

JOHN ANDERSON
AQUA IRRIGATION

F

REFURBISHMENT OF HAWKDUN & IDABURN IRRIGATION SCHEMES

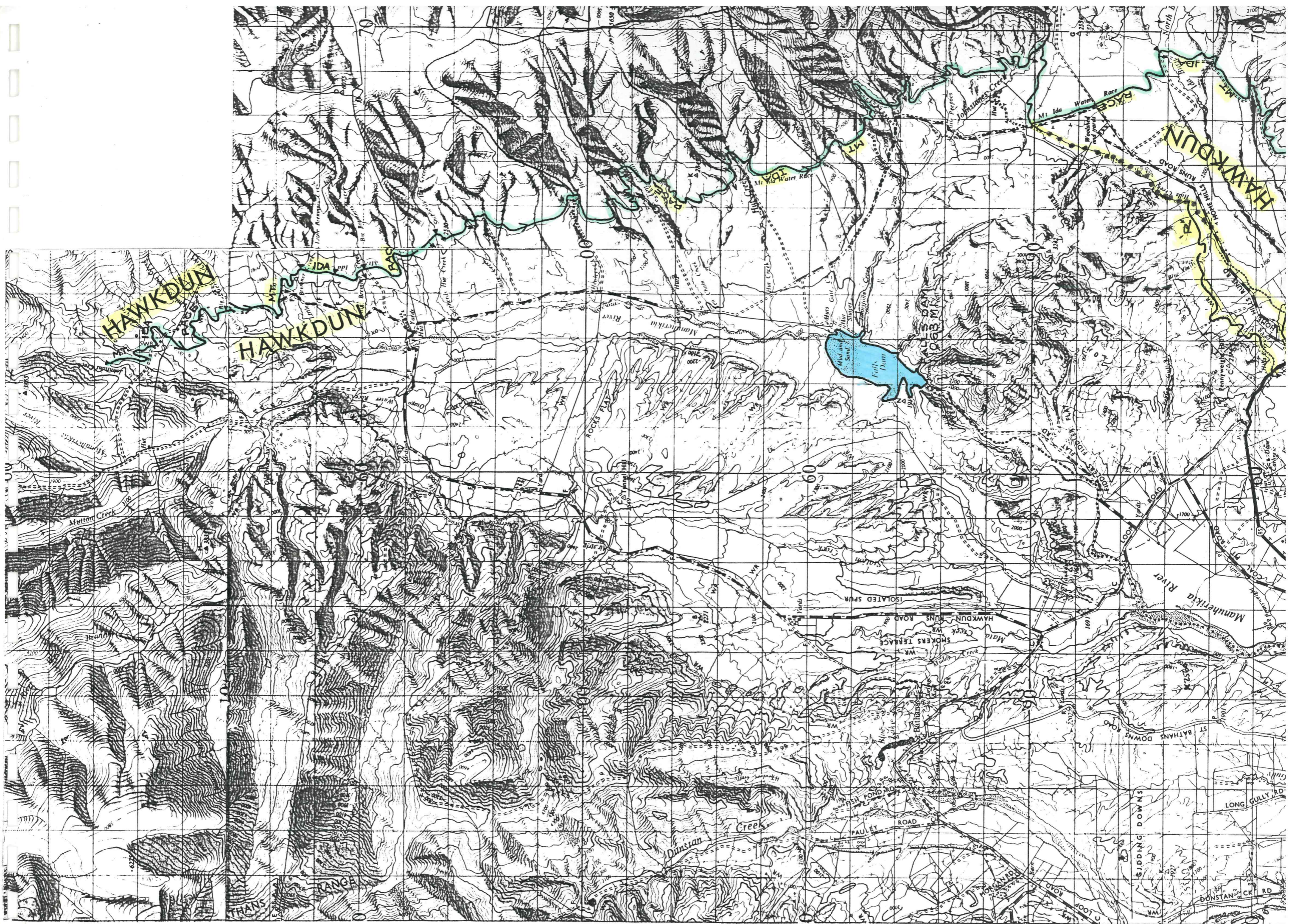
PREFEASIBILITY REPORT

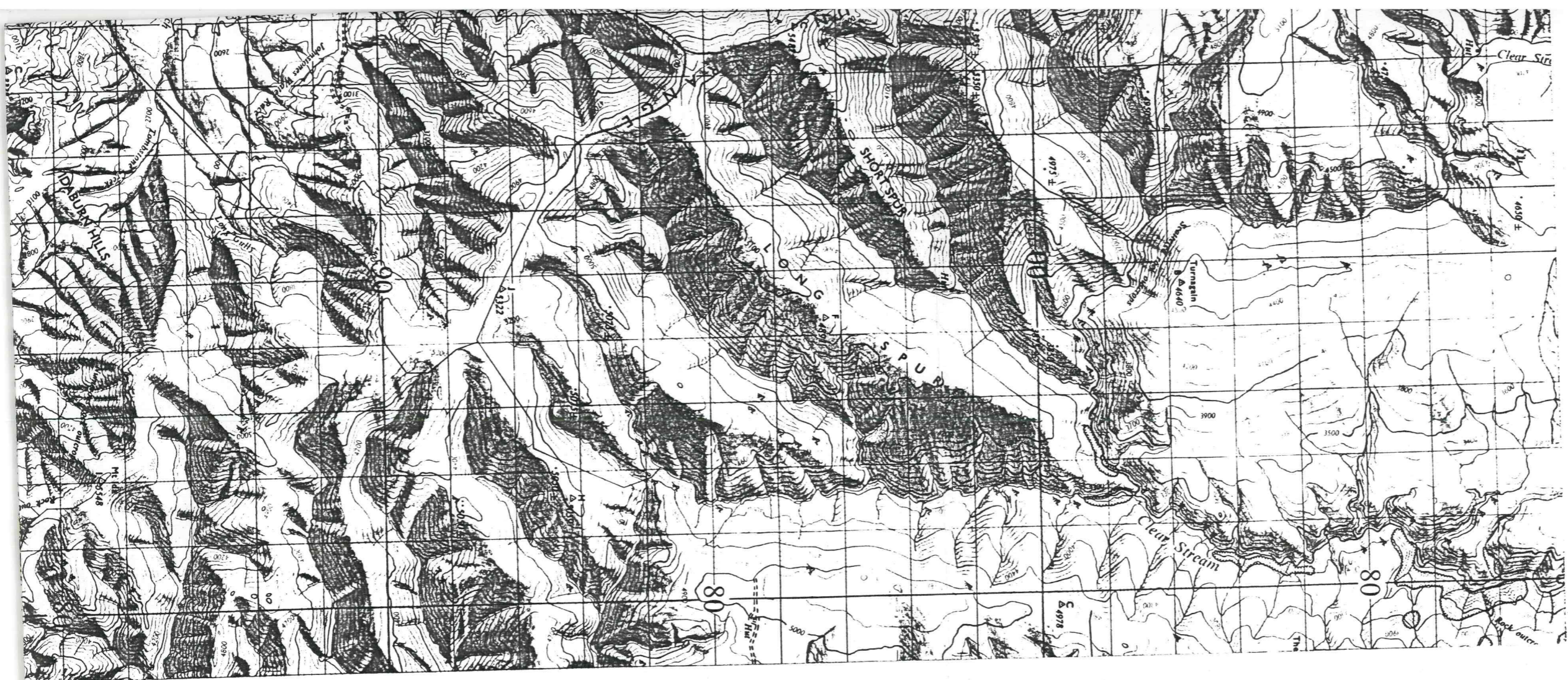


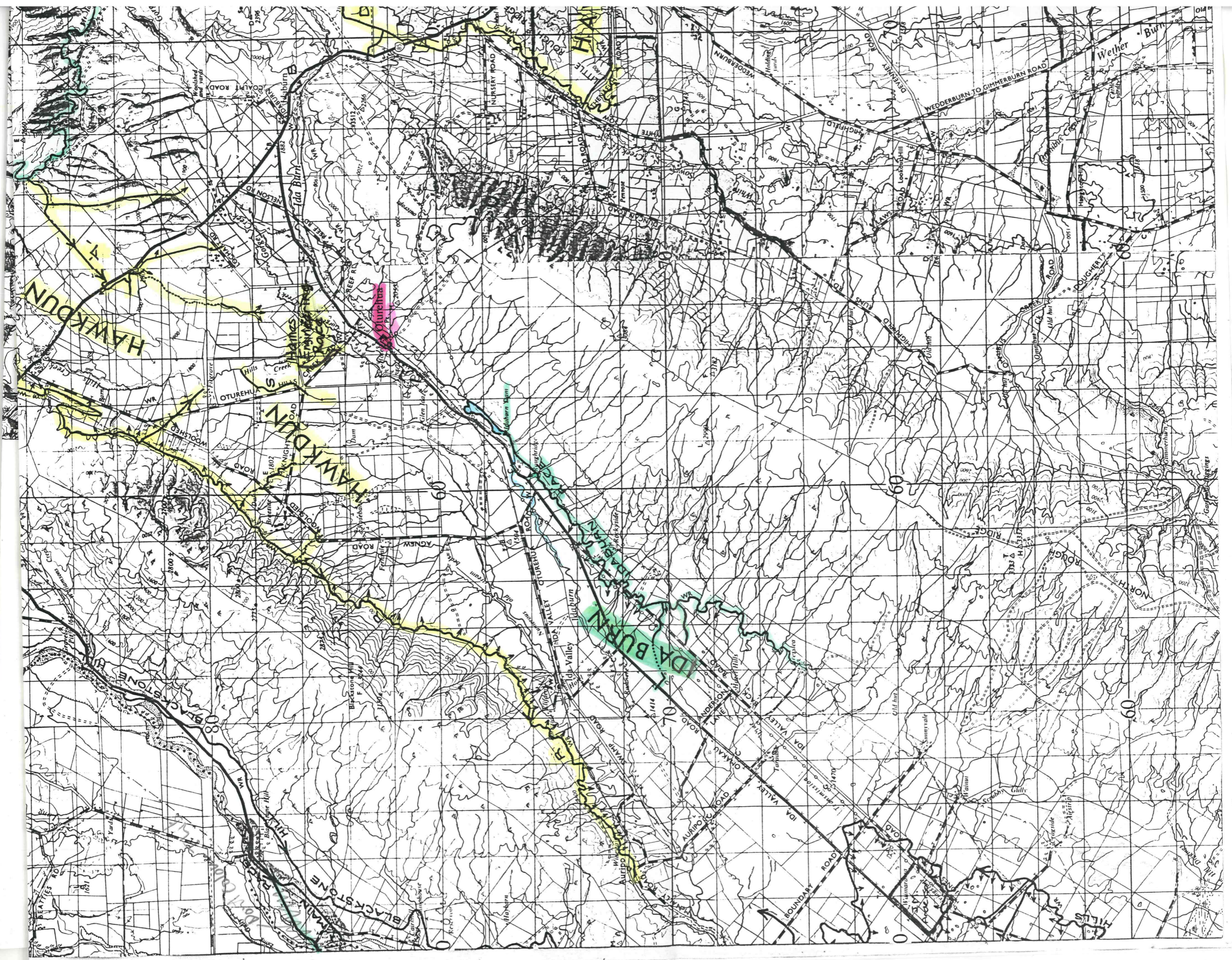
Ministry of Works
and Development

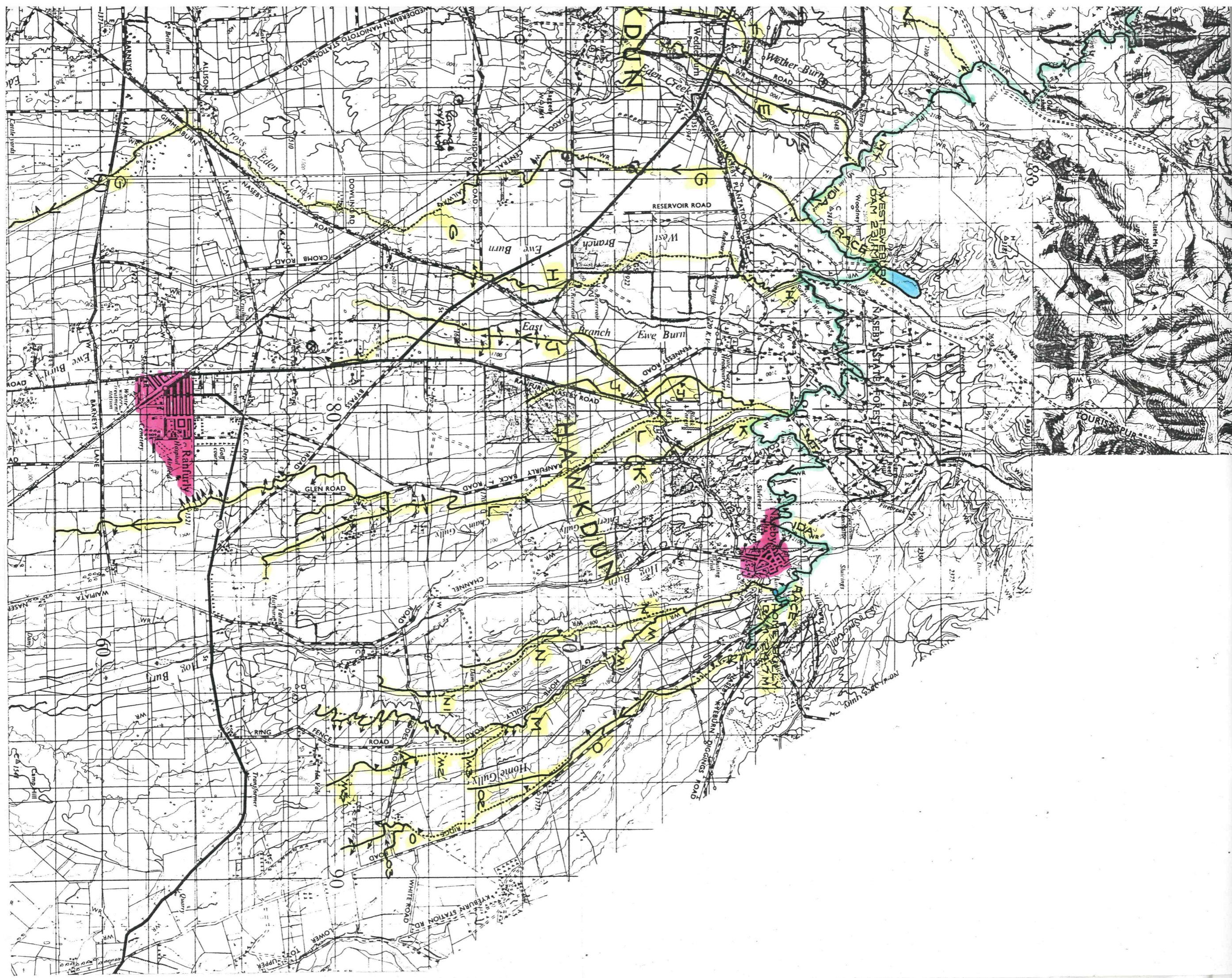
Civil Design Section
Dunedin

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CONTENTS

- 1.0 INTRODUCTION
 - 1.1 General
 - 1.2 Assessment Report Objectives
 - 1.3 Means of Assessment
 - 1.4 General Scheme Description
 - 1.5 Existing Operations and Maintenance Policy

 - 2.0 CURRENT STATUS OF SUPPLY WORKS
 - 2.1 General
 - 2.2 Hawkdun Scheme
 - 2.3 Idaburn Scheme

 - 3.0 CONTINUATION OF 'STATUS QUO'

 - 4.0 REFURBISHMENT PROPOSAL
 - 4.1 Hawkdun Scheme
 - 4.2 Idaburn Scheme
 - 4.3 Smaller Works
 - 4.4 Priority Order of Works
 - 4.5 Implementation of Works

 - 5.0 NOTES ON POST-REFURBISHMENT PERIOD

 - 6.0 COMMENTS ON PROPOSALS WHICH FALL OUTSIDE REFURBISHMENT

 - 7.0 ESTIMATES

 - 8.0 CONCLUSIONS AND RECOMMENDATIONS
-
- APPENDIX A ESTIMATE SHEETS
 - APPENDIX B ESTIMATE OF POST REFURBISHMENT ANNUAL OPERATION COST
 - APPENDIX C ECONOMIC EVALUATION OF ESTIMATES
 - APPENDIX D EWEBURN DAM REPORTS
 - APPENDIX E RACE INDEX
 - APPENDIX F INVENTORY OF SPECIFIC PROBLEMS

HAWKDUN AND IDABURN IRRIGATION SCHEMES
REFURBISHMENT
PHASE II PRE-FEASIBILITY REPORT

1 INTRODUCTION

1.1 GENERAL

A review is currently being made of the operational and maintenance conditions of all of the old irrigation schemes in Central Otago. The review aims at identifying the refurbishment measures required to reinstate the schemes to their original design standards and to place them on a sound long term management basis. The refurbishment period has been set at 15 years.

The following report covers the Phase II civil engineering assessment of the engineering works that will need to be undertaken for the refurbishment of the Hawkdun and Idaburn Irrigation Schemes.

1.2 ASSESSMENT REPORT OBJECTIVES

The objectives for the Phase II civil engineering assessment are given in the job brief 15/26/11 of 8 February 1985. Briefly these are:

- a To recommend the most likely cost effective refurbishment solutions to overcome the major, short and medium term engineering problems affecting the level of service of the off farm supply system to the irrigators.
- b To establish a refurbishment priority order encompassing works on the Hawkdun and Idaburn Schemes.
- c Estimate the post refurbishment annual operating and maintenance costs.
- d Give guideline comments for the Stage III (feasibility study) investigations.

1.3 MEANS OF ASSESSMENT

The inventory set out in the Phase I civil assessment classified structural problems as follows:

a Urgent

Problems requiring immediate attention are those which have an 80% chance of resulting in failure within five years and which would cause a 30% reduction in the capacity of the scheme and would take more than two weeks to repair.

b Major

Problems which would result in serious consequences to the headworks, or which if present in the distribution works would cut the supply totally to 30% of the scheme area.

c Minor

Problems which reduce the level of service, and/or require a high level of maintenance.

