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EVALUATION

of

**PHASE 1 OF THE
REHABILITATION OF THE CALUEQUE-OLUSHANDJA REGIONAL
STATE WATER SCHEME NAMIBIA**

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CONTENTS

1.	INTRODUCTION	1
2.	OBJECTIVE OF THE ASSIGNMENT	2
3.	TIME SCHEDULE AND REPORTING	2
4.	ACKNOWLEDGEMENTS	3
5.	BACKGROUND TO THE PROJECT	4
5.1	Description of the Owambo Region	4
5.2	Water supply situation in Owambo	5
5.2.1	The Owambo pipeline canal system	6
5.2.2	Responsible Authorities for water supply in Owambo	7
6.	PROJECT DESCRIPTION	9
6.1	Objective Phase I	9
6.2	Description of works	9
6.2.1	General	9
6.2.2	Civil Works	10
6.2.3	Mechanical and Electrical Works	12
6.2.4	Executing Agency	14
6.2.5	Community Participation	15
6.2.6	Construction Period	15
6.2.7	Constraints	16
6.2.8	Construction Costs	17
6.3	The Calueque pumping Scheme operation	18
6.3.1	Pumping capacity	18
6.3.2.	Water utilisation	18
6.3.3	Level of service	19

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7. THE IMPORTANCE OF THE CALUEQUE SCHEME OF THE DEVELOPMENT OF THE OWAMBO REGION

7.1 Impacts of the scheme

7.1.1 Human settlements

7.1.2 Agricultural Activities

7.1.3 Operational Costs and water tariffs

7.1.4 Health

7.1.5 Women

7.1.6 Environment

8. RELEVANCE OF PHASE 1 OF THE CALUEQUE PUMPING SCHEME TO THE DEVELOPMENT OBJECTIVES OF THE NAMIBIAN GOVERNMENT

9. RELEVANCE OF PHASE I OF THE CALUEQUE PUMPING SCHEME TO THE DEVELOPMENT POLICIES OF THE NETHERLANDS GOVERNMENT

10. CONCLUSION AND RECOMMENDATIONS

LITERATURE

LIST OF PERSONS MET

ANNEXURE 1

Owambo Existing and proposed pipelines and canals

ANNEXURE 2

Figure 1 General layout of the Calueque-Olushandja Water Scheme

Figure 2 Typical Canal Section

ANNEXURE 3

Figure 3 Location plan of Calueque Pumpstation

ANNEXURE 4

Expenditure Calueque-Olushandja Water Scheme

ANNEXURE 5

Organisation diagram and approved establishment of the Department of Water Affairs

3.

ANNEXURE 6

Terms of Reference

1. INTRODUCTION

During a donor conference regarding Namibia which took place in New York on June 21 - 22, 1990 under the auspices of the United Nations Development Programme, the Netherlands Government has expressed it's willingness to co-operate with Namibia in the field of water supply.

The Namibian Government has since put forward for funding to the Netherlands Government several proposals concerning water supply projects in the Owambo region, an area much neglected during the pre-independence period of Namibia because of the state of war in that region.

The first project proposed for funding was the Rehabilitation of the Calueque-Olushandja Regional State Water Scheme, of which Phase I has now been implemented by the Department of Water Affairs.

Although the Netherlands Government has committed itself in principle to the funding of at least the first phase of this project it wishes to establish whether the project has been carried out as proposed and in line with the Netherlands Development co-operation policies as well as according the priorities of the Namibian Government as expressed at the above-mentioned conference.

The author were therefore requested by the Netherlands Government to evaluate phase I of the above project and it's impact on the development of the rural population.

During the border war between the Republic of South Africa and Angola the Calueque dam and the pumpstation were severely damaged and the Calueque pumping station was put out of operation from 1977 to 1990. During those years the Owambo Scheme was supplied by an emergency pipeline from the Ruacana falls.

This scheme could not meet the growing water demand in Owambo. Also the energy cost were very high, because the water had to be pumped against a head of more than 300 m (see table 3).

2. OBJECTIVE OF THE ASSIGNMENT

The objective of the assignment was to check the implementation of Phase I of the rehabilitation of the Calueque-Olushandja Regional State Water Scheme in Namibia, assess its influence on the development of water supply and irrigation in the Owambo region and evaluate how much the rural population will benefit from the scheme.

3. TIME SCHEDULE AND REPORTING

The assignment was carried out during an eleven day period from July the 1st to July the 11th, 1991.

The period was divided in three parts:

1. 01/07/91 - discussions in Windhoek with officials from the Department of Water Affairs, travel by air to Ruacana in Owambo.
2. 2-4/07/91 - field visits
- 02-07-91 - visit to Calueque barrage and pumping station, pumping main and canal. Visit Ruacana emergency scheme, pumping stations at the tailrace and at the head bay of the hydro power station and boosterstation, Ruacana purification works.
- 03/07/91 - Visit pilot project small scale irrigation scheme (under construction), Olushandja treatment works, Olushandja reservoir, pumping stations, in- and outlet on the north and south embankments. Okahau water works (under construction); Ogongo and Ombalantu water treatment works.

- 2
- 04/07/91 - Visit to the proposed "Ogongo-Okalongo Regional State Water Scheme" project area.
Discussions with village headman at Okalongo.
Visit Oshakati waterworks. Return to Windhoek by air.
3. 5-11/07/91 - Additional meetings in Windhoek with officials of the Department of Water Affairs, the Directorate of Agriculture, draft report preparation, report submission and return to Harare.

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5. BACKGROUND TO THE PROJECT

5.1 Description of the Owambo Region

Of Namibia's estimated present population of 1,7 million about 600 000 people live in the Owambo Region (the central border area with Angola)

The surface area of this region is 52 230 km² (6,3% of Namibia's total surface area and rainfall varies from 300 to 600 mm annually and evaporation is in the order of 2 600 mm per year. The topography in Owambo is characterized by an extremely flat plain, which forms part of the Etosha depression and gradually descends from north to south towards the Etosha Pan.

The majority of the rural population (485 000 in 1990) is occupied with subsistence farming (mostly pearl millet) and raising livestock. Families hold on average 9.5 large animals (7,6 head of cattle and the remainder horses and/or donkeys) and 5,5 small animals (mainly goats, some have sheep and/or pigs).

The present number of animals in the region was estimated in 1990 as follows (1):

cattle	500 000
goats	400 000
donkeys, mules, horses	100 000
sheep	8 000
pigs	30 000

The population is expected to rise by 2,9% per annum, resulting in a population of 780 000 in 2000.

Because of frequent droughts, deficient water supply and the state of war, the living conditions of the rural population have hardly improved during the pre-independence time.

As a result of the lack of access to clean drinking water for the rural population and the sharing of raw water sources (eg shallow points) with livestock diarrhoeal diseases and malnutrition are high and seem to contribute overwhelmingly to infant mortality. The absence of water for irrigation and the arid climate are the reason for low productivity in agriculture.

It is therefore that the Namibian Government has given high priority to the improvement of the Water Sanitation and Distribution in Namibia, with regional priorities based on assessed demand.

Improved supply will have an important impact on the region.

