Feasibility Study for Foxwood Dam (WP10580)

Agro-Economic Study

Final

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STUDY REPORTS

The Agro-Economic Study report forms one of the suite of reports that make-up the Feasibility Study for Foxwood Dam. The full list of reports is provided below:

Feasibility Study for Foxwood Dam: Inception Report	**P WMA 15/Q92/00/2113/1**
Feasibility Study for Foxwood Dam: Preliminary Study Report	**P WMA 15/Q92/00/2113/2**
Feasibility Study for Foxwood Dam: Environmental Screening	P WMA 15/Q92/00/2113/3
Feasibility Study for Foxwood Dam: Geotechnical Reconnaissance	P WMA 15/Q92/00/2113/4
Feasibility Study for Foxwood Dam: Alternative Water Supply Options	P WMA 15/Q92/00/2113/5
Feasibility Study for Foxwood Dam: Feasibility Study Main Report	**P WMA 15/Q92/00/2113/6**
Feasibility Study for Foxwood Dam: Koonap River Hydrology	P WMA 15/Q92/00/2113/7
Feasibility Study for Foxwood Dam: Water Requirements	P WMA 15/Q92/00/2113/8
Feasibility Study for Foxwood Dam: Agro-Economic Study Report	P WMA 15/Q92/00/2113/9
Feasibility Study for Foxwood Dam: Water Quality	P WMA 15/Q92/00/2113/10
Feasibility Study for Foxwood Dam: Geotechnical Investigation	P WMA 15/Q92/00/2113/11
Feasibility Study for Foxwood Dam: Dam Feasibility Design	P WMA 15/Q92/00/2113/12
Feasibility Study for Foxwood Dam: Project Feasibility Costing	P WMA 15/Q92/00/2113/13
Feasibility Study for Foxwood Dam: Economic Impact Assessment	P WMA 15/Q92/00/2113/14
Feasibility Study for Foxwood Dam: Record of Implementation Decisions	P WMA 15/Q92/00/2113/15
Feasibility Study for Foxwood Dam: Book of Maps	P WMA 15/Q92/00/2113/16
Feasibility Study for Foxwood Dam: Public Participation (Queries & Responses Report)	P WMA 15/Q92/00/2113/17

REPORT REFERENCE

This report is to be referred to in bibliographies as:

Department of Water and Sanitation, 2015. Feasibility Study for Foxwood Dam: Agro-Economic Study, P WMA 15/Q92/00/2113/9

Note on Departmental name change

In 2014, the Department of Water Affairs (DWA) changed its name to the Department of Water and Sanitation (DWS). This occurred during the course of this study and as a result some reporting which was commenced and/or approved prior to the name change may still refer to DWA. References herein to DWA and DWS should be considered one and the same.

EXECUTIVE SUMMARY

The Department of Water and Sanitation is investigating the feasibility of developing a multi-purpose dam on the Koonap River near Adelaide in the Eastern Cape. The project is being considered with the intention to utilize the water resources of the Koonap River, the naturally occurring irrigable soils along the Koonap River downstream of the Foxwood Dam site, and the human resource potential in the Amathole District Municipality to stimulate socio-economic development. The depressed socio-economy of this district of the Eastern Cape is urgently in need of stimulus to address the major issues of poverty, work opportunities and equity. The concept of a Government Irrigation Scheme offers a vehicle for realizing the potential socio-economic value of these three main resources in a way that is consistent with the National Development Plan (NDP).

The locality and extent of irrigable land that can be supplied from releases from the proposed Foxwood Dam has been carried out based on aerial survey, soil depth and type data, minimum slope criteria and verified through consultation with current commercial farmers. Historic and current cropping trends have been reviewed and verified through consultation with local farming stakeholders through the establishment of an Agricultural Technical Working Group.

Available Water and Land

Allowing for high and low flow Reserve requirements as well as existing abstraction rights for farmers downstream of the proposed Foxwood Dam site, the proposed 1 MAR dam would supply approximately 12,5 million m^3/a. An irrigation scheme of 1 250 ha of high value tree crops has been proposed based on a water consumption of 10 000 m^3/ha/a allowing for approximately 20% losses from the dam wall to the field edge. Sufficient land for irrigation development has been identified downstream of the proposed Foxwood Dam site, however it is estimated that up to approximately 13 000 ha would need to be purchased to enable 1 250 of contiguous land to be combined form separate farms currently held in private ownership.

The land on which such a scheme could be developed along the Koonap River is at present owned by individuals who are themselves successful farmers. This land would have to be acquired by the State or the current land owners could become partners in the envisaged development, subject to mutually acceptable contractual arrangements. The intention is, however, that the emerging farmers who settle on the Irrigation Scheme become owners of the land on which they make a success of a farming venture.

Cost and Price of water

The cost of water supplied from the proposed Foxwood Dam has been estimated through the calculation of the Unit Reference Value (URV). This gives a URV of **R11,77 /m^3** over the life of the dam. If this is used as an indication of the cost of water it is not financially sustainable price of water for the proposed irrigation scheme. It is however, assumed that the capital cost of the dam is funded through a grant from Treasury. It is therefore proposed that the price of water applied to the Irrigation Scheme reflects only the operational and maintenance costs incurred for the dam. This **price** of water has been estimated at **R0,60 /m^3** over the 50 year lifetime of the dam.

Farm Plot Sizes and Crop Type

Financial models for three high value tree crops (peaches, lemons and macadamias) were developed for three different farming plot sizes (1 ha, 20 ha, 50 ha). Cashflow models for the different farm plot sizes and crop types were developed and the financial performance assessed.

Table 1 below summarises the key financial performance of the different schemes. Revenue and profit is shown as a snapshot at 10 years to illustrate the financial performance of the model once the farming operations reach full maturity. The Internal Rate of Return (IRR) is shown at 15 years to illustrate the long term bankability of the project. The 20 ha scheme was selected for further evaluation within the Economic Impact Assessment (DWS, 2015) to review the potential socio-economic impact that could be expected to result from the Irrigation Scheme.

Funding Investment Required

The peak funding is the total cumulative investment required to fund the capital and operational costs of the farm, less revenue earned, up until the time when the farm breaks even and starts to make a profit. For the 20 ha scheme, averaged across all crops, **peak funding of R 437 million** is estimated to be required to develop the Irrigation Scheme up until it reaches financial sustainability. This investment – expected to be from Government – is estimated to be required over approximately **7 years** from the start of the development of the Irrigation Scheme. Based on the projected cashflow for the different crops, the expected time period for repayment of the peak funding investment has been projected as approximately **5 years**, or 12 years from the start of the development of the Irrigation Scheme. Funding cashflow is illustrated in Figure 1 below.