The inventory further categorised the structures as being good, "okay", fair or bad. Hence, while some structures do not threaten substantial areas of the scheme, nor require heavy maintenance input, their classification as fair or bad indicates a limited serviceable life and thus they warrant replacement in the medium term.

1.4 GENERAL SCHEME DESCRIPTION

The Hawkdun and Idaburn Irrigation Schemes provide partial irrigation and stockwater over a total area of 21450 hectares lying in the northwest corner of the Maniototo Basin and in the Idaburn Valley. Within this area, extending east to beyond Naseby and down to Ranfurly in the Maniototo, and to meet the Ida Valley Scheme in the Idaburn, some 3590 hectares are covered by irrigation agreements. Along with irrigation the scheme provides town supply for Naseby Borough and Ranfurly and the forestry fire fighting ponds at Naseby. The scheme is thus very spread

out with 112 km of main race and 160 km of distributary races.

The two schemes named above were originally developed separately, but with the water for both coming from the same source they are now operated in conjunction and will be considered together in this report.

The basis of the Hawkdun Scheme is the 112 km long Mt Ida Race (1.11 cumec maximum). This race runs from Johnstons Creek, in the head of the Manuherikia River, to near Naseby picking up water from the Hawkdun Range tributaries of the Manuherikia River, from various branches of the Idaburn and Taieri River tributaries which rise in the Ida Range. Within the Hawkdun Scheme supplies are supplemented from the Eweburn Reservoir lying immediately above the race in the West Eweburn. Supply for the Idaburn Scheme is provided from the Idaburn Dam, a small reservoir below Oturehua with additional water coming from stream flow, mainly the Hills Creek branch of the Idaburn.

As well as collecting water from the streams it crosses, the main Mt Ida race acts as the backbone of the distributary system. The actual distribution is down the valley slopes from the sidling main race, with natural stream channels and old mining races being used where convenient.

Distributaries are known by code letters. The upper Maniototo basin is served by D race in the west through to P race in the east, and the upper Idaburn Valley is served by the R and S races on the western side while the eastern side is serviced by A race at the top and the Idaburn Scheme main race lower in the valley. The individual race lengths and capacities are listed in the Appendix E.

Water Management

The operation of both schemes is dominated by the limited and transient water resource, and lack of storage.

A dozen or so creeks are turned into the Hawkdun main race each spring, and these supply the bulk of the Scheme's

water. These creeks are responsive to snow melt or rainfall and this causes considerable fluctuations in the main race flow. As supplies diminish through the summer the limited storage at West Eweburn is added but as this is small its effect is not great.

The fluctuations of supply and the resource which diminishes during the summer make the Hawkdun a complex scheme to operate if the maximum amount of water is to be supplied equitably. The Scheme's inflow is measured daily and each of the distributaries adjusted to take an equitable split. The success of this scheme has varied over the years depending upon the relative abilities of the head raceman. During dry summers the scheme is used exclusively for stockwater.

The water resource for the Idaburn Scheme is also inadequate, as the dam holds insufficient water for the area supplied, and the dam inflow in summer is very small. It is normal for the scheme to be delivering only stockwater during the summer months and during dry summers even stockwater is restricted.

1.5 EXISTING OPERATIONS AND MAINTENANCE POLICY

Over the past three irrigation seasons the Hawkdun Irrigation Scheme has received a large input of Operations and Maintenance (O and M) funding. This funding has been used to reconstruct large sections of the Mt Ida Race resulting in improved supply works. The remainder of the scheme including the Idaburn Scheme has received a barely adequate level of funding necessary to keep the schemes operational.

At* present there are ^{five} ~~six~~ men responsible for the Hawkdun and Idaburn Schemes.

A feature of the Hawkdun Scheme which results in extra O and M spending is the system of water collection from creeks. At present the creeks are turned into the main race

each spring by pushing up a gravel weir and diverting the stream flow through a measuring box. This weir works well until such time as there is a "fresh" in the creek and the weir is washed out. It must then be repaired, usually manually. This system lacks the automation built into modern schemes but the problem is not easily solved due to the unstable nature of the creek beds, and the lack of suitable sites close to the race for a permanent intake structure.

2.0 CURRENT STATUS OF SUPPLY WORKS

2.1 GENERAL

The Hawkdun and Idaburn Irrigation Schemes generally, are in a fairly "run down" condition. However there are very few structures in the schemes that could prove an immediate threat to the existing level of service apart from five creek crossings on the Mt Ida Race.

Apart from the specific problems mentioned above there are a large number of smaller problems scattered throughout both schemes that require attention. These comprise old, damaged, and ineffective minor structures such as measuring boxes, stops, drops, farm access bridges and culverts. Also as a result of the old practice of laying concrete culverts above ground many culverts have pipes which are extensively cracked due to stress created by differential temperature gradients.

Access is another problem, particularly in the Idaburn Scheme, and the distributary races of the Hawkdun Scheme. The berms of these races are at present too narrow for vehicle access.

The headwalls of many culverts which cross underneath country roads have been damaged by road graders during normal road maintenance operations. This suggests that the culverts are of insufficient length.

Many of the general problems are listed in Appendix F.

2.2 HAWKDUN IRRIGATION SCHEME

2.2.1 Eweburn Dam

Problems with this structure date back to construction with many reports being written on the subject. At present the condition of this dam is being assessed as part of the SEED study of old Central Otago dams. The problems with the dam are outlined in correspondence and reports a list of which is attached in Appendix D.

Apart from the structural integrity of the dam some work is also required on the outlet valves. One is inoperable at present and the remaining two are in poor condition.

2.2.2 Mt Ida Race

This race is generally in very good condition as a result of a major reconstruction programme including benching and replacement of old structures over the past three years. Apart from the somewhat unrefined and time consuming methods used in providing creek intake structures mentioned earlier, and some scouring at bywash outlets, there are only a small number of specific problems on this race.

Johnstones Creek pipeline was considered a "major" problem by the Phase I report. This structure consists of twin steel pipes (800 mm diameter), 39 metres long and spans Johnstones Creek. The pipes leak at most of the joints with one pipe being almost rusted through. Parts of this structure have a probable life of less than two years in their present condition.

Hills Creek Box culvert and Idaburn Creek culvert (1050 mm diameter) were considered "minor" problems by the Phase I Report. These culverts act as syphons under Hills Creek and Idaburn Creek, being 32 metres and 17 metres long respectively. Both culverts have been exposed in the creek bed and have suffered significant external wear from abrasive flood debris. Both of these structures have a residual life of 5 to 10 years in their present condition.

Scotts flume and the Eweburn flume were considered "minor" problems by the Stage I report. Scotts flume (800 mm D x 1.4 m wide) is an 18.6 metre long galvanised steel box channel. The flume itself is in good condition but the supporting substructure requires extensive repairs. The Eweburn flume (750 mm D x 1.9 m W) extends 13.3 metres across Eweburn Creek. For this structure the flume is in very poor condition but the substructure is sound. Both of these structures have an expected residual life of 3 to 7 years in their present condition.

The Wedderburn syphon consists of two sections of pipeline. The first section is 676 metres of steel pipe (675 mm diameter) and the remainder is made up of 130 metres of concrete pipeline (600 mm diameter). The problems with this structure include leaking joints, insufficient supports, lack of thrust blocks and aging sections of pipeline. The section of concrete pipeline is in very poor condition with significant cracking and leakage. Most of the steel section is relatively new (10-15 years old) but there is a 90 metre section of older pipe that shows signs of deterioration. The concrete section of the line has an expected residual life of 2 to 5 years while the older steel sections could last 10 years.

2.2.3 Distributary Races

In general many of the distributary races and related structures are in a fair to poor condition at present. Apart from the general problems mentioned in section 2.1, there is also a severe scour problem in some sections of race. The causes of this problem are as follows:

- a Poor design and condition of some drop structures.
- b The practice of using steep natural gullies to transport irrigation water.
- c The transport of larger volumes of water down the race due to the improved water resource resulting from reconstruction of the Mt Ida Race and

d To a lesser extent, the practice of race cleaning while the race is full of water. This practice results in an unevenly graded race bottom.

2.3 IDABURN IRRIGATION SCHEME

2.3.1 Idaburn Dam

This dam is being assessed as part of the S.E.E.D. study of old Central Otago dams. From information available to date the dam appears to be a low risk structure and will probably require only a minimal input of funds in the future. At present the outlet valve seems to be in good working order but this will require a closer inspection in the Phase III Report.

However, some work is required to provide safe walking access to operate the slide gate on the face of the dam. At present the track becomes very greasy in wet weather and the operating platform handrailing is inadequate. The dam face is also in need of a staff guage.

2.3.2 Idaburn Race System

The Idaburn Irrigation Scheme is in fair condition. Apart from the general items mentioned earlier, this scheme has problems with race leakage and lacks adequate bywash facilities. The amount of race leakage that exists is unclear at present due to discrepancies in the measuring weir at the start of the main race. The most likely sources of the leakage are a number of small syphons and a section of race bank between stations 600 and 900 on the main race.