The availability of adequate water for cattle watering and irrigation will reduce animal deaths and increase food production (also one of the priorities of the Namibian Government).

The availability of sufficient safe drinking water all year round will reduce infant mortality and improve general health conditions.

5.2 Water supply situation in Owambo

The people of Owambo make use of the following water sources.

- the Owambo pipeline - canal system
- oshonas (large shallow pools of water which are created during the rainy season);
- Excavation dams ("gatdamme"), constructed by deepening oshonas, and surrounding them by earth walls);
- pumpstorage dams ("pompstoordamme", water is pumped from oshona's into these dams);
- boreholes equipped with motorpumps, windmills or handpumps.

Due to the ephemeral nature of surface water in the oshonas and the limited potential of groundwater in central northern Owambo (where the majority of the population lives), most of these local sources can be regarded as unreliable. These sources are also unprotected against bacteriological contamination. Collapsing of wells, low yields and high concentrations of dissolved solids render groundwater less suitable for human consumption in central northern Owambo. That leaves the Owambo pipeline-canal system as the main reliable water supply system in central northern Owambo.

Since the objective of the mission was to evaluate phase 1 of the rehabilitation of the Calueque-Olushandja Regional State Water Scheme, which is the source and first part of the Owambo pipeline-canal system, only this system of water supply will be described in detail in the following paragraph.

5.2.1 The Owambo pipeline canal system

The Owambo pipeline-canal is the single largest water supply structure in Namibia.

The present length of the system is 770 km (680 km of pipeline and 90 km canal). The extension Ogongo-Okahau will add another 43 km. This section is now almost completed.

A plan of the Owambo pipeline canal system is shown in annex 1. It was constructed in the early seventies to supply reliable water all year round to the growing towns of Oshakati and Ondangua, military camps, airports, police stations, hospitals, schools, water for irrigation and livestock, etc.

The source of the scheme is the Cunene river in Angola, 15 km over the border with Namibia.

The perennial Cunene river forms part of the Angolan/Namibian border and has been recognised as the only permanent large capacity source of water for this region.

Most of the water for drinking water purposes is treated at the Ogongo purification plant (present capacity 1 000 m³/h) and from there the water is pumped to several towns and growth points in the mid west of Owambo. Smaller purification plants are operating in Olushandja-Ombalantu, while a small standby plant is available in Oshakati.

Before independence access to the system, was somewhat restricted although probably half of the population of the Region depended on it during periods of severe draught.

Now, numerous additional public standpipes and cattle watering troughs have been built and the Government intends to built many more (see paragraph).

So high is the demand for water in the region, that many illegal connections have been made by the rural population in Owambo.

5.2.2 Responsible Authorities for water supply in Owambo

The Department of Water Affairs forms part of the Ministry of Agriculture, Water and Rural Development and is primarily responsible for:

- planning, design and implementation of water supply projects;
- bulk supply of water at local, regional and

- national level;
- water pollution control, water quality management and resource management and development.

The Department is responsible for the operation and maintenance of the Owambo pipeline-canal system and was also the implementing agency of phase I of the rehabilitation of the Calueque-Olushandja Regional State Water Scheme.

An organisational chart is given in annex (2).

The Department produced during the financial year 1989/90 3,6 million m³ of treated water in Owambo at a running cost of R4/m³ and sold it at a price of R0,90/m³ resulting in a loss of - 10,8% ().

Recently the Directorate of Rural Water Supply has been formed, which will take a co-ordinating role in the Rural Water Sector. The Directorate of Agriculture Technician, also under the Ministry of Agriculture, Water and Rural Development is heavily involved in the development of irrigation schemes, while the Ministry of Health exercises a controlling function on Health related issues and the developing of the Sanitation Sector.

The Ministry of Local Government is at present responsible for the distribution of the water in the main centres and therefore the main customer for the Department of Water Affairs which supplies the water in bulk.

The Government of Namibia is aware that good co-ordination in the water sector is important and a committee has been formed to lay down the responsibilities of the various Departments involved in water dependant development and to formulate a clear policy.

6. PROJECT DESCRIPTION

6.1 - Objectives: Phase I

An immediate alleviation of water shortages in the Owambo Region and a reduction of the operation costs of the pumping scheme from the Cunene. In the medium and long term it is envisaged that an improved water supply situation will contribute to a better health situation and a higher quality of life for the population of the Region.

6.2 - Description of works

6.2.1 General

The Calueque Barrage is a regulation structure in the Cunene river, situated some 15 km from the Namibian-Angola border in Angola.

In an agreement between the Angolan and the Namibian Government, confirmed in 1990 the Namibian Government is allowed to draw water at a rate of $6 \text{ m}^3/\text{S}$ from the Cunene river for distribution in the Owambo Region. The water can be taken at the Calueque barrage and from there pumped into a steel pipe 2 437 m long with a diameter of 1658 mm. This steel pipe leads into a trapezoidal concrete canal with a capacity of $12,6 \text{ m}^3/\text{S}$ which transmits the water into Namibia in the Owambo pipeline canal system briefly described before.

The Calueque Barrage designed to hold up to $45 \cdot 10^6 \text{ m}^3$ of water has, because of the war situation, never been completed. In 1976 all works have been abandoned, at a near completion stage. The off-take system for the water for Owambo Region, however, was completed and the pumps were installed. At some stages of the war these pump sets have been removed and reinstalled, to safeguard them against war damage.

An air bombardement in 1988 made this no longer possible as damage was inflicted upon the pumphouse structure, upon some electrical and mechanical equipment, while also the steel pipe had been damaged.

The war being over and relations with Angola cordial, the Namibian Government has decided to reinstate the pumping scheme from Calueque as a matter of urgency.

6.2.2 Civil Works

a) Pumpstation

The air raid had caused some structural damage to the pumphouse. The concrete roof was perforated at a few places, and some columns and a roof beam were damaged. The structural integrity of pumpbay I, however, remained basically intact.

Repair works covered: closing the roof, installing new doors, closing the front wall and repairing a concrete beam.

b) Pipeline

Two new steelpipes (length 10 m each) have been installed, while some holes caused by small armament have been patched up.

c) Concrete canal

- The first 12 km inside Angola constructed from in-situ cast concrete slabs 100 mm thick, was still in a fairly good condition. Apart from repairing some cracks the work involved consisted mainly of removing growth from the joints and general cleaning of canal and its surroundings (bush clearing).

- The section from the border to Olushandja constructed in precast concrete slabs, 54 mm thick and 840 x 770 mm long sides, however, was in a poor state of repair. The total length of this section is 9 605 m and it has a capacity of maximum 11,500 m³/S. 5 km of this section was utilised to transmit the water from Ruacana and therefore only about 4,5 km was effectively subject of this project.

The damage was thought to have resulted from;

- insufficient storm water drainage
- probably insufficient compacting of the slopes during construction
- lifting of slabs by hydrostatic pressure and people.