Revenue and profit values have been given at year 10 as this is reflective of the performance of the Irrigation Scheme once the farms have reached full maturity. IRR is given at year 15 as this ratio is useful to indicate the longer term bankability of the project.

Table 1: Financial outputs from farming model

		Peak funding (R)	Total revenue in year 10 (1 250 ha)	Profit as % of revenue in year 10	IRR (@ year 15) %
1 ha	Lemons	749 879 297	R 190 136 584	11%	-9,63
	Peaches	710 676 252	R 212 749 377	36%	4,53
	Macadamias	812 899 635	R 213 346 250	46%	0,79
20 ha	Lemons	405 885 717	R 186 565 322	26%	9,11
	Peaches	423 776 401	R 211 047 382	24%	8,87
	Macadamias	452 534 469	R 206 223 441	35%	6,47
50 ha	Lemons	421 993 876	R 188 069 882	23%	7,33
	Peaches	413 244 219	R 207 488 784	24%	9,31
	Macadamias	439 701 800	R 212 814 214	38%	8,23

Key Risks – Institutional Arrangements

The principal risks associated with the development of the Government Irrigation Scheme relate to the dependency of the success of the scheme on the availability of leadership and management from an appropriately mandated and resourced Implementing Agent. It will be important for that Agent to fully focus on the socio-economic development of the Eastern Cape and to be available to commit resources to the project for a long time. The emerging farmers will be reliant on the Implementing Agent to provide training and technical support, as well as structured financing and marketing services for a period estimated in the order of 10 years.

After consultations in Stakeholder Meetings, in the Project Steering Committee and with individual government departments it is concluded that the Eastern Cape Rural Development Agency (ECRDA) is well placed to fulfil the role of Implementing Agent. The availability of the Agency to

undertake this responsibility has not been canvassed and the possibility of this happening will be dependent on the commitment by government of the necessary resources, financial and otherwise, for a period of 10 years or until the project is self-sustaining.

NB Consultation with the national Department of Agriculture, Forestry and Fisheries as well as the provincial department of Rural Development and Agrarian Reform has taken place throughout this study. However it is imperative that a thorough and formal feasibility study is carried out for the proposed Irrigation Scheme. DWS has requested that such a study is carried out by DAFF.

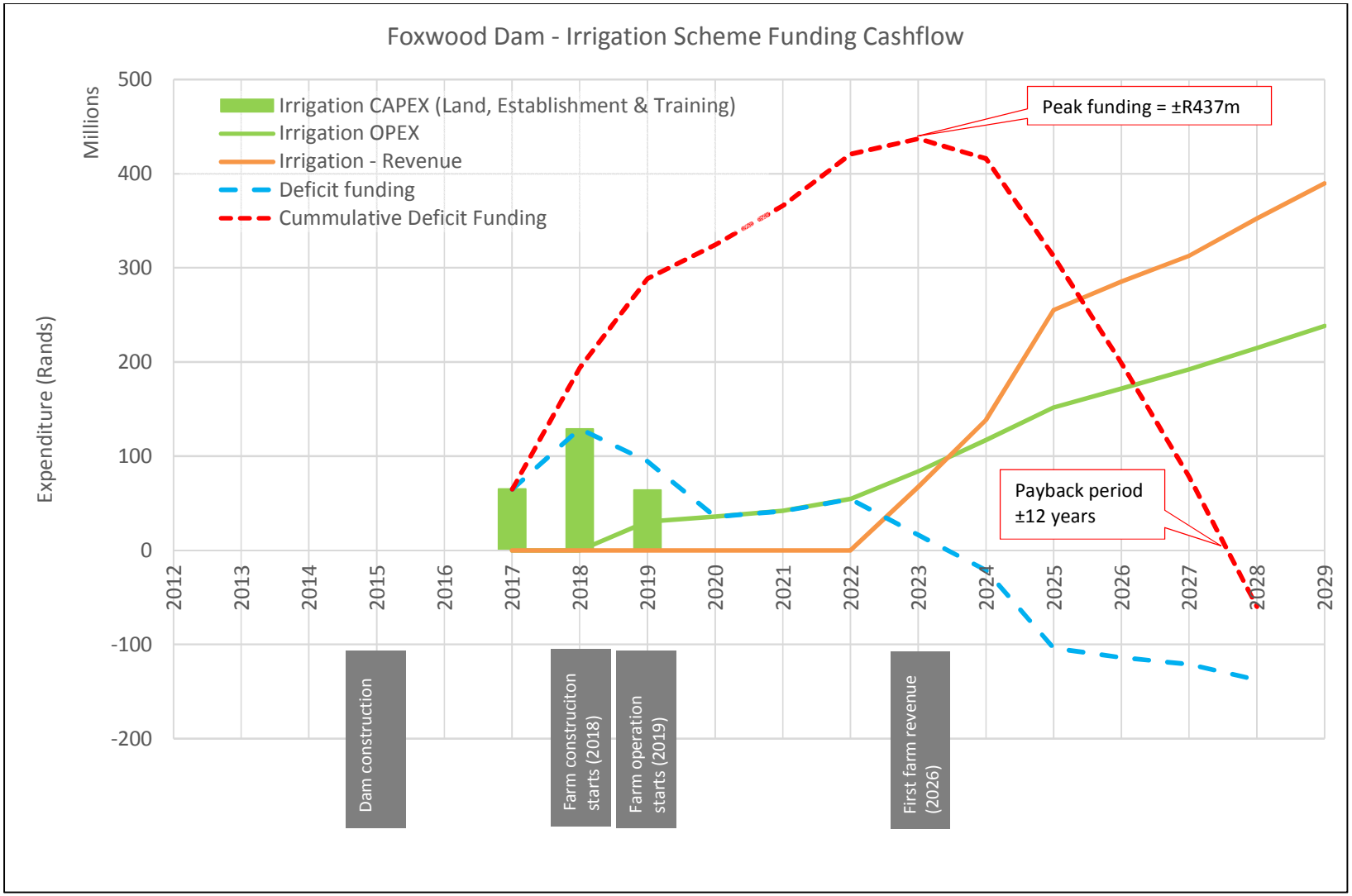

Figure 1: Foxwood Dam Irrigation Scheme Funding / Revenue Cashflow

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LIST OF ACRONYMS

ACRONYM	Full Description
ADM	Amathole District Municipality
AW	Amatola Water
BEE	Black Economic Empowerment
BFAP	Bureau for Food and Agriculture Policy
CBA	Cost Benefit Analysis
CEAS	Central Economic Advisory Agency
DWS	Department of Water and Sanitation (formerly DWA)
ECSECC	Eastern Cape Socio Economic Consultative Council
EIA	Economic Impact Assessment
FTE	Full Time Equivalent – Relating to Employment
GDP	Gross Domestic Product
GGP	Gross Geographic Product
GVA	Gross Value Added
IDC	Industrial Development Corporation
IRR	Internal Rate of Return
NDP	National Development Plan
NFI	Net Farm Income
NPV	Net Present Value
Nxuba	Nxuba Local Municipality
WARMS	Water Use Registration Database
WMA	Water Management Area
WSA	Water Service Authority
WSP	Water Service Provider

