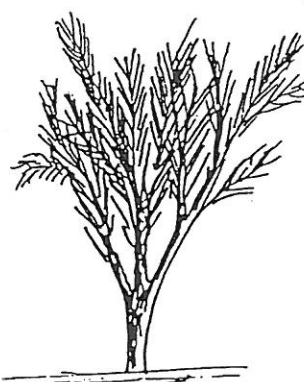
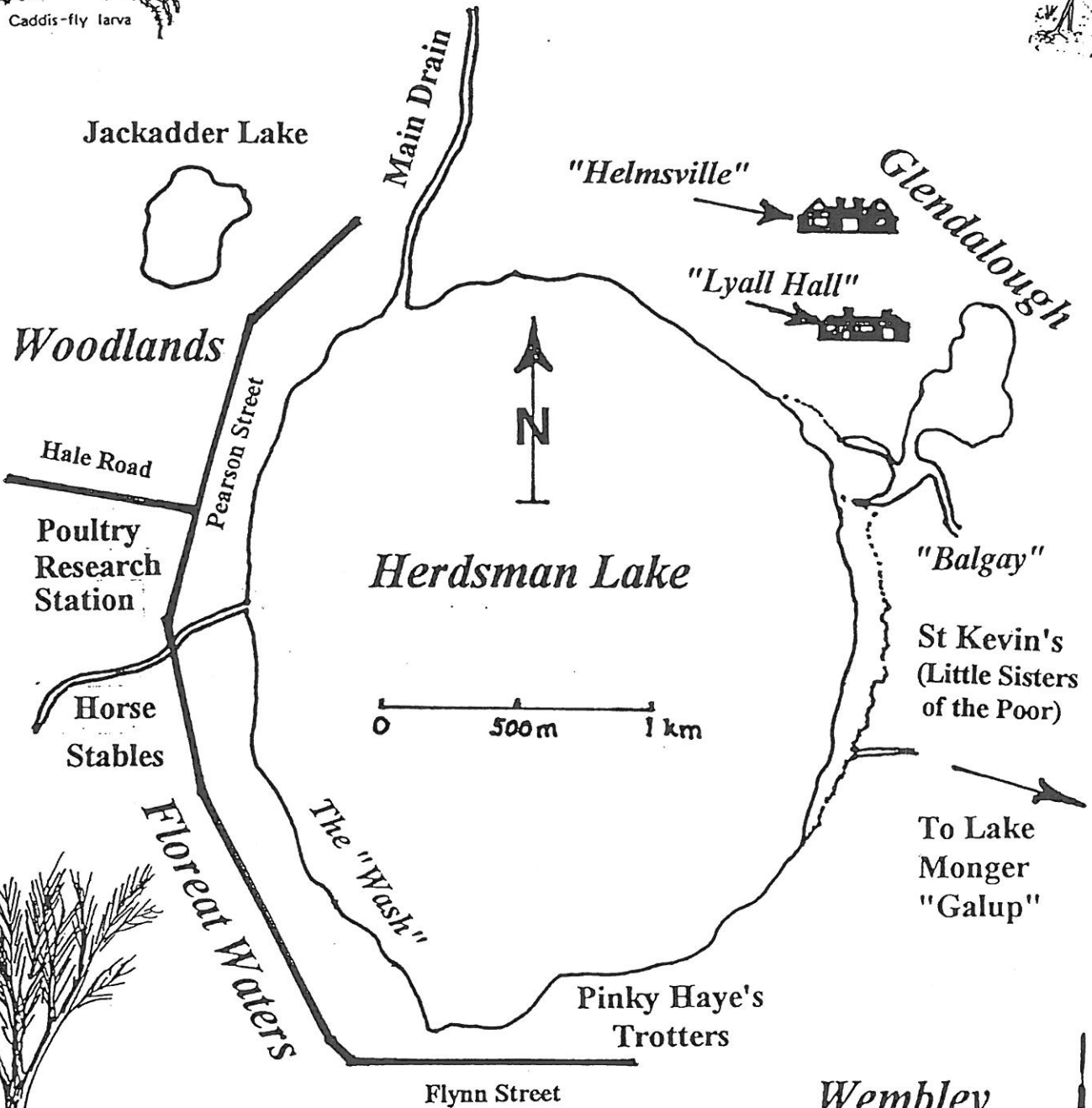
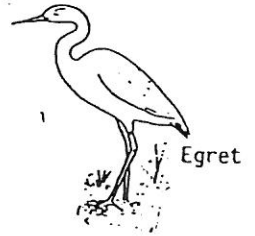
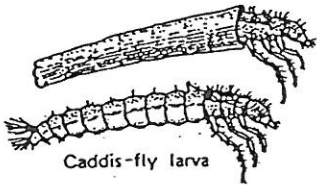


