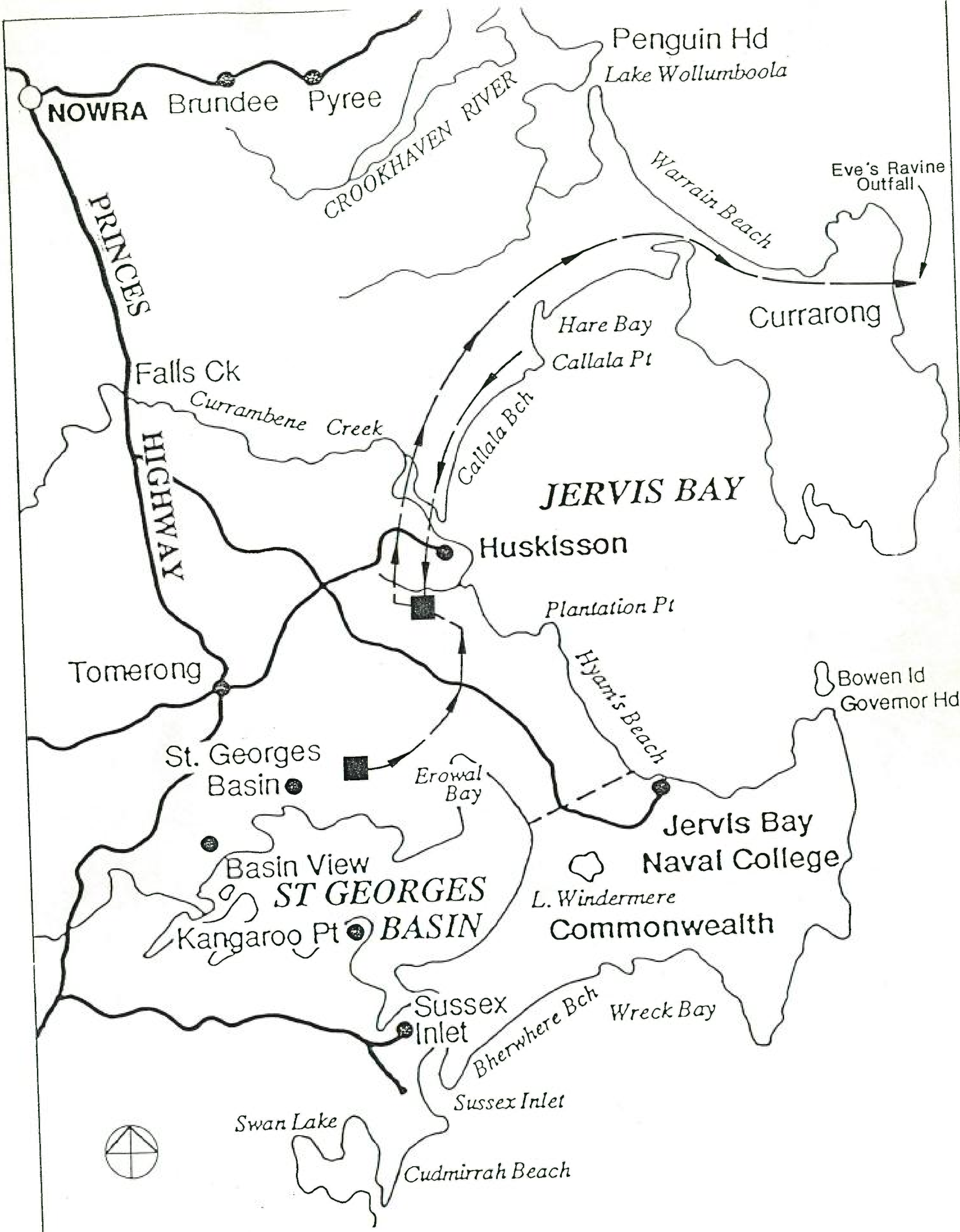


Figure 5