LIST OF UNITS

MEASURE	UNIT
Height	m.a.s.l.
Distance	m or km
Dimension	mm, m
Flow rate	l/s or m^3/s
Area	m^2, ha or km^2
Volume (storage)	m^3, million m^3

1 INTRODUCTION

1.1 Feasibility Study for Foxwood Dam

The Department of Water and Sanitation is investigating the feasibility of developing a multi-purpose dam on the Koonap River near Adelaide in the Eastern Cape. The proposed dam site is known as Foxwood and was identified for the development of the water resources of the Koonap River as far back as the 1960's. The project is again being considered for implementation as a strategic initiative to mobilize the water resources in the area as a stimulus for socio-economic development in this rural, economically depressed region. This initiative would support the objectives of the National Development Plan (NDP) and is consistent with the National Water Resource Strategy (NWRS).

Development of the Foxwood Dam would, in the first instance, provide additional, high assurance water supplies for domestic use; this would significantly improve the resilience of the limited supplies now available from the Koonap River without the benefit of storage, and would make water available to meet any increasing needs for domestic and industrial use.

The effective development of a major storage dam at the Foxwood site would regulate the variable runoff in the Koonap River to the extent that, after full provision is made for maintaining the Reserve to ensure the health and integrity of the resource itself, a significant quantity of water would be made available for irrigation development at an appropriate level of assurance. It is this resource that would be mobilized, together with land and human resources in the region, to provide a stimulus for socio-economic development. This vision is assessed in the context of agricultural development, land reform and rural development policies within the framework of the NDP.

The Foxwood Dam site is located immediately upstream of Adelaide (coordinates 32˚40'30"S, 26˚16'0"E) in the Koonap River catchment (see Figure 2 and
Figure 3). The Koonap River catchment, with an area of 3 334 km², is situated in the Eastern Cape Province and lies within the Fish to Tsitsikamma Water Management Area (WMA). Adelaide is in the Nxuba Local Municipality (Nxuba) within the Amathole District Municipality (ADM). ADM is the Water Service Authority (WSA) in the Nxuba Municipality and Amatola Water (AW) is the Water Service Provider (WSP).

This report assesses the feasibility of developing new irrigation within the Koonap River valley downstream of the Foxwood Dam site.