HERDSMAN LAKE WETLAND AND WILDLIFE CENTRE Osborne Park



YEAR 12 BIOLOGY

Wembley

HERDSMAN DRAINS WATER QUALITY STUDY



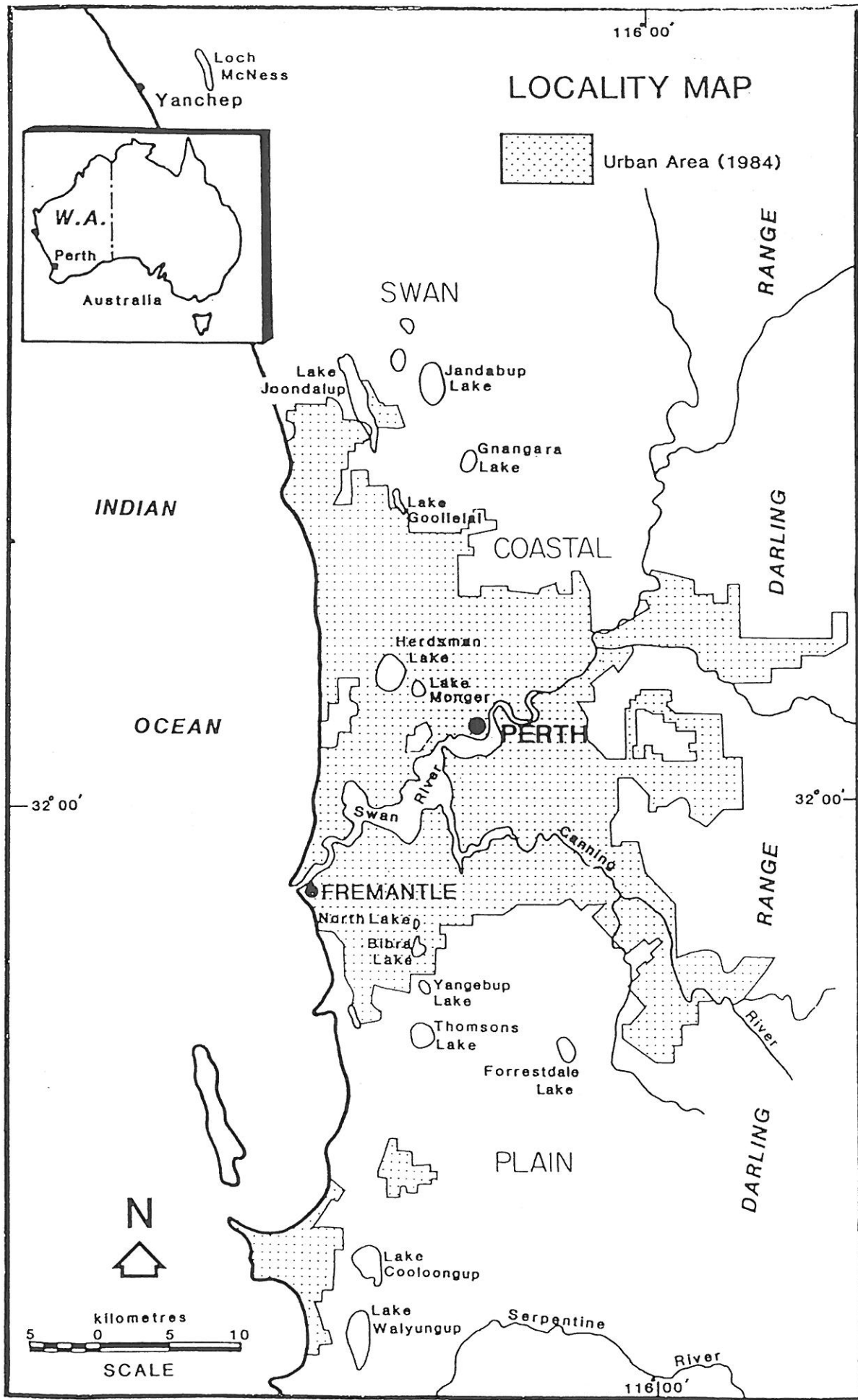


Fig. 1. Location of Herdsman Lake.