OPTION V

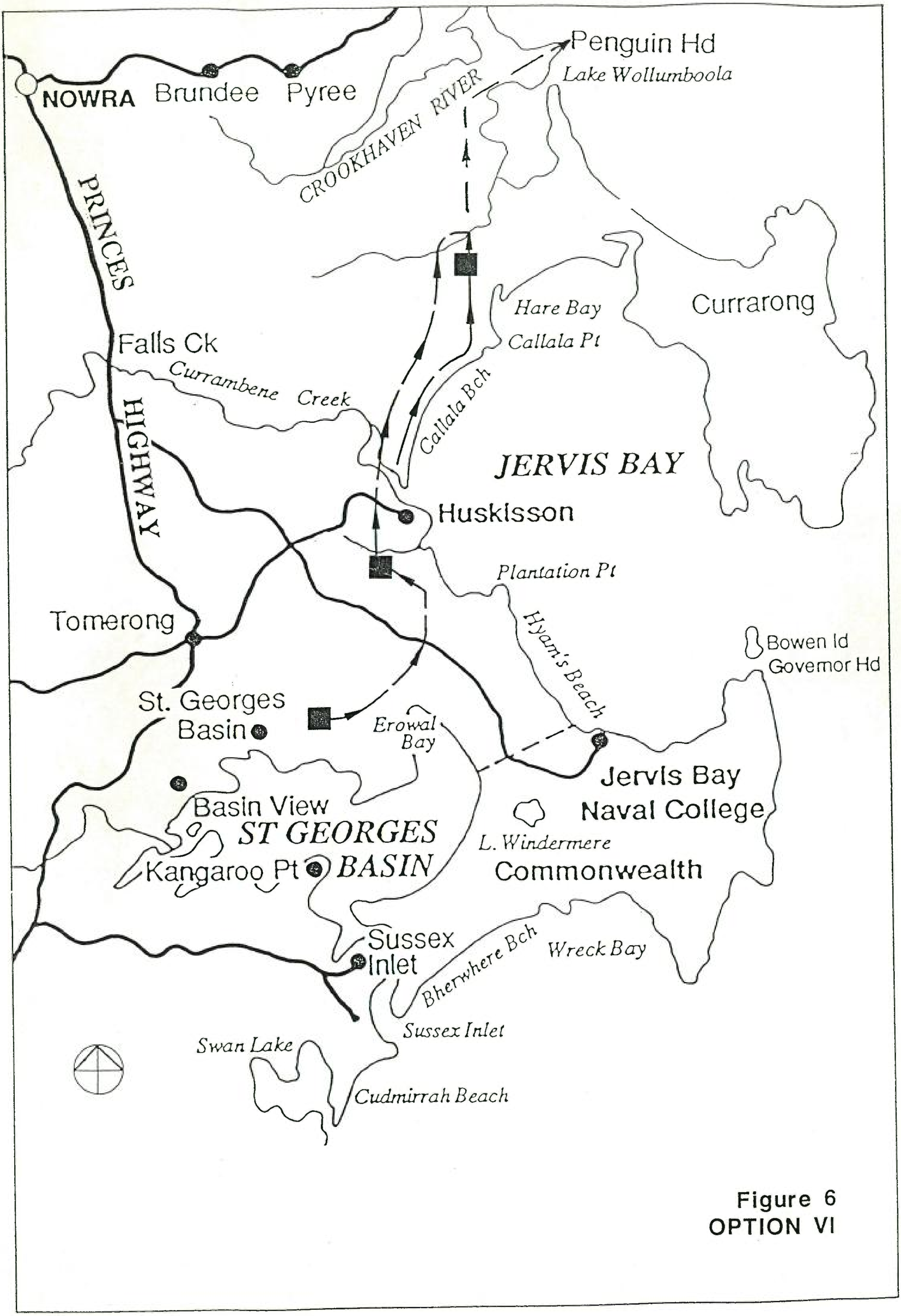