A detailed report was prepared on the methods of rehabilitation of this section. However, the work actually carried out was limited to the basics of:

- clearing and cleaning of canal and surroundings
 - reinstating and compacting erode slopes
 - establishing storm water drains in the "cut" sections
 - removing some of the slabs from the canal floor and casting, in-situ floor slabs
 - reinstating the lining of the canal sides by placing the slabs recovered from the floor
- Whether the replacing of the precast slab will give a lasting solution remains to be seen. The 54 mm thick slabs seem too light to withstand the hydraulic pressure. Moreover the total joint length created by these small slabs is enormous and grass and

weeds have started growing already.

If maintenance is not done regularly, major repair work will again be needed in the foreseeable future.

d) Construction of housing

For the staff, who were to operate the pumps some housing was planned. In fact one single mobile home has been provided.

e) Water Supply

The presence of staff made provision of safe drinking water necessary. A pressure tank, combining a sedimentation and a filtration unit was brought to site, but was not installed yet. This unit is one of two originally used for potable water supply to the town of Calueque.

The capacity seems more than adequate for its purpose but it is intended to include water supply for the local population around Calueque town (at present more of a ghost town) as well.

6.2.3 Mechanical and Electrical works

a) Overhaul and refurbish pump sets

The two pumpsets, taken out before the air raid, had to be thoroughly checked, before being returned to site. Bearings have been replaced and new frames have been manufactured and tested by a complete pumpset assembly and alignment exercise in the Departmental workshop.

b) Reinstallation of pumpsets

Work included transport to site of the pumpsets, complete redesign and installation of the switch gear (done in house by the M & E division), replacing the pipework inside of the pumphouse. (Most of this work was done by a contractor). The non-return valves in the pipeline have been refurbished and fitted with new bearings.

c) Reinstallation electricity supply

The powerline from Namibia into Angola was damaged at some places and was repaired by Swawek, the Namibian Electricity Supply Company. The overhead line was extended and brought right to the pumphouse, also the underground cables into the pumphouse have been replaced. A separate supply for general use, has been provided.

d) Reinstallation overhead crane

The overhead crane, directly under the roof, had suffered from the bomb impact as well. To enable replacing pumpsets an overhaul was necessary.

e) Communication equipment

The Department has its own radio voice communication system, via which the various pumping stations are interconnected Calueque has also been provided with a unit.

6.2.4 Executing Agency

The work was mainly carried out "in House" by Water Affairs staff. For the direct purchases, like electric components, steel pipes and the engagement of a contractor to execute the pipework inside the pump house, a special waiver of the prescribed tender procedures, was obtained from the Tender Board in view of the urgency of the project.

As the project consisted mainly of reinstating existing structures, of which the exact damage only could be assessed when actual work was undertaken, no exact bills of quantities or other indicators on actual volume of work to be executed, have been prepared. Although the standard of work as seen after completion, was simply good, because of this, no judgement on the general efficiency of the Department of Water Affairs in works of this nature, can be passed.

The responsibility for the actual execution of the project was lying with the Directorate of Works (See the organogramme given in annex 2). This Directorate has a highly professional design divisions for Civil and for Mechanical Electrical Works. Construction is again a separate responsibility. This division operates with separate construction units, based in the various regions. These units are mainly Civil oriented. The Mechanical electrical work is carried out from the central base Windhoek. For its heavy construction work this division can call upon a fleet of about 300 earth moving and heavy construction machines, hired out by the Heavy Equipment Division, again part of the same directorate. The high flexibility and the great potential for "in house" execution of major construction project is obvious, although optimisation of the deployment of this size of fleet is normally not simple in a Governmental

organisation.

6.2.5 Community Participation

The Department of Water Affairs, being a professional organisation, has a natural technocratic approach towards the implementation of their projects. Labour intensive construction methods do not appear to have been instituted and reports of unsuccessful attempts to do so were given. Until recently there seemed to be less reasons to involve the community to be served, in the planning and execution of projects. From their side, these communities did not identify with the project as such, which showed clearly in the numerous instances of deliberate damage, illegal connections and unreported breakages of the system. Involving the community in an early stage is expected to reduce these kinds of problems considerably. That the Owambo people will be prepared to co-operate in water projects was clearly visible in the Okalongo area when on vague rumours that the "water pipe" was to come to their area, people already started digging trenches and not, as probably would have been expected, to individual kraals, but directly from one school to the next. There is at present a great drive towards getting the people involved in development, going on in Namibia. The Department of Water Affairs, aware of the benefits of such approach, although still in a transition stage, is making very effort to adapt accordingly.

6.2.6 Construction Period

Although negotiations with the Angolan Government over the reinstatement of the Calueque Scheme started long before, only 24th April 1990 the area could be entered physically. Actual work started in May 1990 and pumping could be started 17th September 1990.

6.2.7 Constraints

a) Materials

Most, if not all, building materials had to be brought in from very far. Owambo Region being a sandy area does not provide aggregate for concrete, while even suitable sand with a low enough salt content is not always easy to find. A cumbersome procedure, especially if one considers the 800 to 900 km that separate the project area from Windhoek.

b) Staff

- The harsh conditions in the Owambo Region far away from Windhoek, do not appeal to professional and supervisory staff of the Department. Especially since the monetary incentives for staying in the Northern areas have been withdrawn, it has become increasingly difficult to get personnel to this Region.
- It appears as if the Department is facing some difficulties in its staffing position of the craftsman level. Building work seems to get executed by general labourers with only some general understanding of the trade. The workmanship especially in the canal section could have been better.
- The impression was left that the Department had to work with a labour force, which was not easily motivated.

6.2.8 Construction costs

The Department has provided an overview of the costs incurred on the project. (Annexure 3) and summary in table below.

ITEM	COSTS (R)
Canal (Calueque-Olushandja)	884 201,16
Calueque pumping station (Civil)	227 918,39
Calueque pumping station (Mech + El)	345 022,82
Overheads	<u>808 403,36</u>
	2 265 545,73

TABLE 2 : EXPENDITURE CALUEQUE-OLUSHANDJA

The accounting system of the Department is providing the costs in the general subjects like salaries, machine costs etc. Because no bills of quantities are available, it was not possible to arrive at sensible rates per unit work carried out.

However, from our investigations we can state that expenditure does cover the work executed and considering the scope of the work involved the cost do not seem excessive.

One remark we would like to make: The system of working out overhead costs as applied by the Department seems to distribute general cost in great detail to the various activities and as such seems fair enough. However with a total overhead on a project of R2 265 545,73 of about 36% (R808 713,36) it also seems to indicate that the Department is a bit generous in the manner it provides facilities. In this regard, one should mention for example the large area of the yards at the offices of the Department at Ruacana and Oshakati.

The activities presented for funding, have all been executed successfully, apart from the housing component. Originally estimated at R230 000,- only one unit, a mobile home, has been provided. The water supply unit is not yet connected. At this time the total expenditure stands at R2 265 545,73 as against the originally presented estimate of R2 000 000,-. In view of the nature of the project; repair work in a remote, security risk area, a cost overrun of about 10% seems acceptable.

6.3 THE CALUEQUE PUMPING SCHEME IN OPERATION

6.3.1 Pumping capacity

At the time of visit the one pump in operation was pumping at a rate of 1,6 m³/s. At commissioning stage the pumps were doing about 1,9 m³/s. This drop in output can be attributed to a lower water level in the river.