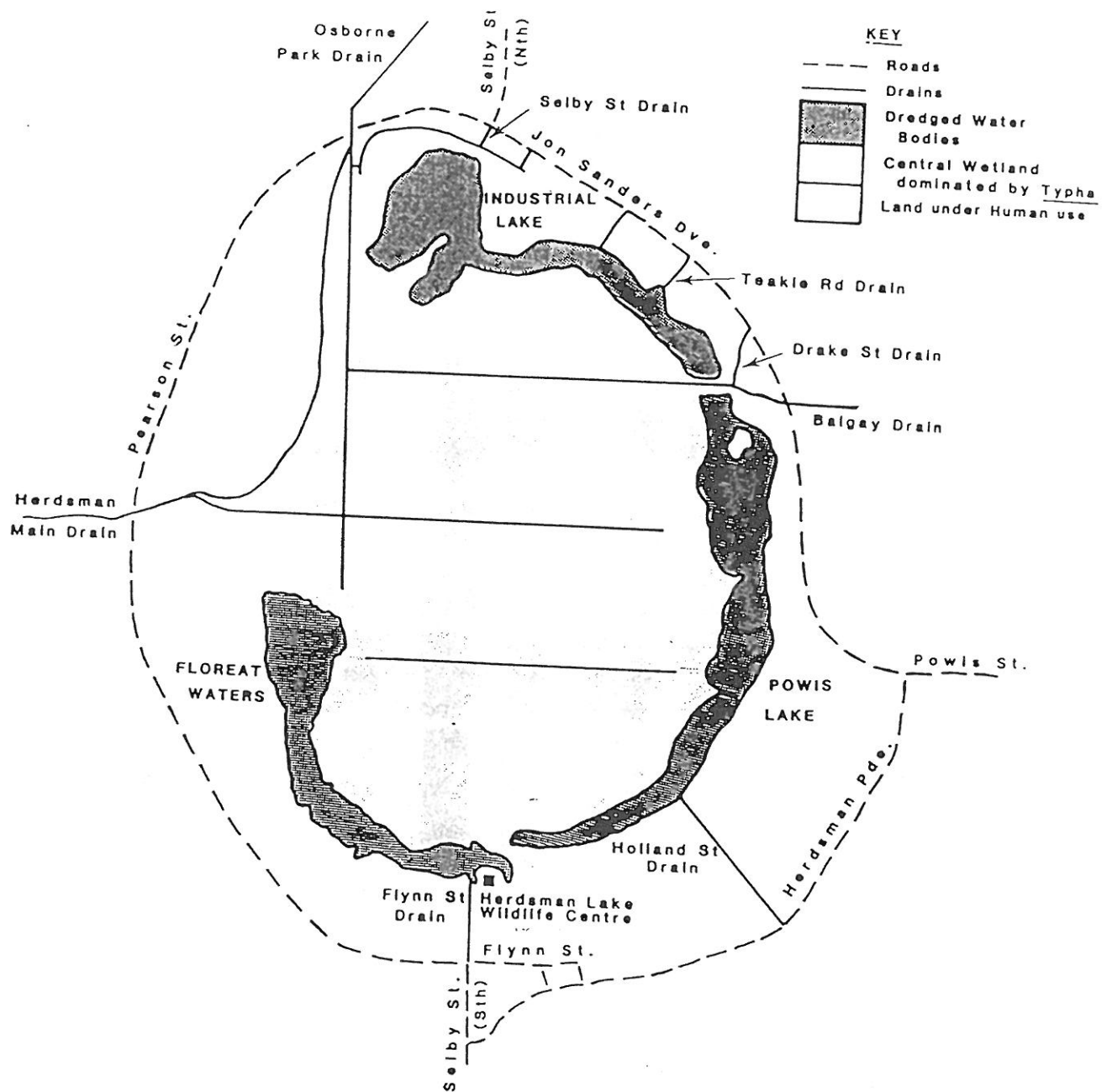


Fig. 2. Location of the three deepened waterbodies and other features associated with Herdsman Lake, April 1988.

Herdsman Drains Water Quality Study

Introduction:

Herdsman Lake has been used by the Water Corporation as a compensation basin for water runoff for many years. The drains leading into Herdsman Lake bring water, dissolved substances, litter, soil, oil and other materials from the 3330 catchment area. The maximum volume of water entering the lake is about 25200 litres/second in a peak storm event. There is one main drain exiting the lake on the western side which normally flows at an average rate of 700 litres/second with a peak flow of 1600 litres per second. This means in a heavy downpour that water levels in the lake rise about half a metre and then fall over the next several days.

Because these drains are bringing water from different types of areas (industrialised, urban, roadways, other lakes, nutrient stripping ponds and groundwater, the chemical and physical nature of the water in the drains differs, as does their flow rates.

Purpose of the study:

To compare the water quality parameters of water entering Herdsman Lake from the following sources:

1. Osborne Main Drain
2. Selby Street Branch Drain.
3. NE nutrient stripping lakes outlet
4. Jackadder Lake outlet drain
5. Balgay Branch Drain
6. Herdsman Main Drain (outgoing)