Figure 6
OPTION VI

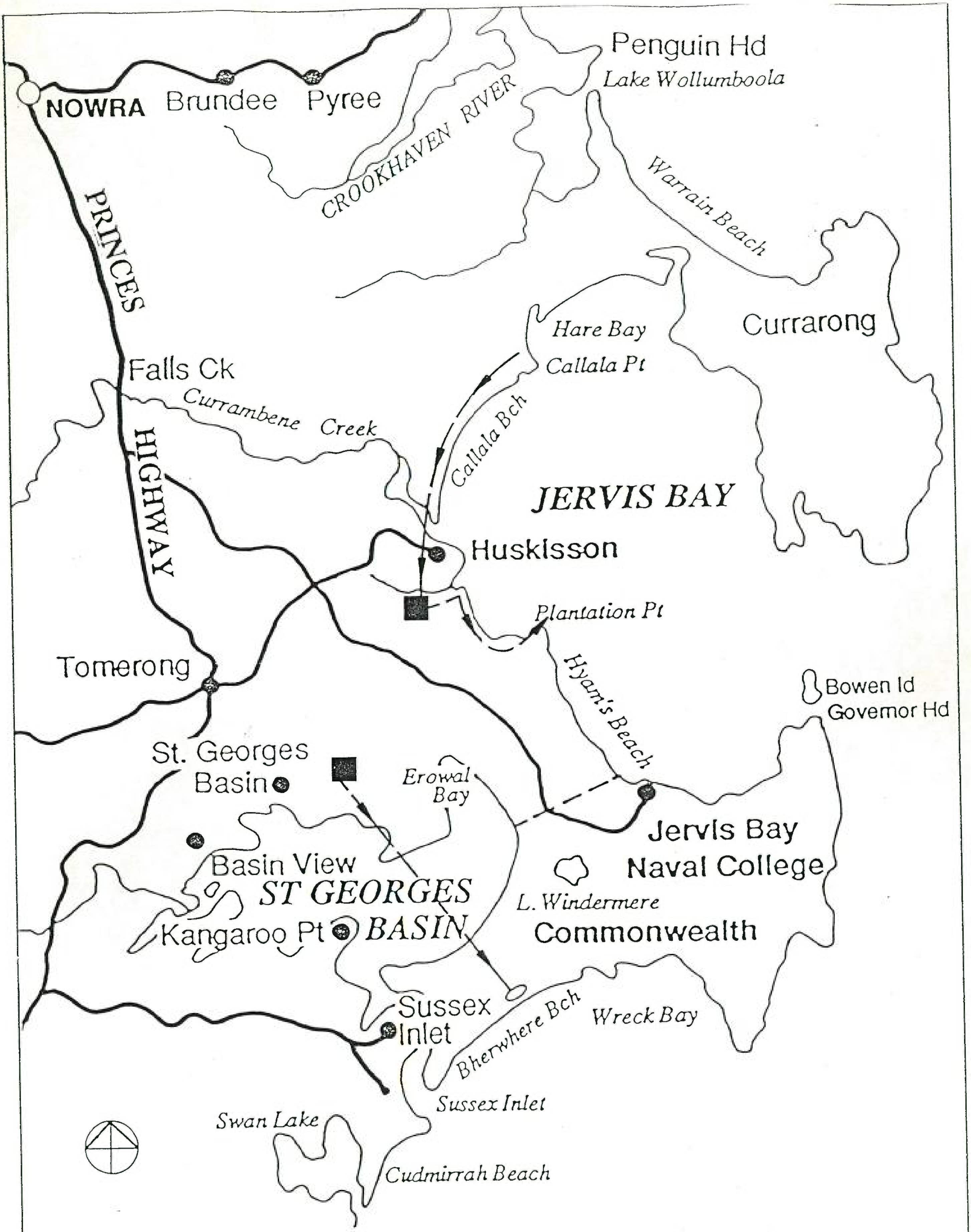