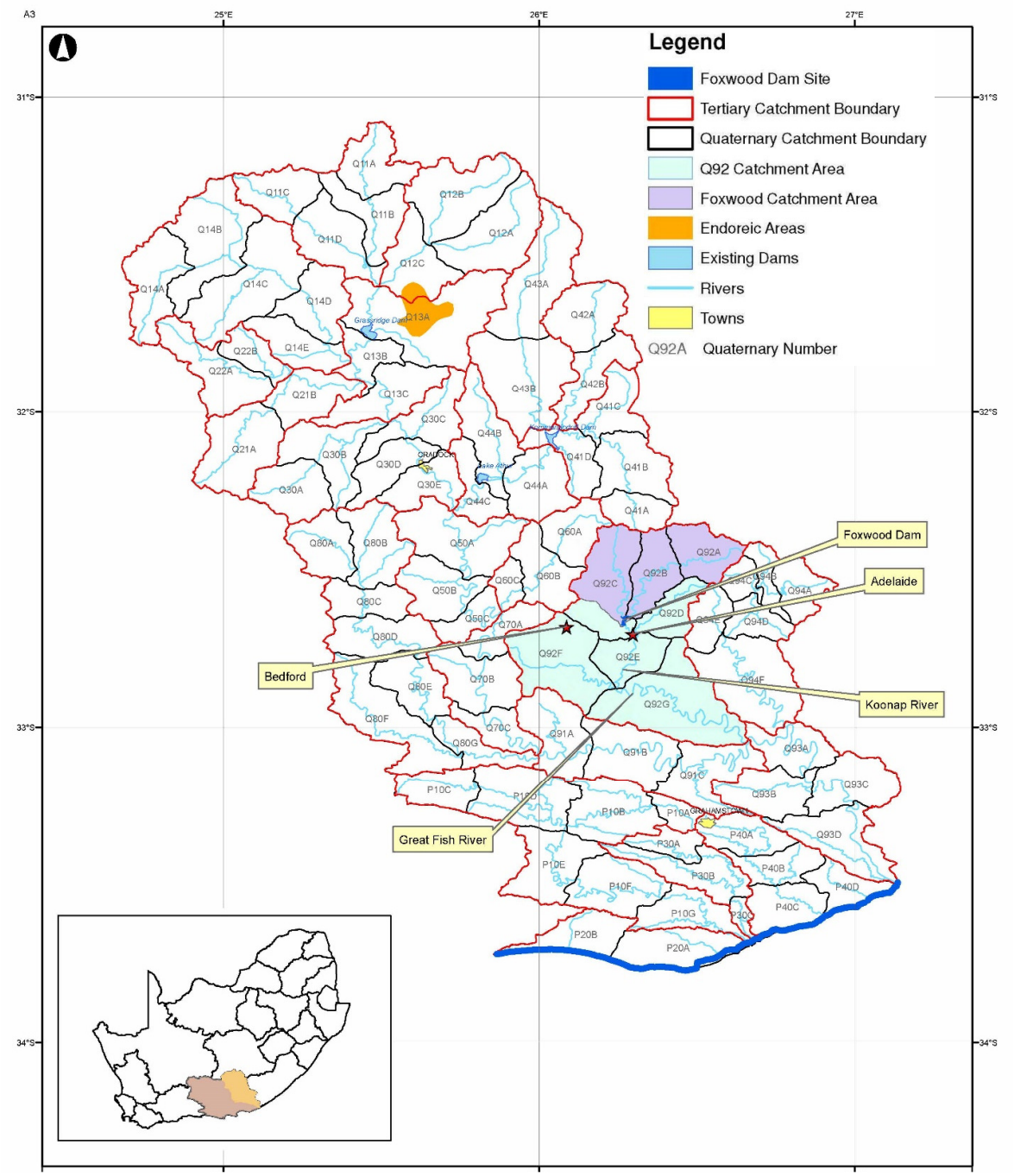

Figure 2: Fish River Catchment with Koonap River Sub-catchment

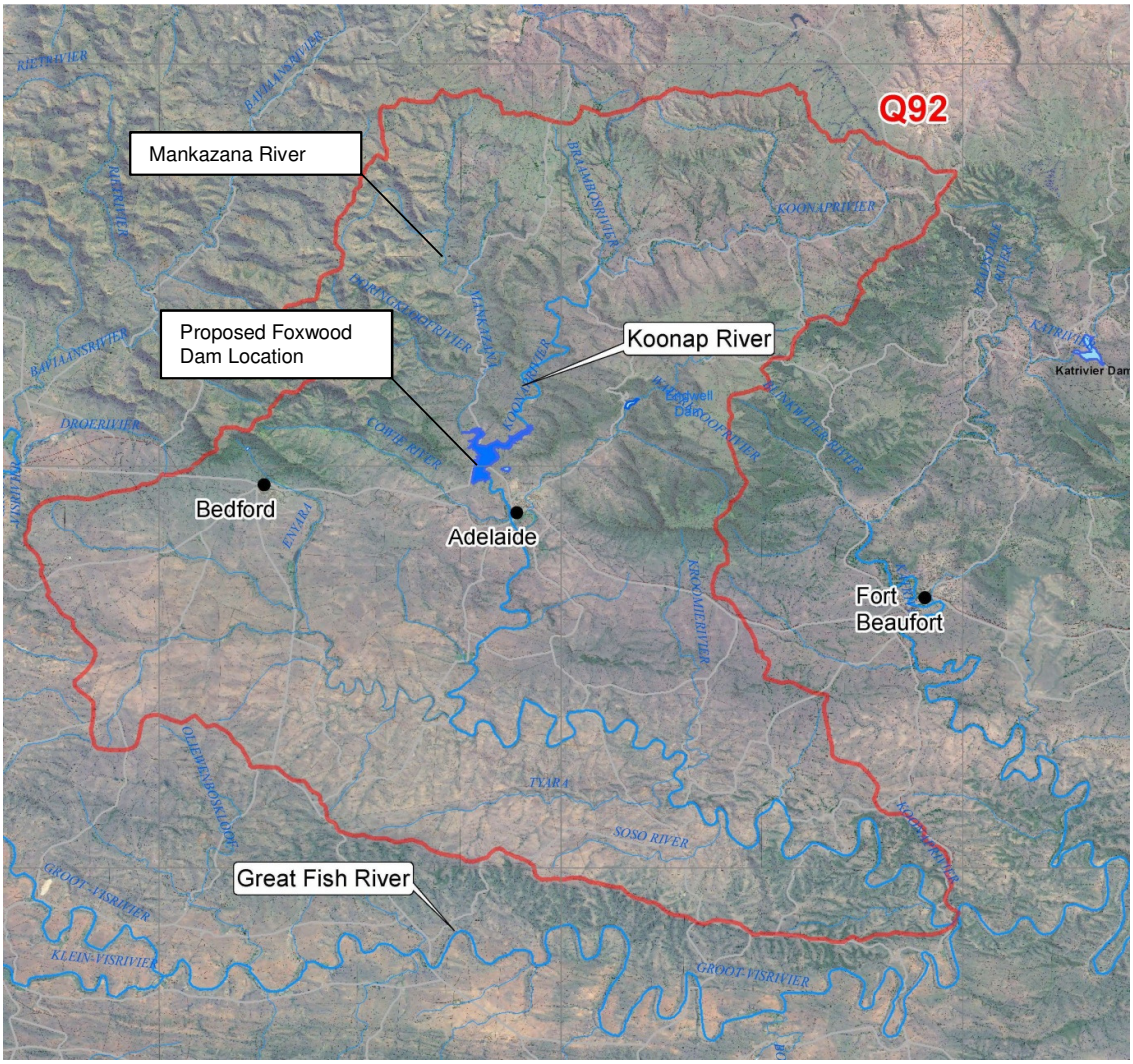

Figure 3: Foxwood Dam location within Koonap River catchment (red line) and surround towns

1.2 Opportunities for Irrigation Development

1.2.1 Existing irrigation development

Previous investigations of the development potential of the water resources of the Koonap River, the last of which was in 1995 (DA-EC, 1995; de Wet Shand, 1988), revealed that under the circumstances of the time there was no need for a major dam to supply water for irrigation purposes. Irrigation at that time was based on the initiative of individual commercial farmers to develop the riparian rights to runoff in the Koonap River. This riparian rights principle was established in the Water Act, Act 54 of 1956, which has since been repealed and replaced by the National Water Act 36 of 1998 (NWA).

Reports on previous investigations are clear on the fact that farmers at the time were not in a position to pay the cost of providing additional water for irrigation purposes. Irrigation was developed primarily for lucerne production and pastures in conjunction with stock farming and dairy farming. Other crops were brought under irrigation and, according to existing farmers, the trend now is towards high value, permanent tree crops.

It has been established that historically 2 900 ha have been irrigated along the Koonap River and the Mankazana River from time to time. Reports indicate that 12 canals and approximately 70 pumps have been used for this purpose. These systems draw water from the run-of-river, without the benefit of storage. The locality and description of each system has not been inspected but it is understood that the situation is little different today.

According to the Water Use Registration Database (WARMS) data base there are at present approximately 340 ha irrigated land along the Koonap River **downstream** of the Foxwood dam site. The extent of this development has been confirmed by site inspections but the area of land actually irrigated varies from season to season.

1.2.2 Previous Investigations into Irrigation Development

The irrigation potential in the Koonap River valley has been investigated since 1945 and many reports on this subject have been produced over the years. The main sources of information used in this investigation are listed in the References. The main findings which emerge from the previous investigations are that:

- Some of the soils in the local area are suitable for irrigation (de Wet Shand, 1988)
- Many crop types including lucerne, maize, citrus and other tree fruits and nuts can be successfully produced in the area (DA-EC, 1995)
- Livestock farming is the predominant farming enterprise and irrigation is used primarily for livestock feed (DA-EC, 1995)
- It appears that additional land riparian to the Koonap River, to that which is currently irrigated, has been irrigated in the past when river flows have permitted (see Figure 4 for a photo of typical lands riparian to the Koonap River) (de Wet Shand, 1988).

Figure 4: Typical land riparian to the Koonap River

There is therefore good reason to expect that the present irrigation development can be successfully and sustainably increased if additional water can be made available at an appropriate level of assurance from the proposed Foxwood Dam.