Because most regulating valves have not been installed and due to some additional damage to the barrage caused by the war, it is not possible to maintain the water level at a the desired off-take level.

The pumps when running parallel are expected to give an output slightly over 2,5 m³/s. Pumptests are envisaged by the Department of Water Affairs to establish this extraction rate.

6.3.2 Water utilization

Notwithstanding the low output of the pumps, a quick water balance reveals that at this moment at best 20% of the water pumped from Calueque returns at a later stage in the books of the Department as "water sold".

12

Although some of this lost water is drawn through communal taps, cattle drinking points and illegal connections, which by the way all seem to have a high waste factor, most of this water is stored in the Olushandja dam.

This dam is at its deepest point about 4 m deep. With its large surface area of 27 square kilometres, and capacity of $(45 \cdot 10^6) \text{ m}^3$ this storage reservoir seems hardly an effective instrument in the water management of the region. Calculations of the Department gave the dam an effective yield of, on average, 7,7% of its capacity at full supply level. The dam is presently operated at about 20% capacity, but still, evaporation losses are high.

The unlined canal which transfers the raw water deeper into the Region also seem to count for considerable losses, especially so, when local farmers breach the canal sides and let the water flow into their local oshana. Although this definitely will improve the growth of grass in their area, it also deprives downstream users of their desperately needed water. Moreover such behaviour does not seem to indicate a well developed community sense.

6.3.3 Level of service

The rather dispersed manner at which the Owambo people are living makes the provision of water supply services expensive. The habit of grouping houses together in clans and villages is seen to a far lower degree in the Owambo Region than in some other areas of Africa. Families tend to live in kraals, a kind of fenced in area of about 3 to 4 ha in which they till the land and have there homes and storage facilities. The cattle is let to graze on the communal grounds. This way of building homes will require the development of specific criteria on tap spacing and

number of people to be served, if a piped water supply system is to be affordable for the National Economy.

The pipeline system was originally initiated to enable further development of natural growth points and small towns, which could no longer be provided from limited local sources.

It is still a declared policy, at least within the Department of Water Affairs that first local Water sources should be exploited, before bringing in water from outside the area is considered. The state of repair of local sources like the already described pump schemes with "gatdamme" does not show much effort in this direction though. The increasing pressure for immediate water will make it more and more difficult to resist the temptation to go for the quick solution: extending the pipelines. Livestock is provided with class A water, at least there where the animals get the water from the pipeline, which is basically at all cattle drinking points. From the tariff table given elsewhere it can be seen that this water is calculated at a cost price of R1,00. Although the implementation of the Calueque scheme lowers this price to about R0,80, this still seems expensive water for livestock drinking.

7. **THE IMPORTANCE OF THE CALUEQUE SCHEME FOR THE DEVELOPMENT OF THE OWAMBO REGION**

Now the works have been completed satisfactorily, the immediate short term objectives have been achieved:

An increased volume of water is being made available to the Owambo Region at a reduced cost per cubic meter.

7.1 Impacts of the Scheme

7.1.1 Human settlements

The limited availability of water has been a restricting factor in the development of concentrated settlements of people in growth points and small towns. Now that water from outside can be brought in to replace or to add to local sources, further growth of these centres can be supported.

It is hoped that such development will be available on arable land. Such settlements could also open some scope for further variety in income generating activities.

7.1.2 Agricultural Activities

The increased volumes of water have made it possible to develop agricultural activities based on irrigation.

The Department of Agriculture and Rural Development has started implementing a 160 ha small scale (3 ha plots for each farmer) irrigation project in Owambo as pilot project for a future extension to the 1 500 ha and known as the Western Owambo Irrigation Scheme (3).

The cost for these schemes are estimated as follows (5):

	160 ha	1 500 ha
Cap costs (R)	118 521	51 070 500
Cap costs/ha (r)	50 741	34 114
Regr costs (R) year	578 385	2 393 151
Rec costs R/ha/year	3 651	1 596
Water requirement (m ³ /S)	0, 583	3

The water will be drawn from the Calueque-Olushandja canal and bought from the Department of Water Affairs at a cost of R0,023/m³.

It is the policy of the Namibian Government to initiate agriculturally based job creating industries in the relatively highly populated region of Owambo as well as other regions where bulk water supply can be made available.

Tomato production and a processing industry will fit well in this policy. A tomato processing plant in Oshakati is being planned with a minimum capacity of approximately 15 000 tons of tomatoes per year. 50% Of these tomatoes will be supplied from commercial farms while the rest will come from the pilot project (yield 50 ton/ha/year).

The tomato paste will be delivered to Namibia's fish canning industry.

Net income for the farmers is estimated to be R4 937/ha/year. A feasibility study will be carried out for the extension of the pilot project to 1 500 ha as soon as the first results of the pilot project are known (in 1992).

Implementation of the 1 500 ha project is not scheduled to start before 1993.

The present capacity of the Calueque-Olushandja Regional State Water Scheme (2,5 m³/S) is adequate to meet the water requirements of the pilot scheme (0,583 m³/S) but not of the 1 500 ha scheme.

The establishment of this pilot scheme of 160 ha however would not have been possible without the commissioning of Phase 1 of the Calueque-Olushandja Regional State Water Scheme.

For the implementation of the 1 500 ha scheme, it will be essential that Phase II of the rehabilitation of the Calueque-Olushandja Regional State Water Scheme is carried out because this includes increasing the pump capacity at Calueque from the present 2,5 m³/s to 6 m³/s.

7.1.3 Operational costs and water tariffs

At this time only treated water is properly measured and charged for. The Department of Water Affairs supplies the water in bulk to the Ministry of Local Government. This has the effect that the Ministry of Local Government inturn pays for all the losses which occur along the pipeline due to illegal connections, wastage, breakages etc.

During the '89-'90 financial year (1.4.1989 to 31.3.1990) the Department of Water Affairs sold in Owambo 8,6 million m³ at a price of R0,90/m³. The calculated production price was R1-. (operational costs only, see table 2 below)

WATER SUPPLY REGION	89/90 PRODUC- TION (Mm ³)	COST (c/m ³)	PRICE (c/m ³)	PROF./ LOSS
Owambo Region	8.6	100.9	90.0	-10.8%
Kavango Region	3.0	59.7	62.4	+ 4.4%
Waterberg Region	5.9	80.9	72.1	-10.9%
Von Bach Region	15.2	52.9	64.5	+21.8%
Namib Region	10.8	69.0	72.9	+ 5.7%
Karas Region	4.4	81.9	79.0	- 3.6%
Hardap Region	1.7	86.5	72.8	-15.8%
Nossob Region	3.0	88.3	79.1	-10.4%

TABLE 2 : WATER REGION PERFORMANCE (4)

The Namibian Government is formulating policy regarding the pricing of water. It would appear that the principle that at least the operations and maintenance cost should be recovered (within the limitations of affordability) is going to be applied in the short term while in the medium term capital redemption should be taken into account as well. For the rural areas special provisions can be made if need be for services rendered (trcnch digging etc).

Irrigation water (untreated) will be priced separately and will be charged for. For the 160 ha pilot schemes the price for water has been worked out at R0,025/m³. At a consumption of minimum 3 million per year this will give a revenue of R85 000,00.