and to compare this with the water quality of the general lake itself. The survey will include recording both biotic and abiotic aspects of water quality. From the information collected a comparison of the drains will be made to determine their likely impacts on the water quality of Herdsman Lake and consequentially on aquatic organisms, plant life and wildlife living in or on the lake.

Procedure:

Each group will be responsible for testing three water samples. Each group will be responsible for testing the water from two drains and sharing this information with the other two drains. In addition each group will test the water from the main Herdsman Lake. this latter testing will be used as a quality control measure to verify the accuracy of the recordings for the drains.

Group	Water samples to be tested
A	Osborne Main Drain, Flynn Street Branch Drain, Herdsman Lake
B	NE nutrient stripping lakes outlet, Jackadder Lake outlet drain, Herdsman Lake
C	Balgay Branch Drain, Herdsman Main Drain, Herdsman Lake

The tests to be made include:

a) **Quantitative measures:** Special equipment will be used to take these measurements. do not use the equipment until you have been shown how to use it.

CATCHMENT AND SUB-CATCHMENTS

SHOWING WATER AUTHORITY DRAINS

- Catchment Boundary [thick dashed line]
- Sub-catchment Boundary [dashed line]
- Drains [solid line]
- Compensating Basins [circle with dot]
- Proposed Compensating Basins [circle]
- Main Drains [thick solid line]
- Branch Drains [thin solid line]
- Pump Stations [triangle]