1.2.3 Opportunity for a Government Irrigation Scheme

As investigations for this Feasibility Study progressed, and the need and opportunity for developing a major multi-purpose dam on the Koonap River became clearer, the focus on new

irrigation development has changed significantly. The objective is to mobilize the natural and human resources in the region to stimulate socio-economic development in this depressed rural part of the Eastern Cape Province.

The intention is to achieve these higher level objectives by developing a Government Irrigation Scheme where emerging farmers, who do not have access to the necessary resources, can be settled and become successful contributors to the economy and to the food security of the region. This objective is positively aligned to the NDP, the NWRS and to achieving the national development goals of enhancing equity in society, job creation and poverty eradication.

Development of a Government Irrigation Scheme as envisaged here calls for the combination of the three resources – water, land and human capital. The Agro-Economic study therefore sought to define in a "business case" the potential to develop such a scheme with reference to at least the following:

- The quantity of water that can be made available from realistically sized dam capacities at an assurance of supply appropriate for irrigation purposes.
- The extent and locality of irrigable land that can be supplied most conveniently and cost effectively.
- Crops that can be successfully produced in the project area.
- The associated water requirements of the proposed crops.
- A project model that provides for combinations of farm sizes.
- Alternative arrangements for land tenure and the financing of land acquisition for individual emerging farmers.
- An assessment of the economic viability of each unit type, size of unit (gross area and irrigated area) and combination of types considered.
- The conceptual arrangement of bulk water distribution infrastructure necessary to serve the development options.

Further, the Agro-Economic Study has proposed conceptual arrangements for the development of an irrigation scheme along the Koonap River downstream of the Foxwood Dam including:

- An estimate of the capital cost of the infrastructure necessary to supply the water in bulk to the scheme.
- Suggestions for institutional arrangements for developing, owning and operating the bulk water infrastructure.
- An estimate of recurring operating and maintenance costs.
- An estimate of the unit costs of supplying water in bulk, the implications of the current DWS water pricing policy, and of the levels of subsidy that will be necessary to make the irrigation development economically viable.
- A view on the various risks associated with developing such a scheme.
- The level and duration of support from Government necessary to sustain the development.

1.3 Study methodology

This study, as presented in this report, has:

- Considered the available water for irrigation from the proposed Foxwood Dam as well as the water requirements for different potential irrigation types.
- Identified potential lands for irrigation development downstream of the proposed Foxwood Dam site on the Koonap River.
- Consulted regional agricultural stakeholders through the establishment of an Agricultural Technical Working Group (ATWG). (Minutes from the two ATWG meetings are provided in Appendix B).

- Developed financial models for potential irrigation schemes to estimate required investments and potential returns from the implementation of a Government Irrigation Scheme.
- Considered institutional matters related to such a proposed irrigation scheme with particular focus on selection and training of possible new farmers and acquisition of lands for possible development.

The outputs from the financial modelling of the irrigation scheme have been assessed within the parallel Economic Impact Assessment (DWS, 2015) study of both the dam itself and the potential irrigation scheme. This was done to determine the possible impact on the Nxuba Local Municipality and wider region from this development, with particular focus on the agricultural sector.

2 AVAILABILITY OF WATER FOR IRRIGATION

2.1 Present use of water for irrigation

Historically water has been abstracted from run-of-river in the Koonap River without the benefit of streamflow regulation by storage. Runoff in the Koonap River is highly variable from year to year and also exhibits strong seasonal variability. This is a reflection of the climatic conditions in the project area. Cognisance should also be taken of the possibility that climate changes, such as that which may be a consequence of global warming, could exacerbate this variability. It is not yet possible to forecast or quantify these changes but it would be prudent to anticipate the possible decrease in the availability of secure water supplies. Stated otherwise, risks of water supply shortages in future could become larger and the shortages could be more frequent and more severe.

Anecdotal information is that the fair distribution of run-of-river flow between the farmers along the Koonap River has in the past been disturbed by “over abstractions” by upstream users to the disadvantage of downstream farmers. This is not surprising because there is no monitoring of flows and abstractions, and therefore no direct control during periods of low flow. It is the intention that lawful water uses will be licenced in terms of the NWA, subject to conditions that make control more practical; this may be a long way off since current water uses have still to be verified and validated for their lawfulness.

Historically, irrigation has been done using the flood method. This is inherently wasteful of water, inefficient, expensive in pumping costs and damaging to the soil. Over time other irrigation technologies have been introduced including sprinkler systems and, more recently, microjet irrigation for citrus and nut trees. Recent rapid increases in the cost of electricity have further stimulated the move to modern irrigation technologies. Although no actual records of abstractions for irrigation are available it is estimated that this is between 3 and 4 million m^3 per annum.

2.2 Envisaged water supply from a new dam at Foxwood.

The planning and conceptual design of a major dam at the Foxwood site is based on a thorough hydrological investigation of the runoff in the Koonap River at that point. Cognisance is taken of up-to-date flow records, rainfall data in and around the catchment and of the best available information on upstream abstractions from the river. Topographical mapping of the dam site and the dam basin provided reliable information on height/ area/ capacity relationship of a dam at the Foxwood site.

The yield of a dam at Foxwood site was estimated using the streamflow hydrology, rainfall and evaporation information, and the characteristics of the dam site. Provision is made for maintaining the Reserve in the river downstream of the dam and for supplying existing users such as Adelaide town and the existing farmers along the river. Various possible dam sizes were examined from a design and construction point of view so as to determine the relationship between development cost and allocable yield. The preferred dam size of 1 MAR can yield about **12,5 million m^3/a** after providing for the Reserve, current and projected domestic requirements in Adelaide and for irrigation development downstream of the dam. This water allocation of **12,5 million m^3/a** could thereafter all be utilized for new irrigation development along the Koonap River downstream of the dam.

In view of the broken topography and locality of irrigable land for new development, it would be uneconomical to distribute this water in bulk from the dam to the irrigation areas through a canal or a pipeline system. It is envisaged that water for irrigation use would be released into the river from the dam and be abstracted by pumping from control points in the river into bulk balancing dams, each serving a block of irrigable soil suitable for new irrigation development. Individual farmers would draw their water from the balancing dams and probably pump this into their on-

farm irrigation systems. This system would lend itself to easy monitoring and control of water flow from the outlets of the dam to individual plots of irrigation in the hands of emerging farmers.

