NORTHERN TERRITORY ADMINISTRATION
WATER RESOURCES BRANCH

DARWIN WATER SUPPLY INVESTIGATION.

TOPOGRAPHY OF SITES
OF
BERRY PROPOSAL

Field Officer's Report - No.1962/7.

Prepared by: D. Kneebone, Senior Technical Officer (P)
INDEX SHEET.

Synopsis Report:

1. Introduction ................................................. 1
2. Investigation Staff ........................................... 1
3. Geology ....................................................... 1
4. Level Datums .................................................. 1
5. Other Investigations - Drafting ............................. 1
6. Darwin River Dam Site ....................................... 1
7. Location ....................................................... 1
8. Site ........................................................ 1
9. Catchment Area and Basin ................................... 1
10. Access ....................................................... 1
11. Preliminary Investigations ................................ 2
12. Investigations ............................................... 2
13. Datums ....................................................... 2
14. Azimuth ....................................................... 2
15. Level Datum ................................................ 2
16. Western Saddle .............................................. 2
17. Dam Site ..................................................... 2
18. Basin Area ................................................... 2
19. Conclusions .................................................. 2
20. Darwin River Ponding Reservoir ............................ 4
21. Location ..................................................... 4
22. Wall Sites ................................................... 4
23. Catchment Area and Basin .................................. 4
24. Access ....................................................... 4
25. Preliminary Investigations .................................. 4
26. Investigations ............................................... 5
27. Datum ....................................................... 5
28. Azimuth ....................................................... 5
29. Level ........................................................ 5
30. Berry Springs and Traverses ................................ 5
31. Location ..................................................... 5
32. Pipeline Site ................................................ 5
33. Investigations ............................................... 5
34. Datum ....................................................... 5
35. Azimuth ....................................................... 6
36. Level ........................................................ 6
37. Berry Springs - Darwin River ............................... 6
38. Berry Proposal Conclusion .................................. 6

APPENDIX NO.

1. Darwin Proposal - Site Plan.
2. Darwin River - Proposed Dam Site - Basin Area
   contours and Capacity - Surface area diagram.
3. Darwin River - Proposed Dam Site - Plan
4. Darwin River - Proposed Dam Site - Cross Section
5. Darwin River Ponding Reservoir - Basin Contours.
6. Darwin River Ponding Reservoir - Site "A" to Site "B"
   Contour Plan.
7. Darwin River Ponding Reservoir - Site "B" Plan.
8. Darwin River - Berry Springs Connection Survey.
X. Berry Springs - Stuart Highway Proposed Pipeline
   Traverse.
BERRY PROPOSAL

1. SYNOPSIS

The field work carried out by this Section was to obtain topographical information and capacities a Dam Site, a Ponding Reservoir on Darwin River, and Berry Springs and traverses for proposed pipelines between Darwin River Ponding Reservoir Site Berry Springs and Stuart Highway. The results of field work suggest that at the Railway Crossing on Darwin River a dam site exists for a wall up to 70 feet high and 734 feet long with capacities as shown in Appendix 2.

Approximately eight miles downstream of the Dam Site, two sites, a ½ mile apart, were investigated for the Ponding Reservoir site. A detailed survey of both areas suggested that a wall site is available within the confines of the banks. Capacities of each site are shown on Appendix 7a. Within the basin area is a waterhole with a capacity of 35,500,000 gallons which maintained standing water level one foot below cease to flow level at the end of 1961 dry season. This high standing water level suggests high replenishment from groundwater sources. The whole of this area is freehold land and acquisition action would be required if this area is to be developed by this scheme.

Two traverses were run between Darwin River Ponding Reservoir site and Berry Springs to enable a suitable location of a proposed pipeline to be selected, if required.

4. A traverse for a proposed pipeline was run from Berry Springs to the Stuart Highway within a road reserve for a distance of 12,130 ft. There are several areas of swampy and one outcrop of rock on the proposed line. Details of these are given in this report.
INTRODUCTION.

Following a report by Mr. H. Wilson, Assistant Chief Hydraulic Engineer, Department of Works, on this proposal, the Water Resources Branch commenced investigations in January, 1961, to evaluate its potential.