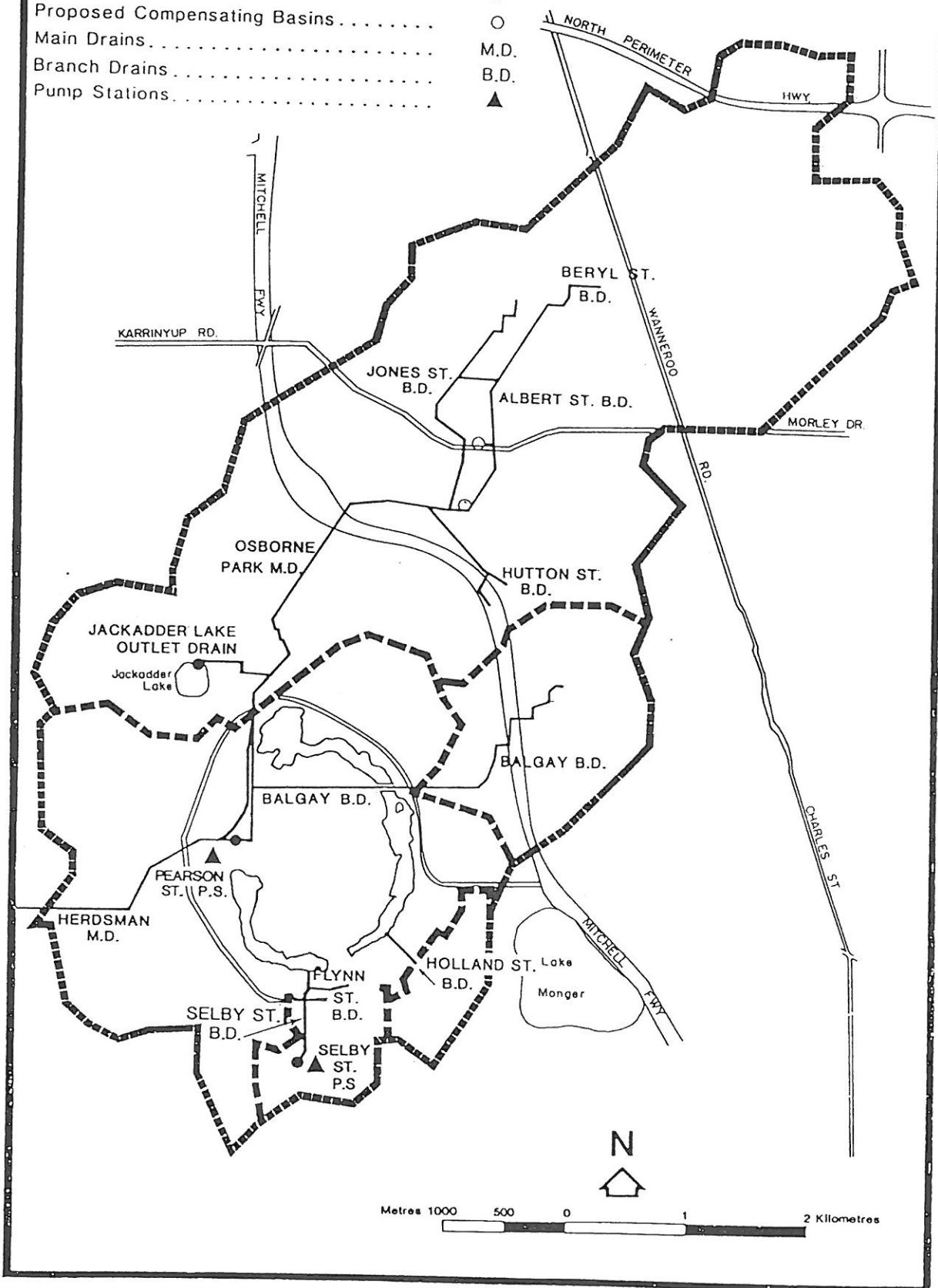


Fig. 5. Map showing Water Authority drains with associated subcatchment areas and the total catchment area.