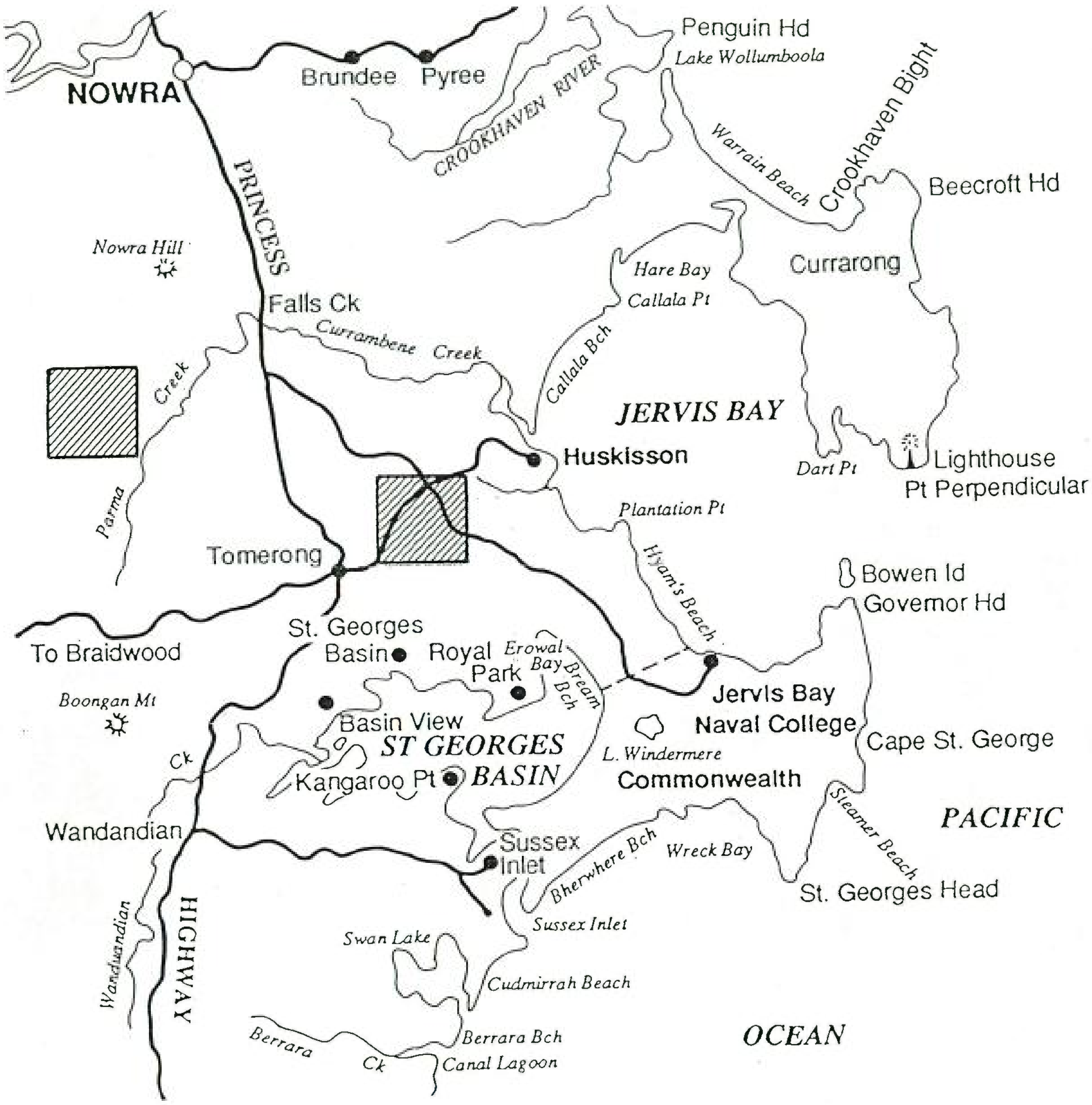