The Berry proposal was suggested as a possible means of augmenting Darwin Water Supply. The proposal consists of a Dam at the railway Bridge on the Darwin River to supply water by run of river to a ponding Reservoir 8 miles downstream near old Bynoe Road (old army) Crossing. The water then being pumped from the ponding Reservoir to Stuart Highway via, and possibly including water from Berry Springs.

This report refers to the first three sections, namely:-

Darwin River Dam Site;
Darwin River Ponding Reservoir;
Berry Springs pipeline;

and details the field investigations undertaken to assess the suitability of the Dam Site and Ponding Reservoir, the survey of Berry Springs area, the pipeline traverses from Berry Springs to Manton Dam/Darwin 12" and 15" water main, and Berry Springs/Darwin River.

INVESTIGATION STAFF

The investigation was carried by officers from the following Branches:-

2:1 GEOLOGY: J. Hayes - Mines Branch
(This is covered in a separate report).


2:3 OTHER INVESTIGATIONS & DRAFTING: Officers of Water Resources Branch.

Field investigations were co-ordinated by O. Kneebone, Senior Technical Officer, Water Resources Branch.

DARWIN RIVER DAM SITE.

3.1 LOCATION. The Darwin River, a stream 23 miles long, rises in the low hills west of the Stuart Highway about 50 miles south of Darwin and discharges into the Blackmore River, approximately 12 miles upstream from its mouth in the middle arm of Darwin Harbour.

3.2 SITE. The Dam Site is located on the Darwin River in a narrow break in the ranges approximately half a mile upstream of Darwin River Quarry and Railway Station, and 12 miles from the mouth of the river.

The proposed site of the Darwin River Ponding Reservoir, detailed elsewhere in this report, is eight miles downstream of the proposed main Dam Site.

The Co-ordinates on the 1:50,000 military map of Tumbling Waters are 33638N36950E. (Refer Appendix 1).
3:3 CATCHMENT AREA AND BASIN

The catchment covers an area of approximately 50,000 acres bounded by a range of hills on the north and north-west and low undulating country on the south-west to east boundaries. Within the catchment there are broad flat areas on the crests and gently undulating country. The soil types are mainly shale on the north-western corner, black soil on the plains and gravel on the undulating country. Overhead cover comprises Stringy Bark, Ironwoods, and various small species on the higher country, a few trees and Pandanus Palms on the black soil plains and along the river banks.

The Darwin-Larrimah Railway line runs through the western side of the catchment and basin area. A section of this railway will be inundated if a weir is constructed on the site. The entire catchment area is freehold land held in fee simple and would require acquisition procedure.

3:4 ACCESS

Access to the dam site is by road or rail. The Delissaville Road branches from the Stuart Highway 35½ miles south of Darwin. The dam site is 12½ miles from the Stuart Highway and is reached by taking the turnoff to the left 6 miles along the Delissaville Road from the highway. A track runs along the telegraph line which is parallel to and with the Railway Line. An old army road, which commences near the 46 mile peg on the Stuart Highway, joins this track three quarters of a mile south of the dam site.

3:5 PRELIMINARY INVESTIGATIONS

Preliminary investigations commenced in March, 1961, with the study and interpretation of aerial photographs of the area, followed by ground and helicopter reconnaissance of the Dam Site, west saddle and north-western ranges and basin area. The reconnaissance showed a basin area with a gentle rising slope on the plains following the river with undulating country to the east and west. Barometric levelling in various places failed to give a clear enough or accurate picture of the area due to low gradients and was rejected in favour of ground levelling and tacheometric work.

3:6 INVESTIGATIONS

Following preliminary investigations the survey was commenced on 26th April, 1961, and a total of 34 working days in the field was taken to complete this part of the investigation. The survey work carried out was not intended to be a detailed survey, but only to provide sufficient information to indicate if this scheme is feasible, the survey being used in conjunction with 1:50,000 military map contour forms to enable approximate surface areas, depths, and volumes to be calculated. (See Appendix 2).
3:7 DATUMS

3:7.1 Azimuth - True Meridian.
A baseline was established running parallel to the railway line, on the southern side of the railway bridge over Darwin River. Appendix 2 shows this baseline whose azimuth was obtained by sun observation (Technical Officer W. de Fraine) and by traverse to the boundary of Block 737 Darwin River. The true meridian bearing being 157° 44' 32".

3:7.2 Level Datum - Darwin Town Datum.
Four Bench Marks were established near the Dam Site by Technical Officer Greensetter of Lands & Survey Branch.