Herdsman Drains Water Quality Study

Test	Information	Equipment
(i) pH	- is measured on a scale from 1 - 14 (1-6 acid; 7 neutral; 7-14 alkaline)	pH meter
(ii) Temperature	measure 15 cm below the surface	Thermometer
(iii) Salinity	measured in milliSiemens 0-0.8 fresh; 0.8-1.6 marginal; 1.6-5.0 brackish; >5.0 saline	Conductivity meter
(iv) Suspended solids	note the colour of the paper and the volume of water at which the filter paper becomes blocked	Filter, filter paper and syringe
(v) Light penetration	measured in NTU's - note the reading at which the markings just disappear	Turbidity tube

b) Abiotic factors - water clarity, colour, speed of flow (where possible) salt content, soil type and colour, drainage, topography of that part of the catchment (obtain from map), drain dimensions.

c) Biotic factors - use a net to filter out the macro-invertebrates, sort and identify these. From the aerial photograph deduce any land use differences around the drains.

d) Human impact: Describe how humans have affected the area. Ask yourself what the lake would have been like a) before Europeans arrived b) after European use of the lake but before the incoming drains were installed c) after the incoming drains were installed d) after the Herdsman Main Drain (outgoing) was installed.

e) Focus questions: each drain will have a few special questions to focus your observations.

Herdsmen Drains Water Quality Study

DRAIN WATER QUALITY COMPARISON

Data sheet for _____ drain	Your name _____
Date of sampling: _____	Time of sampling _____

Note: When completing this record sheet, when asked to **describe** something, use complete sentences, not words or phrases. If you are asked to **list**, then that is all that is required.

a) Quantitative measurements

Mark on the map of the drain the site where your measurements were made.

Factor	Measurements and units
pH	
Temperature	
Salinity	
Suspended solids	
Light penetration	

b) Abiotic factors Describe the distinctive abiotic factors of this drain using your quantitative measurements and any other observations you have made.

c) Biotic factors

Using the macro-invertebrate guides, the aerial photograph and other resources list the:

(i) macro-invertebrates found in the sample

(ii) the water quality index based upon these: _____

(iii) vegetation types in the region of the drain

(iv) likely human impacts on the water quality in the drain

Herdsmen Drains Water Quality Study

DRAIN WATER QUALITY COMPARISON

Data sheet for _____ drain Your name _____
 Date of sampling: _____ Time of sampling _____

Note: When completing this record sheet, when asked to **describe** something, use complete sentences, not words or phrases. If you are asked to **list**, then that is all that is required.

a) Quantitative measurements

Mark on the map of the drain the site where your measurements were made.

Factor	Measurements and units
pH	
Temperature	
Salinity	
Suspended solids	
Light penetration	

b) Abiotic factors Describe the distinctive abiotic factors of this drain using your quantitative measurements and any other observations you have made.

c) Biotic factors

Using the macro-invertebrate guides, the aerial photograph and other resources list the:

(i) macro-invertebrates found in the sample

(ii) the water quality index based upon these: _____

(iii) vegetation types in the region of the drain

(iv) likely human impacts on the water quality in the drain

Herdsman Drains Water Quality Study

LAKE WATER QUALITY COMPARISON

Data sheet for _____	Lake _____	Your name _____	
Date of sampling: _____		Time of sampling _____	

Note: When completing this record sheet, when asked to **describe** something, use complete sentences, not words or phrases. If you are asked to **list**, then that is all that is required.

a) Quantitative measurements

Mark on the map of the lake the site where your measurements were made.

Factor	Measurements and units
pH	
Temperature	
Salinity	
Suspended solids	
Light penetration	

b) Abiotic factors Describe the distinctive abiotic factors of this drain using your quantitative measurements and any other observations you have made.

c) Biotic factors

Using the macro-invertebrate guides, the aerial photograph and other resources list the:

(i) macro-invertebrates found in the sample

(ii) the water quality index based upon these: _____

(iii) vegetation types in the region of the lake

(iv) likely human impacts on the water quality in the lake

Herdsmen Drains Water Quality Study LAKE WATER QUALITY COMPARISON

FOCUS QUESTIONS

a) The Lake in general:

1. Why is Herdsmen Lake important as a wetland?

2. Name any plant communities that you notice in or around the lake

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3. During peak winter rain events the lake can become higher. What impact would this have on

a) the concentration of solutes in the water?

b) waterbirds?