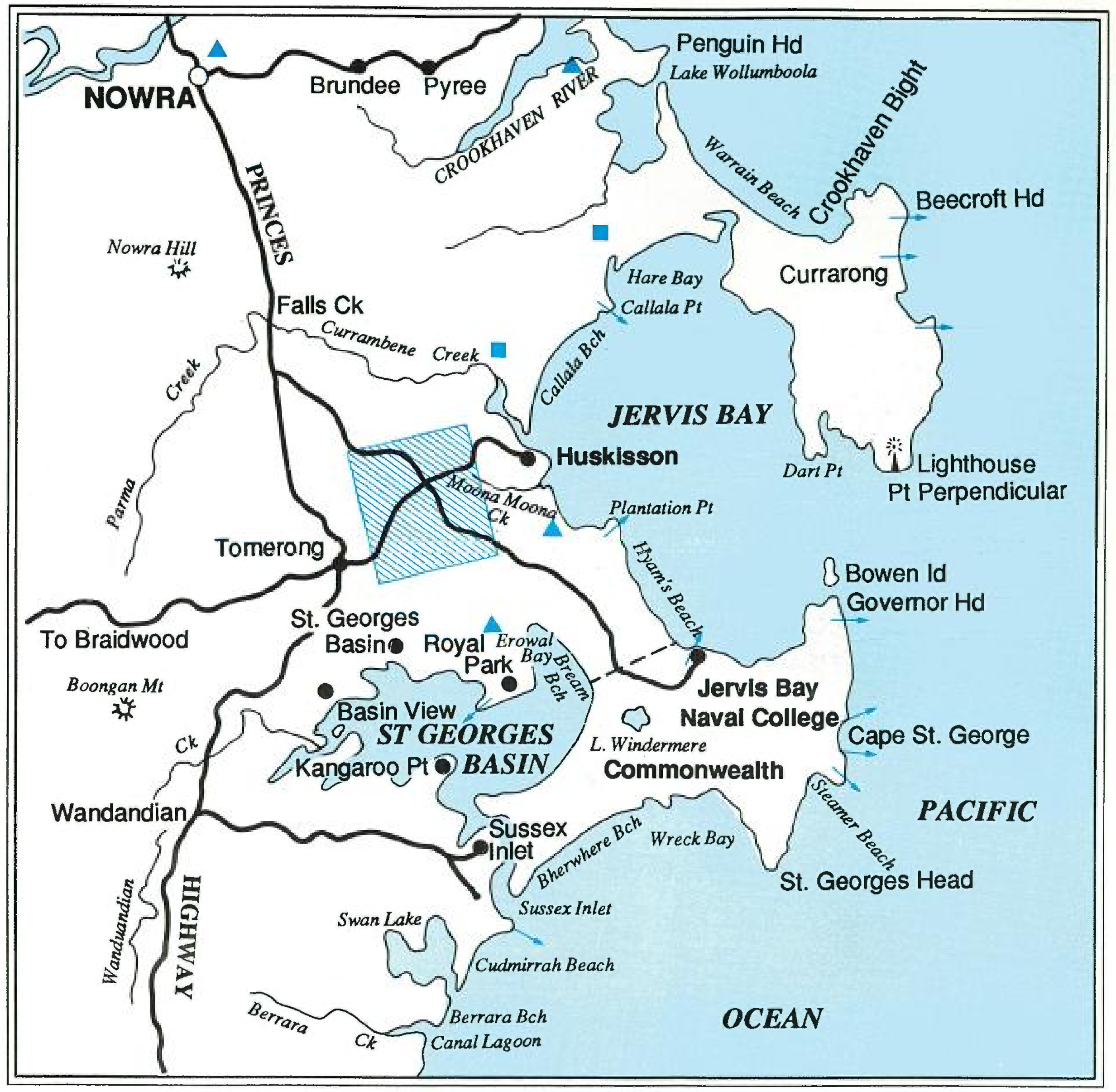
Figure 7
OPTION VII



NOTE: Each area is 1200 hectares.
Locations are approximate only.

Figure 8
OPTION VIII

SOME OF THE OPTIONS



▲ Existing Treatment Works
■ Possible Treatment Works
→ Discharge Options
▨ Possible Land Application Area

CONTACT:

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Mitchell McCotter & Associates P/L
P.O. Box 580
SPIT JUNCTION NSW 2088
Phone: 960-2355

SHOALHAVEN CITY COUNCIL

ST GEORGES BASIN / JERVIS BAY

REGIONAL EFFLUENT DISPOSAL

COMMUNITY NEWSLETTER

Keeping You Informed

Prepared By
MITCHELL McCOTTER & ASSOC.