DR6 RL 109.56 CB N.E. side of River.
DR7 RL 99.90 N.W. Abut Railway Bridge.
DR8 RL 99.17 S.E. Abut Railway Bridge.
DR9 RL 104.21 C.E. S.E. Side of River.

3:8 WESTERN SADDLE
A levelled traverse was run between the baseline and a point known as the Western Saddle approximately 1/2 miles to the south-east to establish level relationship between the saddle and the dam site. The Saddle invert level was R.L. 177.51 and the invert level at Dam Site R.L. 71.76, to determine what effect the R.L. of the Saddle would have on Top Water Level of Dam site.

3:9 DAMSITE
A centre line was established at the Dam Site and was marked at either end with star steel pickets at approximately R.L. 143.00. A longitudinal section with soundings of the river was carried out with a detailed tacheometric survey on both sides of the base line.

Applicable levels in this area are as follows:
- Darwin River Invert Level - 71.76
- Banks - Ground Level R.L. - 85.79
- Railway Line R.L. - 100.45

Appendix 3 shows this detail.

3:10 BASIN AREA
Various tacheometric and levelled traverses were run to provide sufficient levels to delineate the limits of the Basin area. The Railway line was levelled South from the Southern abutment of the Railway bridge for a distance of 22,000 feet to R.L. 147.15.

3:11 CONCLUSIONS
A Dam site exists on Darwin River near the Railway Bridge and a wall of up to 75 feet high may be constructed. Its actual height will depend on Geological confirmation and hydrological information. Capacity and water surface area diagram are shown on appendix 2 attached.
Approximately five miles of Railway line may need to be diverted. A suggested alternative route is via the saddle approximately 1½ miles to the south-south-east of the Dam Site.

4. DARWIN RIVER PONDING RESERVOIR

4.1 LOCATION

There are two Ponding Reservoir wall sites, (referred to as Site A and Site B in this report) situated a ½ mile apart on the Darwin River approximately eight river miles downstream of Darwin River Dam Site and four miles from its mouth. The entire Basin area is Freehold land held in fee simple.

4.2 WALL SITES

Site "A" is situated near Bynoe Road crossing and Site "B" is a half a mile downstream from Site "A". Both sites are confined within the limit of the river banks.

The Co-ordinates of Site "A" on 1:50,000 military map of Middle Arm is 3374N 1967E.

A water hole, situated upstream of the proposed Site A, has a capacity of 35,500,000 gallon at cease to flow level 30.67. Throughout the dry season this pool maintains a constant standing water level of about 30.00 suggesting a high replenishment from groundwater.

4.3 CATCHMENT AREA AND BASIN

The catchment area between the Darwin River Dam Site, eight miles upstream and the Ponding Reservoir Wall Site A is approximately 19,000 acres and 19,500 acres for Site B with the river running through the centre.

Within the catchment area is the Darwin River Road, the Delissaville Road which fords the river and R.A.A.F. Darwin River Quarries a quarter of a mile from the river on the right-hand bank. Up to 90 personnel have been stationed at the quarries. The fall of the ground from the abutions and sewerage of the station is toward Darwin River.

The Basin area is long and narrow being mainly confined within the Banks.

Soil types in the area are gravel, rock and black soil plains while the overhead cover of the basin area is restricted to the river bank and consists of Pandanus and Blackwood. However there are some Stringy Bark species away from the banks.

4.4 ACCESS

Access to this area is by dry season gravel road via Berry Springs and also from Delissaville Road. Wet season traffic is restricted to 4-wheel drive vehicles.

4.5 PRELIMINARY INVESTIGATIONS

Preliminary investigations commenced in May, 1960, with the study of all available maps and aerial photographs followed by a helicopter and ground reconnaissances.
Technical Report WRD62008

The wall site "A" was selected by Geologist J. Hayes of the Mines Branch and Engineer C. Forbes of the Water Resources Branch. Site "B" was selected by Geologist J. Hayes and the necessary Field Work was requested by Dept. of Works, Darwin.

4:6 INVESTIGATIONS

SITE "A" Investigations commenced June 1961 with a capacity survey of the water hole upstream of the wall site. This was followed by a detailed survey of the wall site and traverses to connect cross sections and for contouring of the basin area.