Structure 54, a 37 metre long syphon (375 mm diameter) was considered a "minor" problem by the Phase I report. This syphon has recently been replaced.

3.0 CONTINUATION OF "STATUS"QUO"

If no refurbishment works were implemented and a normal level of O and M funding provided, the following results would be expected for the Hawkdun Scheme.

- a No reduction in staffing levels.
- b Increased water loss, especially from the problem structures on the main race.
- c The limited life expected for some structures on the main Mt Ida Race would threaten the water supply to two townships and the continuation of a large part of the scheme.
- d Increased scour problems with distributaries, and
- e A reduction in the quality of service to farmers.

NB : For the Idaburn scheme it is expected that apart from some increased leakage in the main race any reduction in the standard of supply will be minimal.

4.0 REFURBISHMENT PROPOSALS

4.1 HAWKDUN SCHEME

4.1.1 Eweburn Dam

Due to time constraints and lack of field information, the following proposals and estimates for works on the Eweburn Dam are of a very preliminary nature and will require a large amount of further investigation.

The proposed solutions investigated are effectively as summarised in a copy of letter PW 15/61 dated 10 January 1974 from Dunedin District Office. Estimates for quantities required were taken from a copy of letter PW 64/353 dated 10 September 1965 from Power Design Office (refer Appendix D).

The "patch up" option considered in the above letters is at present unable to be quantified. Investigations will be

required to ascertain the quantities of material required. Also the relationship of dam leakage versus reservoir level should be monitored to establish whether this leakage is a direct result of the slumped areas.

Along with any works carried out, the dam must be regularly monitored for undesirable rock movement on the spillway, and changes in leakage volumes and sediment transport through the dam.

It is also proposed to replace the outlet valves on the dam within the next five years.

4.1.2 Mt Ida Race

To provide a more maintenance free system of water collection from the larger creeks it is proposed to construct a number of labyrinth weirs with a sluice gate intake. These structures would be designed for a 5 to 10 year flood event to keep the size reasonable. To account for the larger floods and the unstable nature of the creek beds it is proposed to design the earthworks adjacent to the structures, to a washout level so as to provide a "fuse" for the system. It is also planned to use a timber weir crest, that can be removed if required, to facilitate natural scouring of bed aggradation. This system should reduce maintenance costs from an annual expenditure to approximately every 5 to 10 years.

At present some of the bywash structures on the Mt Ida Race are causing scour problems at their outlets. It is proposed to reposition some of these structures to solve this problem.

Johnstones Creek Pipeline is in need of immediate attention. It is proposed to renew the existing pipes and the associated inlet and outlet structures. The support structures for the present pipeline are in good condition and should provide adequate support for any new pipes.

To solve the present wear problems with Hills Creek and Idaburn Creek culverts it is proposed to replace both

structures with buried syphons.

It is considered that Scotts Flume is beyond repair. At present it is proposed to replace the flume with a syphon to provide a more maintenance free structure. This proposal will require further investigation.

Due to the sound condition of the substructure in the Eweburn Flume it is proposed to replace the present flume with a pipe bridge. Replacement of the structure with a syphon was ruled out due to the basement rock nature of the creek bed.

The Wedderburn Syphon is in need of extensive remedial work. It is proposed to replace the older sections of steel pipe and the complete section of buried concrete pipe. In addition to the above works, it is planned to replace some of the support structures and provide two extra thrust anchors.

4.3.1 Distributary Races

To alleviate the scouring problems in the distributary races it is proposed to regrade 2370 metres of race and replace many of the older drop structures. It is also planned to pipe some of the shorter natural gullies and provide a series of rock or gabion drops on the longer gullies. It is recommended that more supervision is required when race clearing is carried out. The practice of cleaning the race while it is carrying water should be avoided if possible.

Improved access is also required on some of the races. It is proposed to bench approximately 31310 metres of race. This length is a preliminary estimate at present and will require further investigation.

4.2 IDABURN IRRIGATION SCHEME

4.2.1 Idaburn Dam

At present there are no foreseeable major works required on the dam but this will require further evaluation after the S.E.E.D. study is completed.

The only works proposed for the dam are to provide a staff guage, and a proper walkway with handrails to allow for safe operation of the dam sluice gate.

4.2.2 Idaburn Race System

Proposed works to be carried out on the Idaburn Scheme include the construction of two bywashes and reconstruction of 300 metres of race to remedy leakage problems.

4.3 SMALLER WORKS

In general there are a large number of small structures throughout both schemes which require either renewal, removal or repair. For example it is proposed to renew 46 measuring boxes, 104 stops, 85 drops, 16 bridges and 187 culverts.

To provide thermal protection for exposed concrete culverts it is planned to cover these structures with a 200 mm layer of soil.

To solve the problems with county road crossing it is proposed that the culverts be extended and new headwalls constructed.

4.4 PRIORITY ORDER OF WORKS

A small number of structures in the Hawkdun scheme will require attention within the next 2 to 3 years but only Johnstones Creek Flume requires immediate attention.

The other structures include the Wedderburn Syphon, Scotts Flume, Wedderburn Flume and Idaburn Creek and Hills Creek Culverts. The above list also denotes respective priority

order. Other works that should receive attention within five years are the regrading of sections of distributary races and the replacement of flow control structures such as measuring boxes and stops.

Although some small structures are in poor condition there are no works of high priority required on the Idaburn Scheme at present.

When considering the remedial works required on the Eweburn Dam the order of priority is unclear. The dam has lasted many years in its present condition and for the moment there does not appear to be any imminent threat to supply.

4.5 IMPLEMENTATION OF WORK

It is proposed that the works be carried out in the following order of priority:

- Johnstone Creek Flume
- Wedderburn Syphon
- Scotts Flume (Syphon)
- Eweburn Flume
- Idaburn Creek Culvert
- Hills Creek Culvert

The latter should be programmed to be completed within three years with the first two to be done as soon as possible. The remaining works should be programmed over a seven year period.

5.0 NOTES ON POST REFURBISHMENT PERIOD

The foreseeable works required in the post refurbishment period include the replacement of a large syphon (up to 300 metres long) every five years, and a programme of upgrading smaller structures and distributary races.

6.0 COMMENTS ON PROPOSALS WHICH FALL OUTSIDE
REFURBISHMENT

The Hawkdun Irrigation Scheme is the most extensive scheme in Central Otago, however the water resource and lack of storage limit both the area supplied and the effectiveness.

Both the Hawkdun and Idaburn schemes at present provides a totally inadequate irrigation supply in the summer, but there is however surplus water during the winter and spring. The extensive catchment of the Hawkdun Scheme and its yield appear able to supply an adequate water supply to an increased area if storage was available. At present the only off-farm storage of note is the West Eweburn dam and only a small (though increasing) amount of on-farm storage is available. The resource could be better utilised with greater on-farm storage and the main race would probably carry the flows required (around 1.5 cumecs) but many of the distributary races would at this stage be inadequate.

In the Idaburn Scheme the only off-farm storage is the Idaburn Dam which is very small. There is also potential in this scheme for on-farm storage.

7.0 ESTIMATES

The following estimates have been prepared to ROC standard only, using data extracted from previous contract and own forces works and include for establishment, fencing of new works, etc. Contingencies have been set at 30% to reflect the current status of these investigations and "on costs" at 25% but reduced to 20% for refurbishment items estimated at over \$200 000. The "on costs" cover all investigations and design, design office support through to commissioning, construction supervision and general administration. The cost estimates, summarised below, are at a CCI of 2300.

| | Eweburn Dam | Hawkdun | Idaburn |
|---|----------------|----------------|---------------|
| Construction Estimate | 388 000 | 1 631 678 | 143 066 |
| Contingencies 30% | 116 400 | 489 503 | 42 920 |
| Subtotal | 504 400 | 2 121 181 | 185 986 |
| Engineering and Administration "On Costs" | <u>100 600</u> | <u>529 819</u> | <u>47 014</u> |
| Total Estimate | 605 000 | 2 651 000 | 233 000 |
| Present Value at Discount Rate of 10% | 605 000 | 1 900 000 | 162 000 |

The estimated savings in O and M over the 15 year refurbishment period is estimated at \$88 026 per annum. The present value discounted at 10% over 15 years is \$451 000. This assumes the key problems are solved within the first three years with the full saving being realised from that time.

The cost of repairs to the Eweburn have been separated. This solution is considered an upper bound alternative and subject to further investigations. The "patch up" solution (refer Section 4.1.1) could prove a more viable proposition.

8.0 CONCLUSIONS AND RECOMMENDATIONS

It is clear from the information gathered in this report that apart from the Mt Ida Race both the Hawkdun and Idaburn Schemes are in a "run down" condition. The races involved will require a significant input of capital within the next seven years to provide a workable and sound supply system through to the next century, at which time a renewal programme should begin.

It is recommended that the proposed works be carried out as set out in Section 4.5.

Approximately 22% of the capital cost of proposed works will be recovered from reduced O and M expenditure along.