NEWSLETTER 1
MARCH 1990

BACKGROUND

For some time a regional effluent disposal scheme has been planned for the expanding St Georges Basin-Jervis Bay area.

However, before any work can commence on the scheme, an Environmental Impact Statement (EIS) must be prepared to ensure the proposed scheme meets all environmental requirements.

The EIS, which has been commissioned by Shoalhaven City Council and the Public Works Department, is being conducted by the environmental and planning firm, Mitchell McCotter & Associates Pty Ltd.

The regional effluent disposal scheme will serve the long term needs of residents in the growing areas of St Georges Basin, Vincentia, Huskisson and other urban areas on the northern and western sides of Jervis Bay.

There has already been a number of options put forward for the disposal of treated effluent and the EIS will evaluate each one.

At present the options range from land disposal including reuse, discharge into the waters of Jervis Bay and St Georges Basin or an ocean outfall system north or south of the entrance to Jervis Bay.

The investigations to date have identified an ocean outfall at Bherwerre Peninsula as the preferred scheme.

Some of the options are detailed on the map on the back of this newsletter.

Members of the public, community groups, progress associations and conservation groups will be able to make submissions during preparation of the EIS. They can also put forward alternate options.

Submissions can be made to the Shoalhaven City Council, to Mitchell McCotter (address on back of this newsletter) or to any member of the Community Liaison Group.

All submissions will be carefully considered in the preparation of the initial and subsequent drafts of the EIS.

SOME COMMUNITY QUESTIONS

Why is a new sewerage system needed?

The area is growing so fast that the present system soon won't be able to cope with all the new residents.

Around St Georges Basin, Vincentia, Huskisson and the northern side of Jervis Bay more and more new houses are going up as more and more people move in. There is concern that the quality of water in the Basin is being affected by the operation of septic tanks and overflows.

For many years a regional sewerage scheme has been planned to serve the new residential areas.

However, before Shoalhaven City Council can decide on the best sewerage system an Environmental Impact Statement has to be prepared to ensure the new system meets strict environmental standards.

Will St Georges Basin-Jervis Bay suffer the same problems Sydney's beaches face with sewage pollution?

No. The sewage treatment works envisaged for St Georges Basin-Jervis Bay will be a sophisticated treatment system incorporating secondary and some tertiary treatment processes that will treat the wastewater to a high standard. Through aeration and special treatment ponds solids will be removed and, after further treatment, disposed of on land. The resulting effluent is a colourless liquid which will cause almost no environmental problems.

Trade wastes such as heavy metals and pesticides are not permitted to be discharged to the sewerage system in country areas. Presently, tertiary treated effluent from the Huskisson sewage treatment works is discharged into Jervis Bay at Plantation Point.

The sewage which is pumped into the ocean off Sydney only undergoes primary treatment. This means sewage is held in a tank where some of the solids fall to the bottom. Grease, which floats on the top, is partially collected. The concentrated solids, called sludge, are treated before discharge. All the liquids pass through screens, which remove rags and other coarse solids, before discharge. This primary treated sewage discolours the water and causes the major pollution problems in Sydney.

Sydney is now looking towards secondary treatment as a solution to its problems - St George Basin-Jervis Bay will have better than secondary treatment standard from the beginning.

What are some of the options for effluent disposal?

Several options have been identified and investigated. However, an examination of all options put forward will be carried out before a final recommendation is made.

One option is to discharge highly treated effluent into the ocean, through an ocean outfall. A number of possible sites for the ocean discharge, both north and south of Point Perpendicular, have been identified and each will be examined.

Then there's the option of effluent discharge into the waters of Jervis Bay or St Georges Basin. As well there is the option of disposing of the effluent into sand dunes. In addition to the various disposal options there is scope for re-using some of the effluent for irrigation.

Other options may arise as the EIS proceeds.