4. During summer the levels of water in the lake fall, and parts may dry up. What effect would this have on

a) the concentration of solutes in the water?

b) the aquatic animals like plankton, small fish and tortoises?

c) water birds like swans, coots, musk ducks and swamphens?

d) rushes and sedges at the edge of the lake?

e) the small herbs that grow on the mudflats?

Table 1. Design flow rates for main drains into Herdsman Lake

Drain	Catchment (Ha)	Peak flow* (l/sec)	Ultimate peak flow** (l/sec)
Balgay	254	3000	7000
Osborne Park	1797	5000	4000 (if compensation basins constructed)
Flynn Street	46	1000	1200
Holland Street	83	1500	2000
Drake Street (now feeds into Balgay Drain)	-	6000	-
	2180	16100	

* Calculation based on peak flow from the maximum storm event likely in a three year period.

** After completion of proposed developments.

2530 2520

Herdsmen Drains Water Quality Study LAKE WATER QUALITY COMPARISON

b) DRAIN COMPARISONS

(i) the drains in general

1. Which drain would contribute most nutrients to Herdsmen Lake if they all flowed directly into the lake?

2. At the end of last summer many of the frogs in Jackadder Lake started to die. Frogs in many lakes in the south west have been dying due to the fungus Chytrid. The frogs in Herdsmen Lake seemed unaffected. Recently frogs in Herdsmen Lake started to die. The cause is yet to be determined.

What do you suspect is the cause of their deaths, and how did the disease get to Herdsmen Lake?

3. From your results is there any correlation between the results for water quality which you obtained using instruments, and those results which you obtained from an analysis of the types of macro-invertebrates present? Discuss any differences or similarities.

(ii) the Osborne Main Drain

1. From the results that you obtained, why do you think that the OMD was connected directly to the outgoing Herdsmen Main Drain?

2. When there is a major rain event, water pours over from the drain into the main lake. What impact could this have on the lake?

3. How do you think that these impacts could be reduced?

Herdsmen Drains Water Quality Study

(vi) Balgay Drain

1. The following data show the recorded pesticide concentrations in selected drains at Herdsmen Lake in 1985. All concentrations are expressed as ug/L.

Pesticide	Holland St drain	Balgay drain	Teakle St drain	Osborne Main drain
Dieldrin	0.011	0.24	0.045	0.012
Aldrin	<0.001	0.08	<0.001	<0.001

Aldrin and Dieldrin are pesticides. Why do you think that their concentrations are so much higher in the Balgay Drain?

2. Try to explain any other differences in the Balgay Drain results.

(vii) The Herdsmen Main Drain

1. What differences exist between the water quality readings for this drain and each of the others?

2. Try to explain these differences?

3. Do the data suggest that anything is being left behind in the lake? _____
What? _____

4. Where in the lake might it be left?

5. What might leave the lake via the Main Drain that shouldn't be leaving?

6. What ecosystem is affected by what leaves the lake? _____

Herdsman Drains Water Quality Study

(iii) the Flynn Street Drain

1. Explain the differences between the water quality of this drain and that of the other drains.

2. The Flynn Street drain comes straight in off the roads. What problems does this pose in the event of a chemical spill due to a truck roll over or accident?

3. How could the effects of such an event be minimised?

(iv) the nutrient stripping lakes to the north east of Herdsman Lake

1. Where do you think the water in the nutrient stripping lakes comes from?

2. How does the water differ to that in the other drains?

3. How do you explain these differences?

(v) Jackadder Lake Outflow drain

1. How does the water quality and macro-invertebrates from Jackadder Lake compare with those from Herdsman Lake?

2. Explain any differences.