Items that require further investigation in the Phase III report are:

- a Quantities of earthworks required for remedial works on the Eweburn Dam.
- b Flood data for the larger creeks that feed the Mt Ida Race. This is required for design of the proposed intake structures.
- c Detailed survey of races that require regrading.
- d Detailed estimate of required access benching,
- e The resiting of problem bywash structures.

P T Mulvihill
Assistant Engineer

16 September 1985

APPENDIX A

ESTIMATES

Benching

Civil will need to identify why the benching was required or recommended.

- i) Structural — acceptable for rehab. (leakages, steepness etc)
- ii) Operational — was policy decision reqd.



Ministry of Works and Development

OFFICE: DUNEDIN

HAWKDUN IRRIGATION SCHEME

ESTIMATE

Dwg: CCI = 2300

Recomd: *[Signature]*

FILE: Sh 1 of 6 shts

STATUS: Rough cost/~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~

PURPOSE: Appraisal/~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~

| | | | |
|------------|--------------------|--------------------|---------|
| | Prepared | Checked | Date |
| Quantities | <i>[Signature]</i> | <i>[Signature]</i> | 18 / 85 |
| Rates-extn | | | 18 / 85 |
| Approved: | <i>[Signature]</i> | | 18 / 85 |

| No. | Item | Unit | Quantity | Rate | \$ | \$ |
|-----|---|----------------|----------|------|-----------|------------|
| 1 | MT IDA RACE (600 mm Ø) Little Bremner Creek Syphon <i>Boundary ck?</i> | | | | | |
| | (a) Concrete Work | m ³ | 6.5 | 920 | 5 980 00 | |
| | (b) Pipework - Supply and Lay | m | 15 | 270 | 4 050 00 | 10 030 00 |
| 2 | Johnstones Creek Syphon (Twin 800 mm Ø) | | | | | |
| | (a) Concrete Work | m ³ | 8 | 920 | 7 360 00 | |
| | (b) Pipework - Supply and Fix | m | 80 | 700 | 56 000 00 | 63 360 00 |
| 3 | Hills Creek Syphon (1050 mm Ø) | | | | | |
| | (a) Concrete Work | m ³ | 7.7 | 920 | 7 084 00 | |
| | (b) Pipework - Supply and Lay | m | 35 | 592 | 20 720 00 | 27 804 00 |
| 4 | A Race Turnout Chute (300 mm Ø) | | | | | |
| | (a) Concrete Work | m ³ | 3 | 920 | 2 760 00 | |
| | (b) Pipework - Supply and Lay | m | 10 | 176 | 1 760 00 | 4 520 00 |
| 5 | Scotts Creek - Syphon (1050 mm Ø) | | | | | |
| | (a) Concrete Work | m ³ | 8 | 920 | 7 360 00 | |
| | (b) Pipework - Supply and Lay | m | 30 | 574 | 17 220 00 | 24 580 00 |
| | Sub-Total | | | | | 130 294 00 |
| | <i>Dillon George Byneth - reside</i> | | | | | |



Ministry of Works and Development

DUNEDIN

OFFICE:

HAWKDUN IRRIGATION SCHEME

ESTIMATE

Dwg: CCI = 2300

Recomd: *[Signature]*

FILE: | Sh 2 of 6 shs

STATUS: Rough cost / ~~Rough cost~~

PURPOSE: Appraisal / ~~Appraisal~~

| | Prepared | Checked | Date |
|------------|--------------------|--------------------|----------|
| Quantities | <i>[Signature]</i> | <i>[Signature]</i> | 18 / 85 |
| Rates-extn | | | 18 / 85 |
| Approved: | <i>[Signature]</i> | | 13 17 85 |

| No. | Item | Unit | Quantity | Rate | \$ | \$ |
|-----|---|----------------|----------|--------------|-----------|------------|
| | Sub-Total | | | | | 130 294 00 |
| 6 | Idaburn Creek - Syphon (1050mm ϕ) | | | | | |
| | (a) Concrete Work | m ³ | 8 | 920 | 7 360 00 | |
| | (b) Pipework - Supply and Lay | m | 20 | 574 | 11 480 00 | 18 840 00 |
| 7 | Wedderburn Syphon (675 mm ϕ) | | | | | |
| | (a) Concrete Work | m ³ | 20 | 920 | 18 400 00 | |
| | (b) Pipework - Supply and Lay | | | | | |
| | (i) Concrete | m | 130 | 335 | 43 550 00 | |
| | (ii) Steel | m | 90 | 470 | 42 300 00 | 104 250 00 |
| | <i>Value 100 ϕ</i> | | <i>1</i> | <i>1500</i> | | |
| 8 | Eweburn Flume | | | | | |
| | (a) Concrete Work | m ³ | 8 | 920 | 7 360 00 | |
| | (b) Pipework - Supply and fix | m | 12 | 660 | 7 920 00 | 15 280 00 |
| | <i>Tunnel Bywash</i> | | | | | |
| 9 | Hores Dam - Bywash | | | LS | 10 000 00 | 10 000 00 |
| | <i>Valve 300 ϕ</i> | | <i>1</i> | <i>15000</i> | | |
| 10 | Race Control Weirs | No. | 5 | 3680 | 18 400 00 | 18 400 00 |
| 11 | Bywash Weirs | No. | 3 | 3400 | 10 200 00 | 10 200 00 |
| | Sub-Total | | | | | 307 264 |
| | <i>Eden Ck Syphon</i> | | | | | |



Ministry of Works and Development

OFFICE: DUNEDIN

ESTIMATE

HAWKDUN IRRIGATION SCHEME

Dwg: CCI = 2300

Recomd: *[Signature]*

FILE:

Sh 4 of 6 shs

STATUS: Rough cost / ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~

PURPOSE: Appraisal / ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXX~~

| | Prepared | Checked | Date |
|-------------|--------------------|--------------------|--------|
| Quantities | <i>[Signature]</i> | <i>[Signature]</i> | 18 / 8 |
| Rates—extrn | | | 18 / 8 |

Approved:

[Signature]

13 / 9 / 88

| No. | Item | Unit | Quantity | Rate | \$ | \$ |
|-----|---|----------------|----------|-------|-----------|-----------|
| | Sub-Total | | | | | 615 083 0 |
| | <u>J Race</u> | | | | | |
| 1 | Regrade race (incl of drops)? | m | 570 | 17.54 | 10 000 00 | 10 000 0 |
| 2 | Benching and associated structures | m | 2050 | 7.70 | 15 785 00 | 15 785 0 |
| | <u>L Race</u> | | | | | |
| 1 | Benching and associated structures | m | 5450 | 7.70 | 41 965 00 | 41 965 0 |
| 2 | Pipe Chute (300 mm Ø) | | | | | |
| | (a) Concrete Work | m ³ | 4 | 920 | 3 680 00 | |
| | (b) Pipe work - Supply and Lay | m | 100 | 70.00 | 7 000 00 | 10 680 0 |
| | PVC | | | | | |
| | <u>M Race</u> | | | | | |
| 1 | Structure 4 - Replace Syphon (300 mm Ø) | | | | | |
| | (a) Concrete Work | m ³ | 4.5 | 920 | 4 140 00 | |
| | (b) Pipework - Supply and Lay | m | 122 | 90.00 | 10 980 00 | |
| | (c) Road works | | | LS | 1 000 00 | 16 120 0 |
| 2 | Benching and associated structures | m | 9540 | 7.70 | 73 458 00 | 73 458 0 |
| 3 | Gully Erosion Protection | | | LS | 5 500 00 | 5 500 0 |
| | Sub-Total | | | | | 788 591 0 |



Ministry of Works and Development

DUNEDIN

OFFICE:

ESTIMATE HAWKDUN IRRIGATION SCHEME

Dwg: CCI = 2300 Recmd: *[Signature]*

FILE: _____ Sh 5 of 6 sheets

STATUS: Rough cost / ~~Final~~ / ~~Contract~~ / ~~Other~~

PURPOSE: Appraisal / ~~Final~~ / ~~Contract~~ / ~~Other~~

| | Prepared | Checked | Date |
|------------|--------------------|--------------------|------|
| Quantities | <i>[Signature]</i> | <i>[Signature]</i> | 18/1 |
| Rates-extn | | | 18/1 |

Approved: *[Signature]* 13/8/82

| No. | Item | Unit | Quantity | Rate | \$ | \$ |
|-----|--|----------------|----------|------|------------|-------------|
| | Sub-Total | | | | | 788 591 00 |
| | N Race | | | | | |
| 1 | Benching and associated structures | m | 4480 | 7.70 | 34 496 00 | 34 496 00 |
| | <i>Not possible at that info</i> | | | | | |
| | O Race | | | | | |
| 1 | Pipe - Chute (300 mm Ø) | | | | | |
| | (a) Concrete Work | m ³ | 4 | 920 | 3 680 00 | |
| | (b) Pipework - Supply and Lay | m | 36.6 | 141 | 5 161 00 | 8 841 00 |
| | <u>GENERAL</u> | | | | | |
| 1 | Measuring Boxes <i># Turn outs</i> | No. | 27 | 1150 | 31 050 00 | 31 050 00 |
| 2 | Bridges | No. | 16 | 1800 | 28 800 00 | 28 800 00 |
| 3 | Stops | No. | 88 | 500 | 44 000 00 | 44 000 00 |
| 4 | Drops | No. | 85 | 2300 | 195 500 00 | 195 500 00 |
| 5 | Culverts - Supply and Lay | No. | 162 | 3000 | 486 000 00 | 486 000 00 |
| 6 | Miscellaneous - Includes covering of pipes etc | | | LS | 14 400 00 | 14 400 00 |
| | Sub-Total | | | | | 1631 678 00 |
| | Contingency = 30% | | | | | 489 503 00 |
| | Sub-Total | | | | | 2121 181 00 |
| | Engineering "On Cost" = 25% | | | | | 529 819 00 |
| | TOTAL | | | | | 2651 000 00 |