2.3 Price of water.

The financial performance of the irrigation scheme depends heavily on the price of the water that it is assumed the emerging farmers will have to pay. The NWRS recognises that further development of surface water resources in South Africa to increase available yields will be expensive relative to historic costs of water. The Unit Reference Value (URV) is a common measure in South Africa to assess the economic efficiency of proposed water projects. To determine the URV of a particular scheme, the water supplied (i.e. the primary benefit derived from it) is projected over the same period and 'discounted' at the same rate to derive a 'present value' in cubic metres. The URV of the scheme is derived by dividing the present value of the costs with the present value of the water supplied, as shown in the equation below.

$$URV = \frac{Present\ Value\ of\ Costs}{Present\ Value\ of\ Quanity\ of\ Water\ Supplied}$$

The URV for the proposed Foxwood Dam has been calculated (DWS 2015) and the results given in Table 2 below for a range of discount rates:

Table 2: Unit Reference Value for Water from Capital & Operational Costs

Discount Rate	Unit Reference Value (R/m^3)
6,0%	8,96
8,0%	11,77
10%	14,96

Assuming a discount rate of 8%, the URV for water yielded by Foxwood Dam would be R 11,77 /m^3. This value provides a reference to allow comparison against other potential water resource development projects in South Africa.

However, it is assumed that the capital cost of the Foxwood Dam project would be funded by National Treasury as it is not financially feasible for an Irrigation Scheme to afford water at that price. Nevertheless, it may be reasonable for the Irrigation Scheme to be expected to cover the future cost of water from Foxwood Dam resulting from the operational and maintenance costs for the dam over its life. Table 3 below gives the result for the URV calculation allowing for operational and maintenance costs of the dam only. **Assuming a discount rate of 8%, the URV for water supplied by Foxwood Dam would be R 0,60 /m^3**. The final water price must be determined by DWS in line with the national water pricing strategy.

Table 3: Unit Reference Value for Water from Operational Costs Only

Discount Rate	Unit Reference Value (R/m^3)
6,0%	0,619
8,0%	0,608
10%	0,602

In the event that a Government Irrigation Scheme is developed in the Koonap River valley, the price of water to be charged will require further and fuller investigation during development of the scheme and will need to incorporate government policy. **For the purposes of carrying out the feasibility study for Foxwood Dam, a price of 60c/m^3 has been set for the financial model and subsequent economic impact assessment.**

To assess the impact of the price of water on the proposed irrigation scheme, the financial performance of the farming models (which is developed in detail in section 5) are given in Table 4 below for a range of orders of magnitude of water price.

Table 4: Internal Rate of Return for Different Water Prices

Enterprise	1 ha Farm (Each)	20 ha Farm (Each)	50 ha Farm (Each)
Water @ R0,06/m^3			
Lemons	-6,86%	11,08%	9,38%
Peaches	5,73%	10,67%	11,15%
Macadamia Nuts	1,97%	8,29%	9,99%
Water @ R0,60/m^3			
Lemons	-9,63%	9,11%	7,33%
Peaches	4,53%	8,87%	9,31%
Macadamia Nuts	0,79%	6,47%	8,23%
Water @ R6,00/m^3			
Lemons	Not workable!	Not workable	Not workable
Peaches	-16,16%	Not workable	Not workable
Macadamia Nuts	-15,90%	Not workable	-18,79%

From Table 4 it can be seen that a price of R6,00/m^3 does not work and all scenarios return a negative or incalculable IRR and confirms the reality that the true cost of the water cannot be charged if the irrigation scheme is to be sustainable. However, 60c returned favourable and reasonable IRRs on the irrigation scheme and was used as the representative price of water in the farming financial model and within the subsequent economic impact assessment.

During refinement of the irrigation model and development of the schematic plot layout plan, likely supply costs (infrastructure capital expenditure and operational costs) to supply the water from river to point of farm was developed (see Appendix D). This gave a cost of about 35 c/m^3. Building on the sensitivity analysis carried out above the 35c/m^3 was added to postulated 60 c/m^3 and the financial performance of the irrigation models reviewed for 95 c/m^3. The IRRs reduced as expected, however they remained favourable.

3 AVAILABILITY OF LAND FOR NEW IRRIGATION DEVELOPMENT

3.1 Present land tenure arrangements and land use

Properties riparian to the Koonap River downstream of the Foxwood dam site to the confluence with the Great Fish River are, with few exceptions, in the private freehold ownership of commercial farmers. This land is used primarily for mixed farming with stock, dairy and cropping in various combinations. Some properties are used for game farming. The present irrigation development of about 338 ha along the Koonap River, downstream of Foxwood site, is located on 13 properties, generally in small blocks up to 20 ha in extent.

During previous investigations (de Wet Shand, 1988) owners of land riparian to the Koonap River provided an indication of the extent of irrigable soil on their properties. This information was based on the lands that were being irrigated at the time, some for decades before, and the additional land which farmers would irrigate if more water was available with an appropriate security of supply and at affordable cost. This report identified approximately 2 012 ha that was suitable for irrigation development downstream of the Foxwood Dam site.

The parameters used in the early assessments of suitability for irrigation are still relevant, but soil classification systems have undergone change. It is significant to note that, at that time, no drainage or alkalinity problems were recorded as being prevalent. Anecdotal information recently provided by farmers affirm that most existing irrigation is on alluvial soils near the river, predominantly the Oakleaf form with very little Hutton soils. Many of the present farmers have good information of the soils on their properties. **This information would have to be verified by detailed soil surveys and analysis when development plans are prepared.**

3.2 Irrigable soils

Reports from 1988 and 1992 on the development of irrigation downstream of the potential Foxwood Dam site have been reviewed and collated. Using Google Earth, GIS mapping and the Surveyor General 1:10 000 5 m contour interval orthophotos , it is clear that downstream from the proposed dam site the soils and topography provide well in excess of the previously estimated additional 2 012 ha of suitable irrigation land. The GIS system, assuming relative consistency of soil types, set for parameters of soil depth more than 450 mm and slopes of less than 12% identified a potential 9 000 ha within a 1 km distance either side of the Koonap River. This tool, though providing a generalised indication, enabled a more focused search on the orthophotos which verified that the availability of irrigable soil would not be a limiting factor. These lands are shown in Figure 5.

The previous assessments of soil irrigability were based on on-farm analyses and on the opinion of the land owner or farmer as to what additional land they would irrigate if water was reliably available. More detailed investigation is necessary to identify the areas best suited for a new 1 250 ha irrigation development, should reliable water be made available at affordable prices. Such focused investigations would seek the deepest soil available, probably 750 mm and more, but not less than 600 mm. It would then also be an opportunity to extend the search beyond the nominal distance of 1 km from the river which may identify further suitable land.