ITEM	RUACANA	CALUEQUE
Rate of flow	400	2 500
Power requirements kW	1 400	550
Unit energy cost R/m ³	0,0413	0,0026
Annual energy cost	R430 000	R168 000

TABLE 3 : COMPARISON OF PUMPING COSTS OF RUACANA AND CALUEQUE PUMPING SCHEMES

From the table given above one can read the influence of the changeover from the Ruacana Scheme to the Calueque Scheme (kwh price 1990).

It is clear that the 8 times higher pumping rate from Calueque even although most of this water goes in to the Olushandja dam and may be consumed usefully by villagers along the Etako canal and will not paid for its operation still results in a saving in energy costs of R262 000 annually. In about 10 years the investment costs of R2 300 000,00 will be recovered by savings in energy cost only. It is already clear that the extra volume of water available will be taken up soon and revenue earning improved partly by increased usage of treated water and partly by irrigation demand. There is, therefore, good hope that even for Owambo area the factual losses will remain limited and could even turn in line with the implementation of Governmental policy into full recurrent cost recovery.

7.1.4 Health

a) Acceptance of the water

That the provision of safe water via the pipeline and for that matter untreated water via the canals is to have positive effects on the wellbeing of the population, is obvious. An extensive utilisation of the existing water points, while there was still abundant water available in local sources, was observed

throughout the whole region.

(b) Latrines

Attention should be drawn to the fact that sanitary facilities in the form of latrines or otherwise virtually non-existent in the rural areas. An observation confirmed by a.o. an UNICEF mission carried out in 1990. (See 6 and 7).

Further efforts are needed in this respect, it is believed, if results from an improved water supply have to become noticeable in an better health condition of the population.

c) Waterpoints

Although the region was visited in the dry season, the surroundings of the water points provided a rather unsightly picture. Much water was spilled because of poorly closing valves, or purposely, into pools on the ground to provide drinking facilities for small animals like kids, calves and lambs, which cannot reach the drinking troughs, especially provided for cattle.

The Owambo region is extremely flat and the top soil has a low permeability. Cattle straying through the pools forming around the waterpoints cause depressions and mud pools all around the communal taps. These are not the most hygienic condition for the women and children, in Owambo normally fetching of water. An improved version of the water points has put already the cattle drinking points a bit further away from the taps for human consumption, but still some more thoughts should be given to the drainage around these waterpoints.

d) Schistosomiasis

Occurrence of bilharzia in the open canals and the shallow dams like Olushandja dam could not be confirmed. Considering the conditions it will be only a matter of time, before schistosomiasis will be endemic in the Region, as is Malaria already.

7.1.5 Women

Women and children are in Owambo responsible for the fetching of water but, they are also the main labour factor in the agricultural activities.

The higher availability of drinking water will therefore undoubtedly lessen their burden especially during the dry season when often water only can be found at great distances of the home kraal. Also the burden of caring for the children should be reduced, when the children are less affected by water related diseases because of the clean water.

Whether the extra time will be translated into the tillage of a greater acreage of land and so into a greater production per household could at this stage not be established.

7.1.6

Environment

a) Overgrazing

Local people reacted in general very positive towards the availability of water on a more permanent basis in the Region. The fact that in the future, during drought periods, they probably could save their cattle from dying, seemed to be the main reason for this positive attitude.

Droughts in Owambo Region are an often reoccurring phenomena. Farmers used to move, often with limited success, over distances of over 50 km to find water.

This only goes to demonstrate the role cattle plays in the local Owambo Structure and indicates the inherent problems cattle farming is facing in the area.

The other side of cattle farming also becomes visible as already some signs of overgrazing around the communal water points do appear. Fortunately, it also can be seen that the ability of the soil to recover from this overgrazing, is rather good.

However considering the role cattle plays in the area, as measure of wealth, it is feared that the drive to improve the income position of the population, together with the supporting infrastructure of cattle drinking points, might cause serious overgrazing of the Region, if no measures are taken to control the situation. The Sahel situation with similar climatic conditions can serve here as reference.

However, Government Departments concerned are aware of this problem and cattle watering points will be designed with a capacity to cater only for the maximum number of cattle that can be sustained by the area.

b) Health problems

The water related diseases like Malaria and Schistosomiasis have been mentioned under the health paragraph 7.1.4.

c) Influences on the ecosystem

Some concern has been expressed that the exploitation of ephemeral rivers for storage purposes and or direct water exploitation, might have negative effects on aquifers, riverine forests etc. Nothing could be found at this time to substantiate such fears.

d) Salt accumulation

The installation of permanent irrigation schemes in a climate with high evaporation figures like Owambo, will necessitate strict exploitation controls, if the soils are not to become completely saline. However, the Namibian Government and its executing agents are quite aware of this problem and proper land management techniques are proposed to be incorporated in the executing of irrigation projects.

8. RELEVANCE OF PHASE I OF THE CALUEQUE PUMPING SCHEME TO THE DEVELOPMENT OBJECTIVES OF THE NAMIBIAN GOVERNMENT

The Namibian Governments development policy entails a strong commitment towards improved public health and nutrition, ensuring all citizens access to public services,

and guaranteeing equal opportunities for all Namibians, while protecting ecosystems and natural resources.

These policy aims are reflected directly in the project under consideration.

The Namibian Government wants more water to be made available to the rural population of Owambo, for drinking purposes and irrigation, with the objective to improve health and increase food production (which in itself also promotes health due to better nutrition).

More income and jobs will be created directly and indirectly by this project.

The Calueque pumping scheme had to be brought into operation because the Ruacana emergency scheme had no capacity left to meet the potable water demand for the rural population of Owambo (more than 80% of the regional population), let alone their irrigation water demand. In fact a R14 000 000,00 upgrading of the Ruacana Scheme had been designed and was on the point of being issued for tenders when the extraction agreement with Angola was revived.

Also the Ruacana scheme used a lot of energy because of the high pumping head and it is therefore not in accordance with the Governments policy of energy conservation and minimising the cost of water for the consumers.

It is therefore that the Namibian Government has given this high priority to the implementation of Phase I of the rehabilitation of the Calueque-Olushandja Regional State Water Scheme.

The implementation of phase I has resulted in an increased inflow in the Owambo pipeline-canal system, which creates the opportunity to embark on rural water supply and irrigation projects in Owambo. Several proposals for such projects have been prepared by the Namibian Government and presented to various donor agencies.

The reinstatement of the Calueque-Olushandja Regional State Water can be considered a Prerequisite to a successful start of these projects, because only this scheme will be able to meet their water requirements.

9. **RELEVANCE OF PHASE I OF THE CALUEQUE PUMPING SCHEME TO THE DEVELOPMENT POLICIES OF THE NETHERLANDS GOVERNMENT**

The main objective of the Netherlands development policy is sustained poverty alleviation.

In this policy the intended support of the Netherlands Government to the rural water supply sector in Owambo fits very well because.