Ministry of Works and Development

OFFICE: DUNEDIN

ESTIMATE HAWKDUN IRRIGATION SCHEME
EWEBURN DAM

Dwg: CCI = 2300

Recomd: *[Signature]*

| | | | |
|------------|------------------------------------|--------------------|-------------|
| FILE: | Sh 6 of 6 shs | | |
| STATUS: | Rough cost / Final cost | | |
| PURPOSE: | Appraisal / Final cost | | |
| | Prepared | Checked | Date |
| Quantities | <i>[Signature]</i> | <i>[Signature]</i> | 18 / 85 |
| Rates-extn | | | 18 / 85 |
| Approved: | <i>[Signature]</i> | | 13 / 9 / 87 |

| No. | Item | Unit | Quantity | Rate | \$ | | \$ | |
|-----|---------------------------------------|----------------|----------|-------|---------|----|---------|----|
| | Gravel Blanket | | | | | | | |
| 1 | Remove Silt | m ³ | 6500 | 10.00 | 65 000 | 00 | | |
| 2 | Supply and Place Gravel Fill | m ³ | 11500 | 18.00 | 207 000 | 00 | | |
| 3 | Surface Protection - Supply and Place | m ³ | 3800 | 25.00 | 95 000 | 00 | 367 000 | 00 |
| | Valves | | | | | | | |
| | Supply and Install | No. | 3 ✓ | 7000 | 21 000 | 00 | 21 000 | 00 |
| | Sub-Total | | | | | | 388 000 | 00 |
| | Contingency = 30% | | | | | | 116 400 | 00 |
| | Sub-Total | | | | | | 504 400 | 00 |
| | Engineering "On Costs" = 20% | | | | | | 100 600 | 00 |
| | TOTAL | | | | | | 605 000 | 00 |



Ministry of Works and Development

DUNEDIN

OFFICE:

ESTIMATE IDABURN IRRIGATION SCHEME

Dwg: CCI = 2300

Recomd: *[Signature]*

FILE: | Sh 1 of 2 shs

STATUS: Rough cost/~~Final cost/Assessment/Prime estimate~~

PURPOSE: Appraisal/~~Final cost/Assessment/Prime estimate~~

| | | | |
|-------------|--------------------|--------------------|---------|
| | Prepared | Checked | Date |
| Quantities | <i>[Signature]</i> | <i>[Signature]</i> | 18 / 85 |
| Rates—extrn | | | 18 / 85 |

Approved: *[Signature]* 13 / 9 / 85

| No. | Item | Unit | Quantity | Rate | \$ | | \$ | |
|-----|--|----------------|----------|------|-------|----|--------|----|
| 1 | Idaburn Dam | | | | | | | |
| | (a) Staff Gauge | | | LS | 1 000 | 00 | | |
| | (b) Safety Rail | | | LS | 2 300 | 00 | | |
| | (c) Measuring Weir | | | LS | 1 700 | 00 | 5 000 | 00 |
| 2 | Structure 20 - Replace (450 mm Ø) | | | | | | | |
| | (a) Concrete Work | m ³ | 6 | 920 | 5 520 | 00 | | |
| | (b) Pipework - Supply and Lay | m | 20 | 168 | 3 360 | 00 | 8 880 | 00 |
| 3 | Structure 39 - Replace (525 mm Ø) | | | | | | | |
| | (a) Concrete Work | m ³ | 4 | 920 | 3 680 | 00 | | |
| | (b) Pipework - Supply and Lay | m | 11 | 248 | 2 728 | 00 | 6 408 | 00 |
| 4 | Structure 69 - Replace | | | | | | | |
| | (a) Concrete Work | m ³ | 6 | 920 | 5 520 | 00 | | |
| | (b) Pipework - Supply and Lay | m | 17 | 220 | 3 740 | 00 | 9 260 | 00 |
| 5 | Distributary 1 - Structure 2 (300 mm Ø) | | | | | | | |
| | (a) Concrete Work | m ³ | 2.4 | 920 | 2 208 | 00 | | |
| | (b) Pipework - Supply and Lay | m | 50 | 132 | 6 600 | 00 | 8 808 | 00 |
| 6 | Benching <i>(No structure)</i> | | 300 | 3.70 | 1 110 | 00 | 1 110 | 00 |
| | Sub-Total | | | | | | 39 466 | 00 |
| | <i>Structure 65 - PM - allowed for in the contract</i> | | | | | | | |



Ministry of Works and Development

OFFICE: DUNEDIN

ESTIMATE

IDABURN IRRIGATION SCHEME

Dwg: CCI = 2300

Recomd: *[Signature]*

FILE: Sh 2 of 2 sh

STATUS: Rough cost / ~~Final~~

PURPOSE: Appraisal / ~~Final~~

| | Prepared | Checked | Date |
|------------|--------------------|--------------------|---------|
| Quantities | <i>[Signature]</i> | <i>[Signature]</i> | 18 / 85 |
| Rates-extn | | | 18 / 85 |

Approved: *[Signature]* 13 / 19 / 85

| No. | Item | Unit | Quantity | Rate | \$ | | \$ |
|-----|------------------------------|------|----------|------|--------|----|-------------------|
| | Sub-Total | | | | | | 39 466 00 |
| | <u>General</u> | | | | | | |
| 1 | Measuring Boxes | No. | 19 | 1150 | 21 850 | 00 | 21 850 00 |
| 2 | Stops | No. | 16 | 500 | 8 000 | 00 | 8 000 00 |
| 3 | Culverts - Supply and Lay | No. | 25 | 2830 | 70 750 | 00 | 70 750 00 |
| 4 | Miscellaneous | | | LS | 3 000 | 00 | 3 000 00 |
| | Sub-Total | | | | | | 143 066 00 |
| | Contingency = 30% | | | | | | 42 920 00 |
| | Sub-Total | | | | | | 185 986 00 |
| | Engineering "On Costs" = 25% | | | | | | 47 014 00 |
| | TOTAL | | | | | | 233 000 00 |

APPENDIX B

ANNUAL OPERATION COST

ESTIMATE

HAWKDUN IRRIGATION SCHEME

REFURBISHMENT

ANNUAL OPERATION COST

The following data was extracted from the Phase 1 Report
(All x \$1000 at CCI = 2200)

| | After Refurbishment | Existing Level |
|----------------------------|------------------------|-------------------|
| Raceman Wages | 80.5 | 97.0 |
| Wages - Alex Irrig Section | 22.5 | 22.5 |
| Raceman Vehicles | 23.0 | 25.0 |
| Other | 7.0 | 10.0 |
| Plant - Race cleaning, etc | 35.0 | 40.0 |
| Weedspray | 10.0 | 10.0 |
| M & E Mtce | 3.0 | 3.0 |
| Stores | 3.0 | 3.0 |
| Renewals and Repairs | ? | 45.0 |
| 10% Admin Charge | 18.0 | 25.5 |
| TOTAL | <u>202.0</u> | <u>281.0</u> |

Extra cost per year at CCI of 2200 = \$79 000

Extra cost per year at CCI of 2300 = \$82 590

ESTIMATE
IDABURN IRRIGATION SCHEME
REFURBISHMENT
ANNUAL OPERATION COST

The following data was extracted from the Phase I report
 (All x \$100 at CCI = 2200)

| | After Refurbishment | Existing Level |
|----------------------------|------------------------|-------------------|
| Raceman Wages | 13.0 | 13.0 |
| Wages - Alex Irrig Section | 2.5 | 2.5 |
| Raceman Vehicles | 6.5 | 6.5 |
| Other | 1.0 | 1.0 |
| Plant - Race cleaning, etc | 2.0 | 2.0 |
| Weedspray | 0.5 | 0.5 |
| M and E Mtce | 0.5 | 0.5 |
| Stores | 1.0 | 1.0 |
| Renewals and Repairs | ? x | 5.0 |
| 10% Admin Charge | 3.0 | 3.2 |
| | <hr/> | <hr/> |
| TOTAL | 30.0 | 35.2 |
| | <hr/> | <hr/> |

Extra cost per year at CCI of 2200 = \$5200

Extra cost per year at CCI of 2300 = \$5436

APPENDIX C

ECONOMIC EVALUATION OF ESTIMATES

O & M SAVINGS

O and M savings per year = \$88 026

Estimated saving capitalised over 3-15 years at 5%

= \$88026 (7.66) = \$674 279
say = \$675 000

Estimated saving capitalised over 3-15 years at 10%

= \$88026 (5.12) = \$450 693
say = \$451 000

REFURBISHMENT OPTION

5% Discount Rate

| Construction Cost \$ | Year | Present Worth Factor | \$ |
|-------------------------|------|----------------------|-----------------|
| 412935/3 | 0-3 | 2.72 | 374 394 |
| 2471065/7 | 0-7 | 5.79 | 2 043 924 |
| | | | <hr/> |
| | | | 2 418 318 |
| | | | say \$2 419 000 |

10% Discount Rate

| | | | |
|-----------|-----|------|-----------------|
| 412935/3 | 0-3 | 2.49 | 342 736 |
| 2471065/7 | 0-7 | 4.87 | 1 719 155 |
| | | | <hr/> |
| | | | 2 061 891 |
| | | | say \$2 062 000 |

Note : Repairs to Eweburn Dam are not included in discounting.