Information available in this study, including verification field inspections, indicates that the irrigable soils lie in relatively small pockets on both sides of the river with no large, contiguous blocks preferred for such a development. The target of developing an additional 1 250 ha under new irrigation can only be achieved on an accumulation of many smaller blocks of land on a number of separate properties now in private freehold ownership. The locality of the blocks of soil most suited for irrigation development are highlighted on Figure 5 below (full size image is provided in Appendix A). The yellow hatched areas indicate land under *existing* irrigation and the black shapes indicate areas of large contiguous suitable lands for potential irrigation.

It is envisaged that water would be released down the Koonap River from the Foxwood Dam and be abstracted for pumping at appropriate points along the river to serve the various blocks of new irrigation. No bulk water distribution infrastructure would be required and the objective of always providing the Reserve in the river would be satisfied.

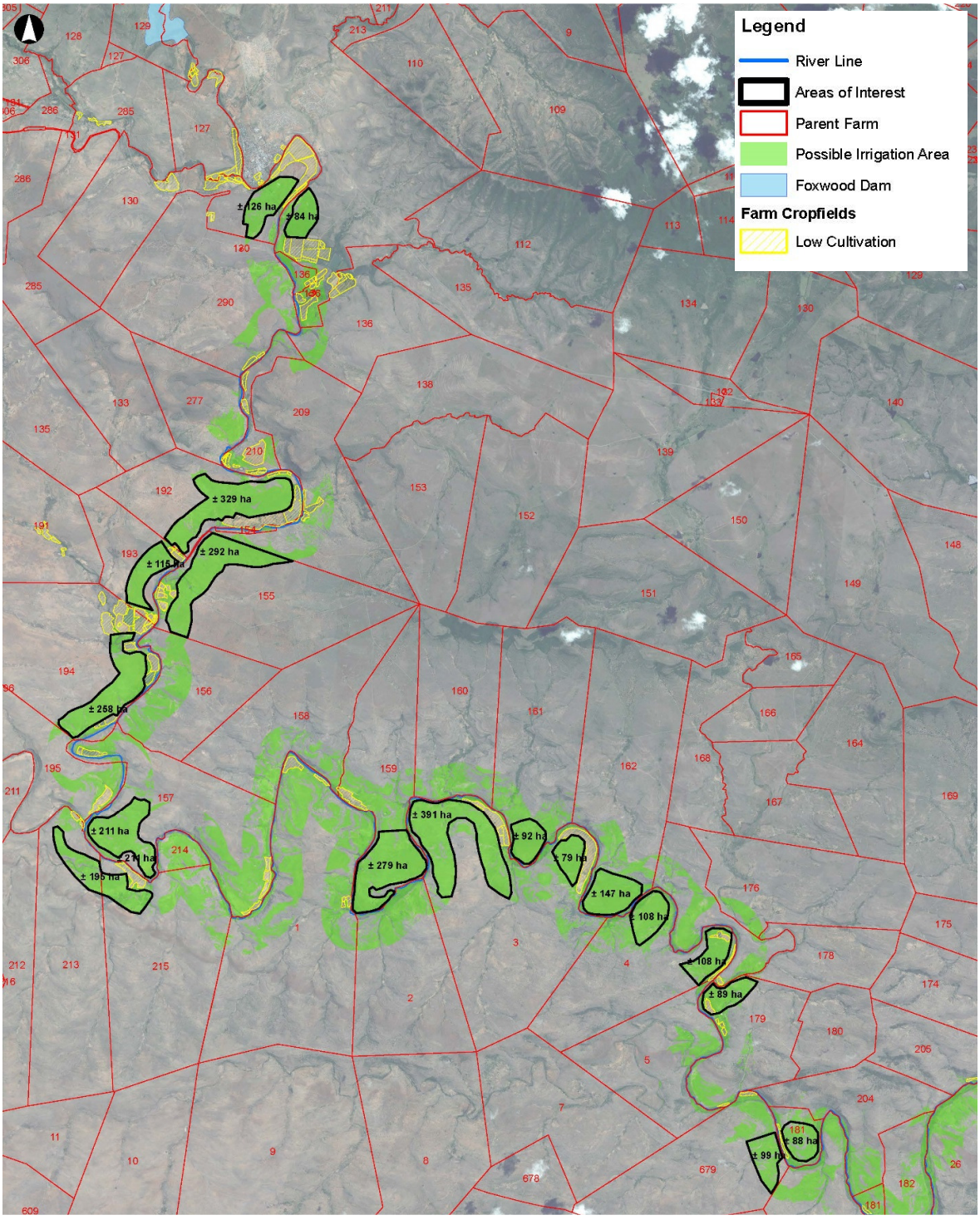

Figure 5: Irrigable soils downstream of the proposed Foxwood Dam site

3.3 Municipal land

In previous studies provision is made for irrigation of up to 300 ha of food plots, vegetables and urban type agriculture on Municipal commonage. The electronic data sources used in this study and information gathered during site inspections show that very little of the Municipal commonage is suitable for irrigation. The ATWG, at its meeting on the 4th September 2013, confirmed this finding. It appears that irrigable land that had been available in the past has since been sold to private owners, or used for other purposes such as the construction of a Waste Water Treatment Works. The remaining open land in the commonage is badly damaged and very little is suitable for continuous vegetable production. It is still possible to produce vegetables for home use in the immediate vicinity of dwellings in the suburbs. Further study on suitable systems for food plot production is required; possible intensive hydroponic tunnel systems adjacent to the townships may be feasible and could certainly produce reliable quantities of vegetables and crops, though at high capital cost and requiring very good management. However these systems use very little irrigation water.

There may have been the intention in the past of allocating sufficient water from the envisaged new water resource development scheme to the Municipality to irrigate up to 300 ha, with the intention that this water be used for domestic and municipal purposes. Under present circumstances and in the present legislative framework, this is no longer necessary.

3.4 Illustrative development plan

In the interest of minimizing losses of water released from the dam for irrigation, when considering further developing the concept of a Government Irrigation Scheme for the settlement of emerging farmers along the Koonap River land closest to the dam would be preferred for new irrigation development. Road access to new irrigation areas is important to minimize the need to development new infrastructure and to maximize the efficiency of producing, processing, packing and distribution of products to market.

In conceptualizing a new irrigation scheme, cognisance must be taken of the fact that the intention is that the emerging farmers become sustainable and commercially successful. They would probably become resident on their farm and undertake other farming activities such as food production and stock farming, albeit on a limited scale. Therefore provision must be made for properties large enough to accommodate the irrigation development as well as all of the associated land uses.