- the rural population in Owambo (more than 80% of regional population) lives at best at subsistence level and has no access to potable water or sufficient water for cattle drinking and irrigation.
- making adequate potable and irrigation water available to the rural population in Owambo will improve their living conditions (better health, nutrition and more income through increased agricultural production)

The Netherlands Government has expressed interest in funding the following water projects:

- Ogongo-Okalongo Regional State Water Scheme
- Improvement of Water Supply in Owambo (public standpipes and cattle watering points for the rural population)
- Upgrading of the Ogongo water purification plant to

1 500 m³/h

- Western Owambo irrigation Scheme (1 500 ha) feasibility study and the 160 ha pilot scheme already in execution

A prerequisite to the successful start of these projects is the reinstatement of the Calueque-Olushandja Regional State Water Scheme because only with this scheme operational the water requirements of the proposed projects can be met. Phase I will be adequate to meet the demand of the first three projects. An increased capacity, to be implemented under Phase II, will be necessary to meet the demand of the proposed Western Owambo irrigation scheme. This project is not scheduled before 1993, pending the outcome of a feasibility study.

10. CONCLUSION AND RECOMMENDATIONS

In Owambo the rural population (485 000 people) has insufficient access to potable water for human and livestock consumption. Irrigation is a strong option to improve their living standards.

Improved water supply is crucial to the development of the rural areas of Owambo.

General health conditions will improve, food production will increase and more jobs will be created as a result.

Phase I of the rehabilitation of Calueque-Olushandja Regional State Water Scheme has made possible:

- Further development in rural water supply now that more water is available from the pipeline-canal system
- irrigation development in the rural areas
- energy saving in the pumping operations
- further development of the few urban centres in Owambo now the increased availability of water can support further growth.

The execution of the project by the Department of Water Affairs, is done to high professional standards and within acceptable financial limits.

The project is considered to have been completed successfully and the transfer of funds to reimburse the Namibian Government, which has prefinanced the project, is therefore recommended.

W ANKERSMIT

W F E VAN GORKUM

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Windhoek, February 1991

LIST OF PERSONS MET

WINDHOEK

Department of Water Affairs:

Mr P J Maritz - Secretary
Mr P Heyns - Director Investigation and Research
Mr B Haussler - Mechanical Electrical Div. Head
Mr S Aldrich - Planning Divisional Head
Mr P F Hamman - Director Rural Water Development
Mr G Lukovski - Chief Engineer (Planning)
Mr J de Kock - Construction Divisional Head

Department of Agriculture:

Mr J N de Klerk - Director for Agriculture
Mr L Hugo - Deputy Director Agriculture
Engineering

OWAMBO REGION

Department of Water Affairs:

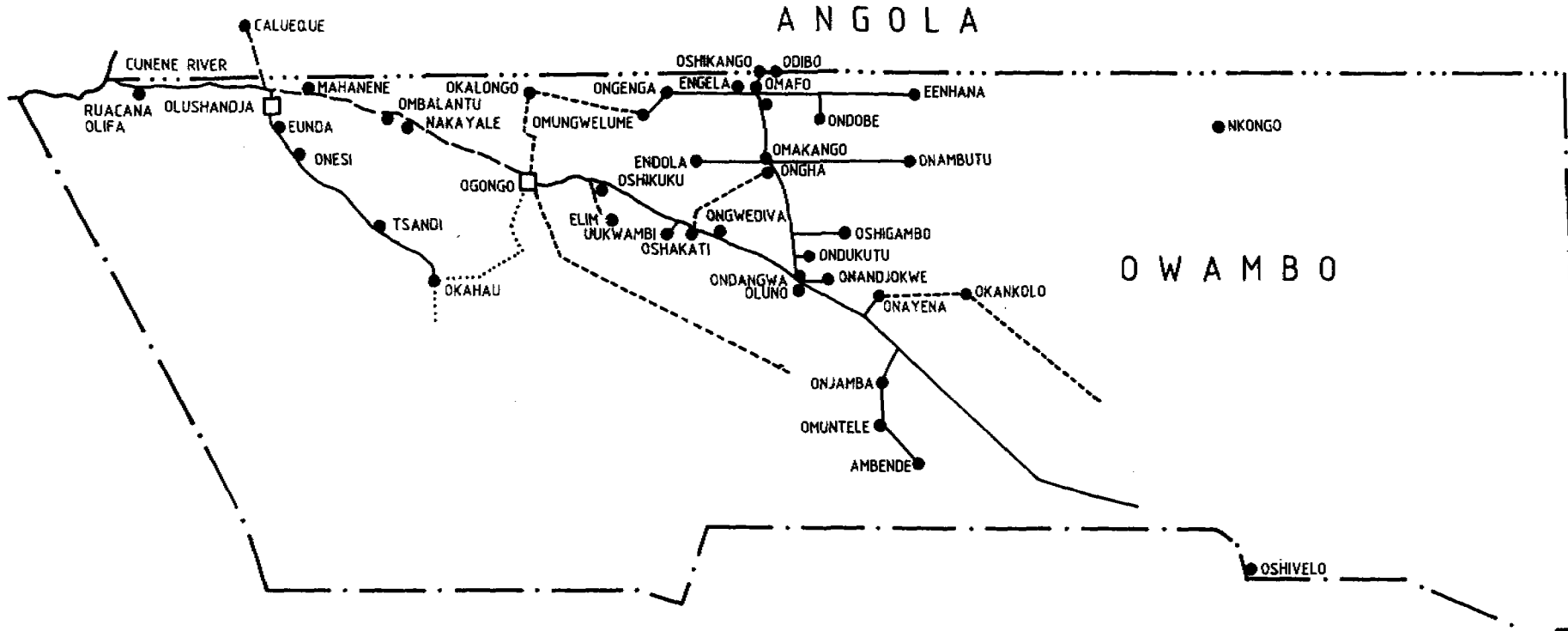
Mr L Nel - Regional Head Owambo
Mr H Goetze - Acting Resident Engineer: Construction
Owambo

Department of Agriculture:

Mr T E Basson - Senior Agricultural Engineer
Mr K P Jacobi - Agriculture Engineering Technician

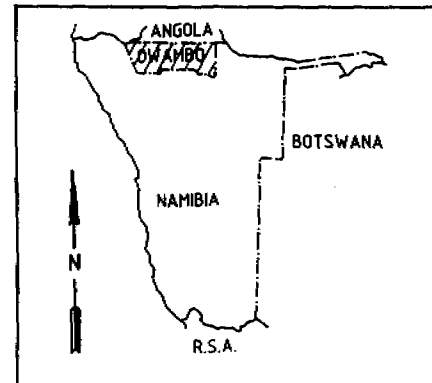
Tribal Authorities:

Mr Mathias Walaula - Village Headman
Okalongo/Ondanjamba



LEGEND

- PIPELINES
- - - CANALS
- - - - PROPOSED PIPELINES UNTIL 1995
- PIPELINE UNDER CONSTRUCTION
- PURIFICATION WORKS



NAMIBIA		
DEPARTMENT OF WATER AFFAIRS		
APPLICATION FOR PROJECT AID		
OWAMBO: EXISTING AND PROPOSED PIPELINES AND CANALS		
SURVEYED	CHECKED	SHEET N°
P.J. MARITZ		