SITE "B" Field work commenced 3rd December 1962. A detailed survey was carried out of the area within the banks between Site "A" and Site "B" plus the proposed wall site. All survey work was tied into Site "A" Datum.

4:7 DATUM

4.7.1 Azimuth - True Meridian.
- Lands & Survey traverse on north side, Section 1570, "Hundred of Ayres", being 259° 58' 50" (refer Appendix 8).

4.7.2 Level - Darwin Town Datum.
- BM-SOLLA R.L.47.53 is situated below the wall site "A". Established by Lands & Survey Branch.

5. BERRY SPRINGS AND TRAVERSES

5:1 LOCATION
- Berry Springs is situated on the Berry Creek approximately three miles from the mouth. It discharges into Blackmore River near the middle arm of Darwin Harbour.
- Co-ordinates on the military map 1:50,000 of Middle Arm are 3374N 3967E.
- Berry Springs is situated on the north boundary of reserve No.1007 which is all of Section 1570, Hundred of Ayres.

5:2 PIPELINE SITE
- The traverse for the proposed pipeline commenced 1,376 feet east from the north-west corner of the north side of Section 1570 and road reserve and extended eastward to the Manton Dam-Darwin 12" and 15" pipelines near the Stuart Highway 32-mile post.

5:3 INVESTIGATIONS
- A detailed survey, on assumed datum, of Berry Springs reserve was carried out by Lands & Survey Branch previous to the commencement of the investigation. To enable the levels of this Survey to conform to the datum used on the overall proposal, the plan has been recountoured and redrawn to Darwin Town Datum.
- There is no traverse surveyed within the reserve.
- 00' on traverse being on the Bank above the Creek. However, the area around Berry Springs being contoured will enable selection of a pump and pipeline site if required.
- The traverse is a straight line from Berry Springs to join the Manton Dam main near 34 mile Stuart Highway. It is located 10 feet from and parallel to the northern boundary of 150 road reserve and is pegged with steel spikes every 100 feet and star steel pickets.
every 300 feet. Levels were taken on all pags and ground levels at pags and 5 feet left and 5 feet right on each 300 ft section. (Appendix 11 refers.)

The soil along the traverse line is mainly gravel with rock outcrop approximately 300 feet long from chainage 8,698 feet. This outcrop was detailed during the Survey. The traverse crosses sections of swamps varying in length from 350 feet to 1500 feet with a total of 3400 feet along the line of the traverse. (Refer appendix 10, 16,10).

With the exception of 500 feet the traverse is on a road reserve. The part of Section 1564 through which the traverse passes (see appendix 10) is Freehold land and would require an easement or acquisition prior to any construction.

5:4 DATUM

5:4.1 Azimuth.

As for Ponding Reservoir.

5:4.2 Level.

Darwin Town Datum.

6. BERRY SPRINGS - DARWIN RIVER

Two traverses connecting the Berry Springs Survey and the Survey to Darwin River Ponding Reservoir site were run.

The traverse connecting the west side of the Berry Springs reserve has permanent Bench Marks (concrete blocks) situated at every change of direction to enable an accurate tie-up of bores in the area and any future work required.

The area between Berry Springs and Darwin River has been contoured. This area is also Freehold land held in fee simple.

7. BERRY PROPOSAL CONCLUSION.

There exist sites for a Dam and a Ponding Reservoir on the Darwin River with approximately eight miles of river between which may be utilised as a natural connecting medium.

(i) The wall height of up to 71 feet and length of 734 feet with basin capacities at various levels as shown in Appendix 2 could be constructed at the dam site.

(ii) The Ponding Reservoir site has an existing pool with capacity at reduced level 30.67 in the vicinity of 3½ million gallons. This level remains reasonably constant throughout the dry season, suggesting a high groundwater replenishment. A site exists for a wall up to 15 feet in height with capacities at various levels as shown at Appendix 5 (a).

(iii) The construction of a pipeline is practicable. From Darwin River Ponding Reservoir to Berry Springs the minimum distance is 18,420 feet. From Berry Springs to the 12-inch and 15-inch Manton Dam/Darwin water mains on the Stuart Highway the minimum distance is 12,130 feet.

(iv) Acquisition of freehold land held in fee simple would be necessary to implement any of this scheme.

(Signed)

(D. Kneebone)
Senior Technical Officer (P)