What unique features of the St Georges Basin-Jervis Bay area need to be considered by the EIS?

There are a number. There's Jervis Bay itself. There's the wetlands, salt marshes and fringe forest which are widely recognised as having conservation significance. There's also the penguins on Bowen Island and the recreational diving areas between Governor Head and the ruined lighthouse. As well there's the Jervis Bay defence facilities and how they would be integrated into any effluent disposal scheme.

Each of these unique features, and there are many more, must be studied before the final system of effluent disposal is resolved.

How long will the EIS take?

It will take about six months. This is a bit shorter than usual. The reason for this is that a very wide range of studies have been undertaken in Jervis Bay over the last two decades. These studies provide not only statistical base for the EIS but are a valuable research resource which can be utilised to save time. This means that an environmentally sound system can be built sooner.

Can anyone make a submission to the EIS?

Yes. One of the major features of the EIS is public accessibility. Mitchell McCotter, the environmental and planning consultants who are preparing the EIS, will make sure that major issues in the EIS are available for public comment. Information about the EIS will be made available through the local media and through Shoalhaven City Council. Any person who wishes to comment on the EIS, make suggestions or question any of the options will be able to do so direct with Mitchell McCotter. Newsletters, like the one you're reading now, will be circulated throughout the St Georges Basin-Jervis Bay area to keep the public informed of what is going on.

As well, a special Community Liaison Group has been established. This group, which will monitor the progress of the EIS, includes members of local environmental and community groups as well as representatives of the local members of State and Federal Parliament.

Only by providing for public accessibility and taking note of public comments can the EIS be a success.

COMMUNITY LIAISON GROUP

To ensure the highest possible degree of community participation in all the EIS processes, and to take into account issues which have been raised by the local community, a Community Liaison Group has already been established.

The Community Liaison Group will progressively monitor the preparation of the EIS.

As well the Community Liaison Group will:

- ❑ receive and consider progressive drafts to the EIS;
- ❑ provide recommendations of any additional matters which should be examined in the EIS;
- ❑ suggest possible sources of information which could be useful to the study; and
- ❑ consider appropriate ways of obtaining informed public responses on the issues involved during the investigation.

Members of the Community Liaison Group

Shoalhaven City Council (represented by Alderman G. Watson (Chairperson) and Alderman W. Hilzinger);

The Nature Conservation Council of NSW (represented by Dr J. Messer);

The Public Works Department (represented by Mr M. Monaghan);

The ~~Federal~~ Commonwealth Member for Gilmore (represented by Mr R. Salmon);

The ~~Federal~~ Member for Frazer, ACT (represented by Professor K. Taylor);

The State Member for South Coast (represented by Mr A Barry);

The Shoalhaven Conservation Society (represented by Ms M. Leatch); and

The Shoalhaven Combined Progress Association (represented by Mrs P. Mason).

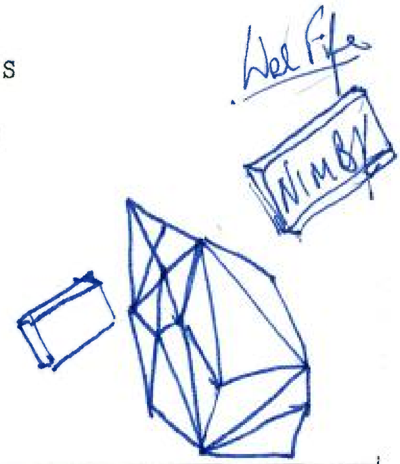
ST GEORGES BASIN/JERVIS BAY
REGIONAL EFFLUENT DISPOSAL EIS

PUBLIC SECTOR PLANNING FOCUS MEETING

4TH APRIL, 1990

COUNCIL CHAMBERS
SHOALHAVEN CITY COUNCIL

DRAFT PROGRAMME



TIME	TOPIC/ACTIVITY	SUGGESTED SPEAKER
9.00	Registration	
9.30	Welcome	Mayor
9.40	Overview & Introduction	Bob McCotter
10.00	Planning Context	R. Evans
10.20	Morning Tea	
10.35	Sewerage Infrastructure	N Southwell
11.00	History of Investigations	Jeff Brown
11.30	Environmental Setting	R McCotter
12.00	Options	Daryl Lacey
12.30	Environmental Issues	R McCotter
1.00	Lunch	
2.00	Government Departments to Identify their Areas of Interest	
3.00	Afternoon Tea	
3.20	Discussion and Questions	Floor

TRUST ME.