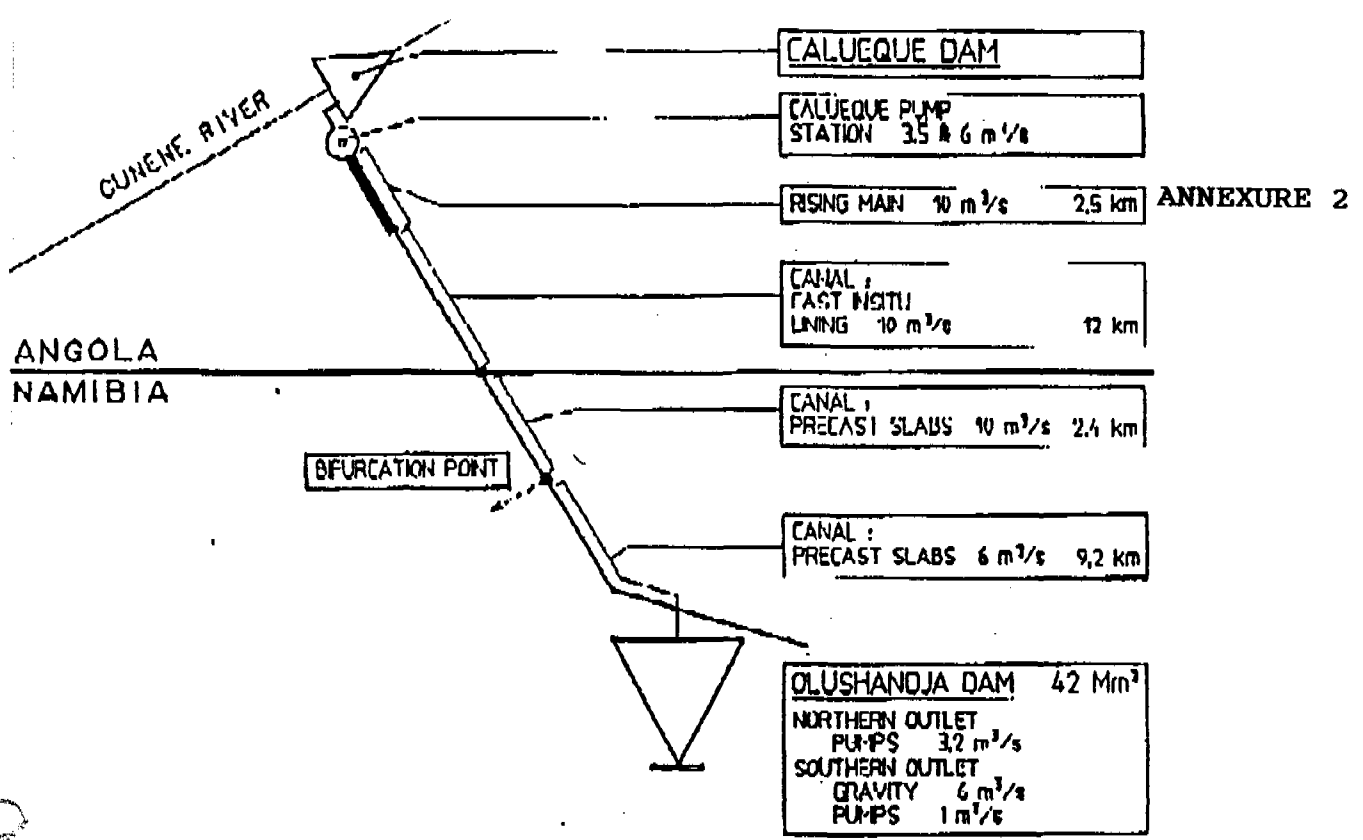


FIGURE 1 GENERAL LAYOUT OF THE CALUEQUE-OLUSHANDJA REGIONAL STATE WATER SCHEME

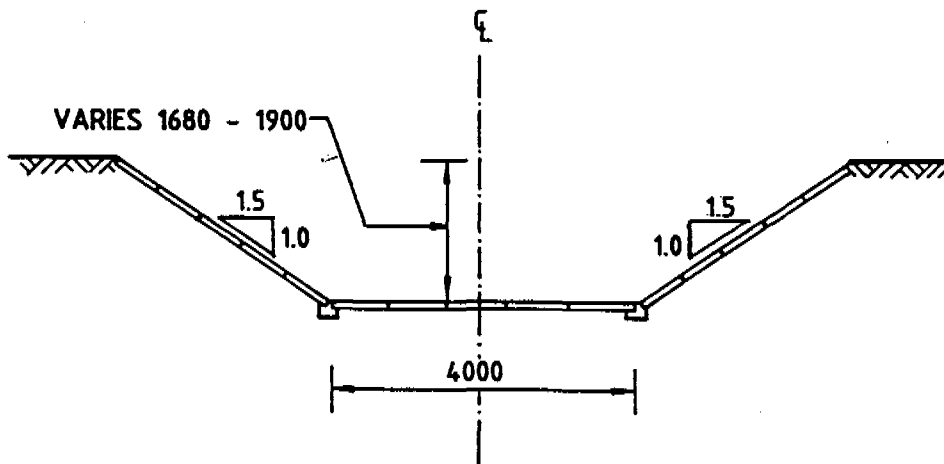


FIGURE 2 TYPICAL SECTION OF CALUEQUE-OLUSHANDJA CANAL IN NAMIBIA

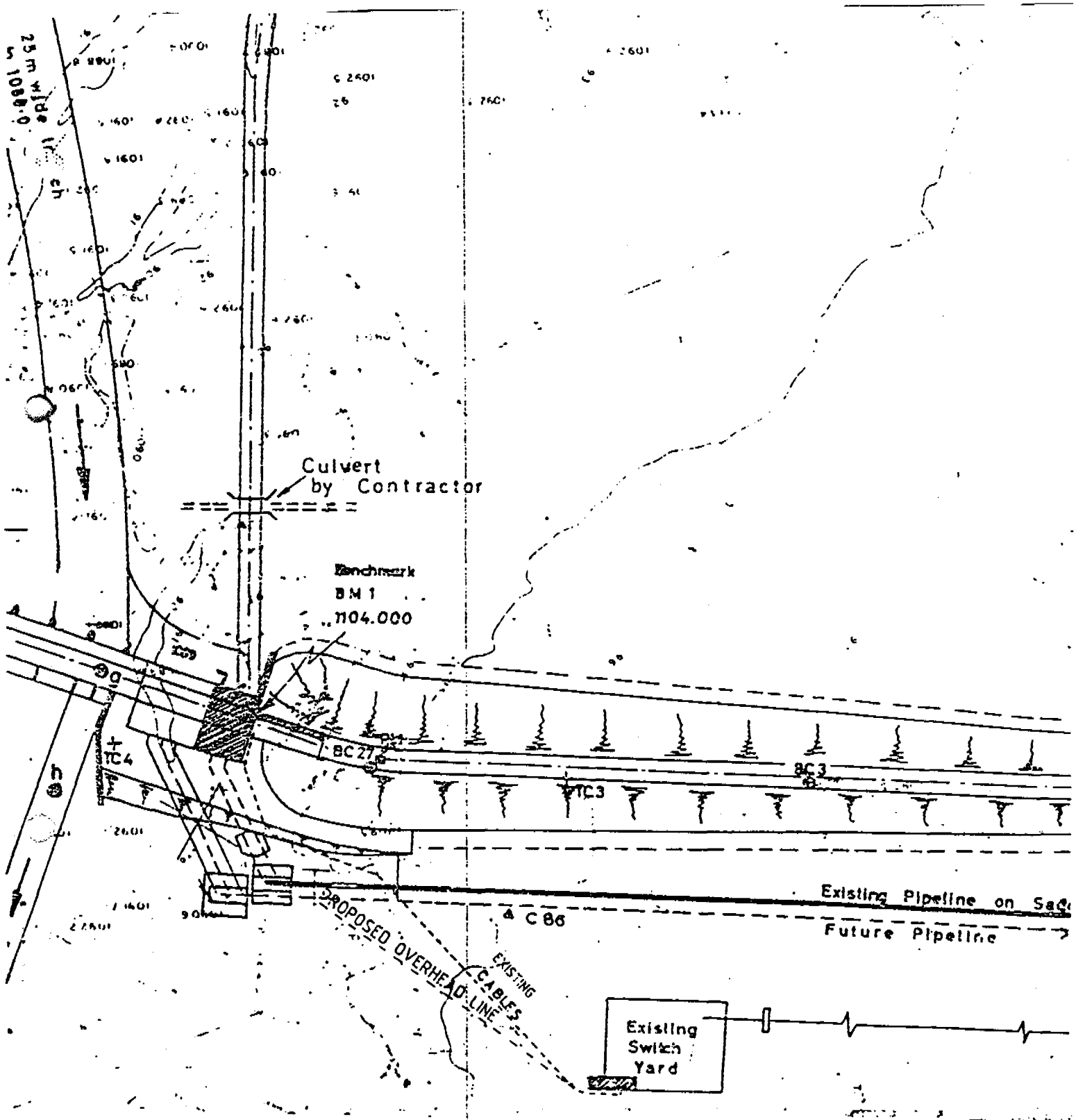


FIGURE 3 LOCATION PLAN OF CALUEQUE PUMPSTATION

	CODE	SALARIES & ALLOWANCES	DIRECT PURCHASES	STORE ISSUES	JOURNALS	ADJUSTMENTS	DVS MACHINES	DW TRANSPORT	RAILAGE	WORKSHOP AMOUNT	SUB TOTAL	SCHEME OVERHEADS	PROF. FEES	MCE DIVISION	CONTRACT PAYMENTS	TOTAL
SCHEME OVERHEADS	001/00											457223,37				457223,37
PERSONNEL: Salaries	002/01	34620,92									34620,92					34649,88
Allowances	002/02	172974,94									172974,94					172974,94
Clothing	002/03															
Training	002/05	1306,32									1306,32					1306,32
TRANSPORT: Employees	003/06	2351,94	5300,00		2204,80		448,96	50498,30			60804,00					60775,04
Machines	003/07						240,00				240,00					240,00
Materials	003/08	598,96					12623,95	212,43			13435,34					13435,34
MAINTENANCE: Machines	004/07	308,68	2232,92	234,68			72,41				2848,89					2848,89
Security	004/19	43446,65	198,00	446,51			2366,55				46457,71					46259,71
Carp	004/31	461,32					3891,02				4352,34					4352,34
OVERHEADS TOTAL		256069,93	7730,92	681,19	2204,80		19642,89	50710,73			337040,46	457223,37				794263,83
CANAL																
BUSH CLEARING/FINISHING	100/00	334692,90	2747,79	899,71		10000,00	107388,49	8677,56			464406,45					464406,45
BACK FILL/COMPACTION	220/00	105555,21				30000,00	37461,73	3631,65			176648,59					176648,59
CONCRETE	270/00	58379,54	26106,98	12588,72		1783,00	77090,41				175948,65					175948,65
PLACING OF BLOCKS	320/00	22163,67	1108,80			23745,00	20180,00				67197,47					67197,47
CANAL TOTAL		520791,32	29963,57	13488,43		65528,00	242120,63	12309,21			884201,16					884201,16
PUMP STATION: CIVIL WORKS																
CONCRETE/SHUTTERING/REINFORCING	260/00	51235,65	15278,85	1056,44		20000,00	6599,34				94170,28		5452,10			99622,38