APPENDIX D

EWEBURN DAM REPORTS

REFERENCES

- Otago Irrigation Dams : S.E.E.D. PROGRESS REPORT
R W J Fookes
23 January 1985
- Eweburn Dam Repairs : E R CHAVE
10 January 1974
Ref - DO PW 15/61
- Eweburn Dam : H J F KENNEDY
16 November 1973
Ref - DO PW 15/61
HO 64/7/1/14
- Eweburn Dam Repairs : J H H GALLOWAY
10 September 1965
Ref - DO 76/1
HO PW 64/353
- Hawkdun Irrigation Scheme : EWEBURN DAM
9 July 1965
Ref - DO 76/1
HO PW 64/353
- Eweburn Dam : J H H GALLOWAY
26 May 1965
Ref - DO 76/1

APPENDIX E

RACE INDEX

HAWKDUN IRRIGATION SCHEME : RACE INDEX

| <u>Race</u> | <u>Length</u> <u>(to nearest 0.1 km)</u> | <u>Race Capacity</u> <u>(m³/hr)</u> |
|--------------------|---|---|
| MT IDA | 108.0 | <4000 |
| R RACE | 32.5 | 600 |
| Distrib. No. 1 | 6.4 | 100 |
| No. 2 | 0.8 | 200 |
| No. 3 | 1.7 | 200 |
| No. 4 | 0.7 | 200 |
| S RACE | 3.1 | 200 |
| HAINES ENGINEERING | 1.4 | 25 |
| A RACE | 4.4 | 200 |
| Distrib. A1 | 0.7 | 200 |
| A2 Lateral 1 | 1.1 | 200 |
| A2 Lateral 2 | 2.8 | 200 |
| D RACE | * 13.4 | 200 |
| Distrib. No. 1 | 0.8 | 200 |
| E RACE | 5.5 | 200 |
| F RACE | 1.7 | 200 |
| G RACE | 18.1 | 600 |
| Distrib. No. 1 | 1.1 | 200 |
| No. 2 | 0.08 | 200 |
| No. 3 | 0.4 | 200 |
| H RACE | 8.2 | 300 |
| J RACE | 12.6 | 400 |
| Distrib. No. 1 | 1.1 | 200 |
| No. 2 | 2.6 | 300 |
| No. 3 | 2.8 | 200 |
| No. 4 | 0.6 | 200 |
| K RACE | 3.3 | 150 |
| Distrib. No. 1 | 0.3 | 200 |

| <u>Race</u> | <u>Length</u> | <u>Cusecs</u> |
|----------------|---------------|---------------|
| L RACE | 16.6 | 600 |
| Distrib. No. 1 | 3.0 | 400 |
| No. 2 | 1.4 | 200 |
| No. 3 | 0.2 | 200 |
| M RACE | 15.5 | 200 |
| Distrib. No. 1 | 0.6 | 150 |
| No. 2 | 2.3 | 150 |
| No. 3 | 0.3 | 150 |
| No. 4 | 0.6 | 150 |
| No. 5 | 1.8 | 150 |
| N RACE | 7.8 | 200 |
| Little N | 2.7 | 200 |
| O RACE | 10.2 | 400 |
| Distrib. No. 1 | 0.05 | 150 |
| No. 2 | 1.5 | 150 |
| No. 3 | 1.2 | 150 |
| P RACE | 0.01 | 50 |

IDABURN IRRIGATION SCHEME: RACE INDEX

| Page | Race | Length (to nearest 0.1 km) | Race Capacity (m ³ /hr) |
|------|-------------------|-------------------------------|--|
| 1 | Main | 11.7 | 700 |
| 8 | Distributary No 1 | 1.8 | 200 |
| 9 | Distributary No 2 | 0.1 | 100 |

Total Raceline Length = 13.6 km

APPENDIX F

INVENTORY OF SPECIFIC PROBLEMS

| Structure or Race Station (m) | Hawkdun | | Description | Problem | Residual Life (Years) | Proposed Solution |
|-------------------------------|---------|------|---|---|-----------------------|---|
| | Mt Ida | Race | | | | |
| 17 | Mt Ida | | RC syphon 600 Ø x 12.8 mL | Exposed in Creek | 5-10 | Replace |
| 56 | Mt Ida | | Wooden Raiser Weir | High maintenance input required | < 2 | Replace with concrete weir |
| 66 | Mt Ida | | 500 mm Measuring Box (M/B) - Turnout to A Race | (a) Scour at outlet (b) No stop/weir | < 5 | a Add pipe chute to outlet. b Add stop or weir |
| 67 | Mt Ida | | Bywash - RC 600 mm Ø x 5 mL - RC 900 mm Ø x 5 mL | Bad scouring at outlet | < 5 | Resite bywash to provide better runoff grades |
| 92 | Mt Ida | | Turnout to "G" Race | Needs a control weir | N/A | Add stop or weir |
| 101 | Mt Ida | | Turnout to "H" Race | Needs a control weir | N/A | Add stop or weir |
| 106 | Mt Ida | | Wooden Bywash with sandbags | High maintenance input required | < 1 | Replace with concrete bywash |
| 112 | Mt Ida | | Turnout to "I" and "J" race | Needs a control | N/A | Add stop or weir |
| 114 | Mt Ida | | Turnout to "K" race | Needs a control | N/A | Add stop or weir |

| Structure or Race Station (m) | Hawkdun | | Description | Problem | Residual Life (Years) | Proposed Solution |
|-------------------------------|---------|------|---------------------------|---------------------------------|-----------------------|-----------------------------------|
| | | Race | | | | |
| 129 | Mt Ida | | Sandbag controlled bywash | High maintenance input required | N/A | Add concrete bywash weir |
| Hores Dam | Mt Ida | | | Existing bywash scouring | | Armour and regrade bywash channel |

| Structure or Race Station (m) | Hawkdun | | Description | Problem | Residual Life (Years) | Proposed Solution |
|---|---------|------|--|---------------------------------------|-----------------------|---|
| | | Race | | | | |
| 29 | R | | Concrete channel 1.1 m wide x 800 mm deep x 137 mL | Wall of channel Collapsing | < 5 | Excavate a new race on existing alignment |
| 8100-14250) 32000-32450) | R | | Race | Poor access | | Provide access bench on outside berm |
| 7200-9000 | G | | Race | Bad scouring | < 5 | Regrade race |
| 0-2550) 5560-6000) 18100-18600) | G | | Race | Poor access | | Provide access bench |
| 1600-2000 | H | | Race | Bad scouring | | Provide pipe chute |
| 12050-12620 | J | | Race | Bad scouring | | Regrade race |
| 0-1000 | L and J | | Race | Poor access | | Provide access bench |
| 0-1050 | J1 | | Race | Poor access | | Provide access bench |
| 6500-8000) 9500-10100) 13500-16550) 16570-16870) | L | | Race | Poor access | | Provide access bench |
| 40-46 | L | | 6-concrete weir drops 400 mm W x 400 mm D | Race scoured and overgrown by willows | | Replace with pipe chute |

| Structure or Race Station (m) | Hawkdun | | Description | Problem | Residual Life (Years) | Proposed Solution |
|---|---------|------|--|-------------------------|-----------------------|---|
| | M | Race | | | | |
| 4 | M | | RC Pipe Syphon 300 mm Ø x 122.0 m L | Pipes Leaking | <5 | Replace |
| 0-1500) 3000-4500) 5500-8500) 12000-15540) | M | | Race | Poor Access | | Provide access bench |
| 8500-9250 | M | | Long Gully | Bad Scouring | | Regrade using rock using rock or gabion drop structures |
| 0-2900 6520-7830 | N | | Race | Poor access | | Provide access bench |
| 13 | O | | Buried pipe drop 36.6 m L combination of 300 mm Ø RC and 460 mm Ø steel | Pipes in poor condition | <5 | Replace |

| Structure or Race Station (m) | Idaburn | | Description | Problem | Residual Life (Years) | Proposed Solution |
|-------------------------------|-----------|------|----------------------------------|--|-----------------------|--------------------------------------|
| | Main | Race | | | | |
| 20 | Main | | RC 450 Ø x 17.0 m L | Exposed and Cracked | <10 | Replace with a syphon |
| 39 | Main | | RC 525 Ø x 11 m syphon | Leaks | <5 | Replace |
| 62 | Main | | RC 450 mm Ø x 17.1 m L | Bad leaking at joints | <10 | Replace |
| 600-900 | Main | | Race | Leakage through out-side berm | | Reconstruct and compact outside berm |
| 2 | Distrib 1 | | 675 mm Ø x 48.8 m steel pipeline | Filled with debris and in poor condition | <5 | Replace with 300 mm Ø culvert |

12 21 57

CIVIL ENGINEERING DIRECTORATE
GENERAL OFFICE
INDIANAPOLIS, INDIANA

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REVIEW OF OLD CENTRAL OTAGO IRRIGATION SCHEMES
JOB BRIEF TO CIVIL ENGINEERING DIRECTORATE
PHASE 2 : REFURBISHMENT : INITIAL ASSESSMENT

1 INTRODUCTION

This brief outlines an initial engineering assessment for refurbishment of the supply works for 13 old Central Otago irrigation schemes. The initial assessment is the second phase of the proposed 4 phase refurbishment exercise. The refurbishment programme and reports generated by this brief will provide planning information for NWASCA to seek funding from government. Refer also to the phase 2 job brief to water and soil directorate.