What do the Penguins do with their effluent?

Marriage ~~it very much like~~ can be likened to ~~running~~ operating a vessel.

Many components are necessary but one of the most important is A cable, which is a necessary requirement for all vessels

If properly secured it will hold a ship safe to the bitter end.

It must be flaked down correctly, maintained ~~at~~ as pristine as possible to prevent degrading.

If not allowed to let run carefully it can kink & throw the vessel aback, even destroying the vessel or otherwise snapping.

So to avoid trouble with cables – keep up maintenance coil carefully, let run carefully and watch it doesn't snap on you.

Very importantly dont smoke in the cable tier.

NATURE CONSERVATION COUNCIL OF NSW

THE NATURE CONSERVATION COUNCIL OF NSW
39 GEORGE STREET,
SYDNEY, NSW 2000.
PHONE: (02) 27 2228/27 4206.

PHONE: (02) 247 4206/247 2228
FAX: (02) 247 5945

1989

STATEMENT OF THE NATURE CONSERVATION COUNCIL EXECUTIVE ON WATER, SEWERAGE DRAINAGE PROBLEMS IN THE SYDNEY REGION.

The Nature Conservation Council of NSW recognises the urgent need to find solutions to the problems of the massive pollution of our urban and marine environment and condemns the failure of successive NSW governments to properly enforce the Clean Waters Act.

The Council notes:

(1) the widespread public concern regarding the disposal of domestic and industrial wastes and stormwater via the sewage system in the Sydney Region; and

(2) the complexity of the attendant environmental, social and economic issues, and calls upon the NSW government to:-

(a) implement and enforce the Clean Waters Act as a matter of urgency;

(b) move towards tertiary treatment of all waste discharged into rivers and the ocean;

(c) promote the recycling of sewage sludge; and

(d) hold a Public Inquiry into the disposal of sewage within the area under control of the Water Board.

Such an Inquiry should:

(i) take into account the need to protect and conserve natural ecosystems and the likely impact, upon future water consumption and waste disposal, of the Greenhouse problem, urban development, water and waste recycling programmes and user-pays principles;

(ii) evaluate current and future State Pollution Control Commission and Water Board policies and strategies;

(iii) identify and qualify alternative options where necessary; and

(iv) make recommendations to ensure that an environmentally acceptable and socially equitable integrated water use and sewage disposal system is achieved for the Sydney Region.

In addition, the Nature Conservation Council calls upon the Federal Government to:

(a) encourage a decrease in population influx to the Sydney basin until such a stage as urban sewage problems have been properly overcome;

(b) make available substantial Federal funding to the States for sewerage treatment programmes;

(c) as a signatory to the London Trade Dumping Convention, apply the Convention's clauses to Australia; and

(d) formulate and implement uniform guidelines in concert with the States.

PLANNING FOCUS WORKSHOP
ST GEORGES BASIN/JERVIS BAY REGIONAL EFFLUENT DISPOSAL

WEDNESDAY, 4 APRIL 1990

COMMITTEE ROOMS 1 AND 2 - SHOALHAVEN CITY COUNCIL - ADMINISTRATIVE CENTRE

9.30 AM	Morning tea	Reception Area
9.45 AM	Workshop commences	Committee Rooms 1, 2, and 3
12.30 PM	Lunch	Reception Area
1.30 PM	Workshop resumes	Committee Rooms 1, 2 and 3
3.00 PM	Afternoon tea	Committee Rooms 1, 2 and 3
4.30 PM	Workshop finishes	

Borrower's name	Date	Ex

EIS 771

St Georges Basin / Jervis Bay regional effluent disposal options report