BRICKLAYING/PLASTERING	360/00	27430,78	7208,28	625,35		20000,00	5759,23	4136,58			65160,22					65160,22
METAL WORK	400/00	15141,44	22633,85	604,74		20000,00	507,57	1890,74			60778,34					60778,34
FINISHING	620/00	406,47						1950,96			2357,45					2357,45
PUMP STATION CIVIL TOTAL		94214,34	45120,98	2286,53		60000,00	12866,14	7978,30			222466,29		5452,10			227918,39
PUMP STATION: MECHANICAL AND ELEC. WORKS																
SCHEME OVERHEADS	001/00											14139,53				14139,53
MECHANICAL EQUIPMENT	800/30		249113,96			2352,68					251466,64					251466,64
PIPES AND ACCESORIES	800/31		31103,49			57,51					31161,00					31161,00
INSTALLATION	800/32	10494,00	8567,89		3599,34	8396,85					31058,68					31058,68
ELECTRICAL EQUIPMENT	800/24		16835,13								16835,13					16835,13
TRANSPORT	800/33	10465,00					3895,00	141,37			14501,37					14501,37
PUMP STATION MCE- TOTAL		20959,60	305620,47		3599,34	10807,04	3895,00	141,37			345022,82	14139,53				359162,35
PROJECT TOTAL		892035,19	388425,94	16456,15	5804,14	136335,04	278524,66	71139,61			1788730,73	471362,90	5452,10			2265545,73

ANNEXURE 5

	DIRECTORATE	DIVISION
PERMANENT SECRETARY	RURAL WATER DEVELOPMENT	
	GENERAL SERVICES	LAW ADMINISTRATION AND TRAINING
		FINANCE AND SUPPORT SERVICES
		LIAISON SERVICES
	INVESTIGATIONS AND RESEARCH	GEOHYDROLOGY
		HYDROLOGY
		WATER QUALITY
		PLANNING
	WORKS	CIVIL DESIGN
		MECHANICAL/ ELECTRICAL DESIGN
		CONSTRUCTION
		HEAVY EQUIPMENT
	WATER SUPPLY	LOGISTICS
		OPERATIONS NORTH
		OPERATIONS SOUTH

ORGANISATION DIAGRAM OF THE DEPARTMENT OF WATER AFFAIRS

CLASSIFICATION OF POSTS	POST APPROVED		POSTS FILLED		SHORTAGE (%)	
	89/90	90/91	89/90	90/91	89/90	90/91
Secretary	1	1	1	1	0	0
Director	5	5	4	4	0	20
Divisional Head	13	15	13	11	0	27
Professional	101	103	64	73	37	71
Technical	118	138	47	51	60	37
Artisan Staff	235	239	139	139	41	58
Waterworks Officer	158		60	74	62	47

APPROVED ESTABLISHMENT OF THE DEPARTMENT AS ON 31 MARCH