2 SCOPE OF BRIEF

- 2.1 The objective of the initial engineering assessment is to report to the DPM on the following:
- a For each scheme the most likely cost effective refurbishment solutions to overcome the major short and medium term engineering problems affecting the level of service of the off farm supply system to the irrigators.
 - b A refurbishment priority order encompassing works on each scheme.
- 2.2 The "level of service" to irrigators for each scheme referred to is the capacity of the system to supply the water quota depth within the constraints of the water resource, to the traditionally irrigated area. There will be no increase to the nominal capacity of the supply works as part of the refurbishment programme.
- 2.3 Changes to the existing form of the supply works should only be considered when such changes either:
- a The minimum cost options of replacing works with a residual service life of less than 15 years.
 - b The most economic means of continuing supply (ie, change to reduce O to M costs).
- 2.4 The priority order for works should recognise the following factors:
- Major structures with a high risk of failure within ten years and affecting more than 30% of the irrigated area.
- Structures that will in the short term or do now seriously reduce the level of service to significant numbers of irrigators.

Cost effectiveness of the priority order to the programme as a whole from the operational view point.

3 REFURBISHMENT STANDARDS

The proposed refurbishment programme should reinstate the integrity of the supply system so that an acceptable programme of planned renewal and normal operation and maintenance input can be set in place for the post refurbishment period, ie, from year 2000 onwards.

Refurbishment on a minor scale compared to that currently thought necessary to update scheme for new technology and land uses could generally be expected every 30 to 50 years.

4 SCHEMES TO BE REVIEWED

The schemes included in this brief are the following:

| | |
|--------------|------------------------------|
| Manuherikia | Ardgour - inclusive of Beggs |
| Arrow River | Teviot River |
| Omakau | Last Chance |
| (Ripponvale) | Galloway |
| Pisa | Ida Valley |
| Tarras | Hawkdun |
| | Idaburn |

4.1 Special Note

The DWSO has previously initiated briefs with Civil Engineering Directorate for the Arrow River, Manuherikia, Omakau and Ripponvale irrigation schemes. For the most part these briefs requested reports on specific structures. Scheme reports to the format set out in section 5.2 will be produced for those four schemes. Monitoring progress on the earlier briefs and initiating the work to achieve the input required for this brief is within the scope of this brief.

4.2 Water and Soil Directorate Role

Water and soil function as client and consultant in terms of the old schemes review.

As Client:

Water and Soil define the level of service to be achieved by refurbishment, ie, a statement for each scheme will be provided to coincide with the start of individual scheme engineering studies (refer attached programme).

As Consultant:

- Input and comment on refurbishment concepts and options, economics and agricultural impacts.
- Input on water management, ie, water resource, off farm system, comment on on farm performance.
- Produce water and soil scheme reports and the review summary report and assist with assimilation of the combined scheme reports.

5 INITIAL ASSESSMENT FOR REFURBISHMENT
CIVIL ENGINEERING SCHEME REPORT

5.1 Content

The individual scheme reports should contain the following presented as succinctly as is practical:

- a Summary of the extent and general condition of the existing supply works in particular focusing on the residual life and risk of failure of major structures and comment on likely failure mode.
- b Describe briefly the decline in the level of service that would result if no refurbishment works were implemented and the present level of O and M continued - please include an approximate time scale.
- c Notes on structures with capacity problems in terms of level of service and operational inefficiency, ie, those with high operating costs, special difficulties.
- d Outline of measures required to overcome the urgent and major problems effecting the level of service of the supply works in terms of their capacity. Comment should be made on possible solutions and directions to be investigated for phase 3 - feasibility study.
- e Outline of any major capital improvements proposed primarily to reduce operating costs - these should be separately denoted in the estimate.
- f Itemised estimate of the proposed refurbishment works to rough order of cost accuracy ($\pm 30\%$). Minor works may be expressed as a lump sum. The contingency sum appropriate estimate should be shown separately.
- g Estimate of the post refurbishment annual operating and maintenance cost.

- h Comment briefly on the post refurbishment liabilities, ie, renewals of major structures from year 2000 onwards.
- i Provide a priority order of the major works with cognisance to the priorities referred to in 2.4 above. Interdependent activities should be noted.

5.2 Scheme Reports - Compilation

The "Scheme Report" will summarise for each scheme the phase 1 and phase 2 work done by Civil Engineering and Water and Soil Directorates. The format for the combined scheme report is set out in section 5.3. The areas of appropriate contribution are annotated with WS and CE. Water and Soil and Civil Engineering Scheme Reports should be structured to enable a straightforward assimilation into the combined "Scheme Report" format. This assimilation will be co-ordinated by the project manager. The Civil Engineering Scheme Reports are the only formal reports required within this brief and should be submitted to the DPM as programmed.

5.3 Combined Scheme Report Format XYZ Irrigation Scheme Report Review for Refurbishment

| <u>Preface</u> | <u>Consultant Contribution</u> |
|---|------------------------------------|
| Introduction | WS |
| Summary | WS |
| <u>Chapter 1 - Preliminary Scheme Appraisal</u> | |
| Background | WS |
| Level of Service : | WS |
| with refurbishment | WS |
| without refurbishment | CE-WS* |
| Land Use | WS |
| Soils | WS |
| Water Resource | WS |
| Water Management | WS |
| off farm system | |
| irrigation methods | |
| Economics | WS |
| * CE input required | |
| <u>Chapter 2 - Initial Engineering Assessment</u> | |
| Current Status of Supply Works | CE |
| Refurbishment Needs | CE |
| essential works | |
| highly desirable works | |
| Priority Order | CE |
| Summary Estimate and comments (appended) | CE |

Chapter 3

Conclusions WS
 Direction of Feasibility Reporting (Phase 3) WS-CE

Appendices

References WS
 Notes on Engineering Options CE
 Detailed Estimate - Capital CE
 Operation and Maintenance
 Detailed Statement of Level of Service - WS
 Post Refurbishment

6 SUMMARY REPORT

The scheme reports, ie, the combined Water and Soil and Civil Engineering Scheme Reports will be used by Water and Soil Directorate to draft a summary report that will be first reference for the review of the Central Otago Schemes. The summary report will include the following:

- Comment on priorities reflected in the programme.
- Comment on regional and national economics, social and physical environment.
- Detailed programme for refurbishment showing cost and content of the feasibility and design and construction phases (ie, phases 3 and 4).
- Other input as appropriate, eg, appendices.

No formal reporting is required for the summary report as part of this brief however some input will be needed for commenting and review. The DPM will submit the draft summary report to the Chief Designing Engineer for audit.

7 PROGRAMME

The attached programme defines the reporting dates for the work in this brief.

The key dates are as follows:

| | | |
|---------|---|-----------------|
| Phase 1 | Civil reporting - complete | 31 May 1985 |
| Phase 2 | Civil reporting - complete (scheme reports) | 31 August 1985 |
| | Submission of audited "Summary Report" to Client | 31 October 1985 |

8 PROGRESS REPORTING

Monthly reports are to be submitted to the DPM by the tenth day of each month. These reports are to cover details of progress, programme review expenditure and forecast final cost and are to be presented in the format set out in the project management manual. The project manager is responsible for the oversight of progress and cost and reporting to the client.

G M Dent
Water and Soil Engineer

$$\frac{2 \text{ chm}}{\text{hr.}} = 40 \text{ m } 2 \text{ ch/W.}$$

$$20 \text{ m } 1 \text{ ch/W.}$$

70 ~~Days~~

50 ~~Days~~

120

=

84-5/m.

STANDARD PROBLEM

The following problem is a typical example of the type of problem which is often encountered in the study of the history of the earth. It is a problem of the type which is often encountered in the study of the history of the earth. It is a problem of the type which is often encountered in the study of the history of the earth.