Since very little, if any, land on which this project is focused is State-owned, the land on which new irrigation can be developed as a Government Irrigation Scheme has to be acquired for this purpose. Acquisition of land for such a purpose is a complex matter, affecting private individuals and their families, is subject to the legislation at the time, and is costly in monetary terms. Where the National interest is to be served this process is tenable but care must be taken to work sparingly with public resources, minimize any negative social and environmental consequences and follow processes which are fair and equitable. Therefore the minimum number of privately owned farms should be earmarked for inclusion in a new irrigation scheme and every opportunity should be taken to encourage the participation of existing land owners, who themselves are successful commercial farmers, to participate in the development of the Irrigation Scheme in partnership with the emerging farmers and the Government. There has been a stated willingness within the ATWG by existing commercial farmers to work in partnership with the development of emerging farmers.

This Feasibility Study does not extend to the detailed identification of farming units for emerging farmers but Figure 6 does illustrate how the aspects discussed above could be accommodated

in a development plan. This plan illustrates a potential 1 250 ha development of 62 farms each of approximately 20 ha.

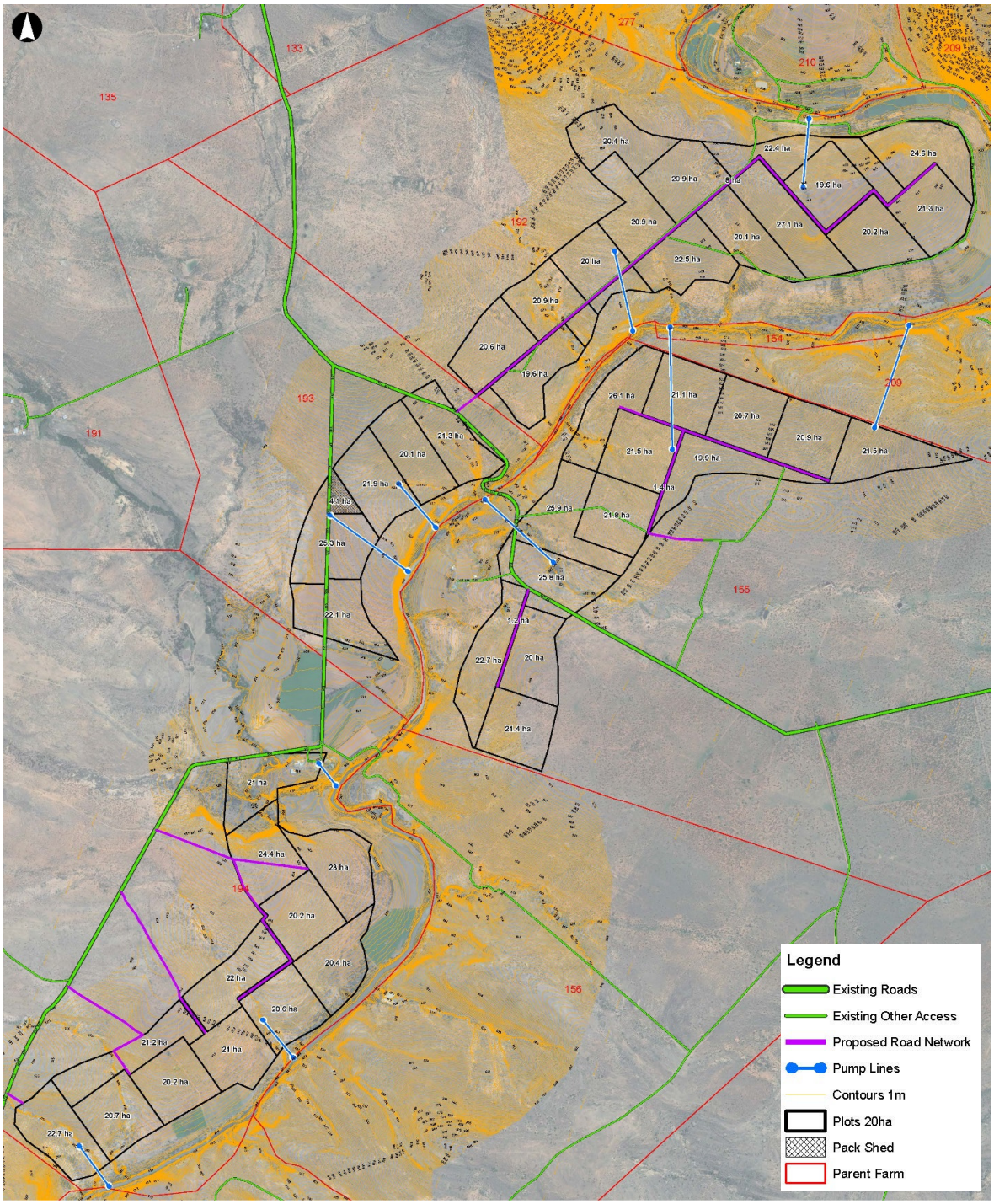

Figure 6: Illustrative layout of a development plan for a new Government Irrigation Scheme.

Figure 6 is for illustrative purposes only and that no landowner has been approached in relation to this possible development plan (full size image provided in Appendix A). Other more suitable areas may be available elsewhere along the Koonap River and the most desirable development plan would be the outcome of detailed design and optimization of all aspects.

The rough terrain along the Koonap River, downstream of the proposed Foxwood Dam, limits the size of individual irrigation land units. The area with apparent highest potential for new development, indicated in green on Figure 5, was examined in most detail, including site inspections. In order to obtain a total of 1 250 ha for new irrigation development within reasonable distance to access roads, 13 separately registered properties with a total area of 13 000 ha would be affected. These properties are all parts of existing commercial farms and include 21 existing irrigated lands and used for livestock farming. It is clear that to realise the proposed irrigation that could be stimulated by the Foxwood Dam, much more land would need to be included in the project than just the irrigable areas. Access to these properties is difficult at present and improved roads and bridges will be necessary. This is particularly important if the new irrigation development produces high value fruit crops which must be transported to markets.

4 CROP TYPES SELECTION

4.1 Present cropping pattern

The current farming practices in the Koonap River valley are centred on livestock, predominantly cattle and sheep, with maize and lucerne being produced as supplementary feeds for the livestock. Irrigated pastures are maintained by dairy farmers. There has been an increase in citrus orchards in recent times with farmers finding that tree crops are more profitable, in terms of return per cubic metre than producing maize or lucerne as fodder for livestock.

Historically the main land use has been grazing of animals on veld with supplementary feed being grown in the form of lucerne and some maize where these crops could be irrigated. Anecdotal information gathered through the ATWG suggests that this profile has changed very little over the last nineteen years. (See Appendix B)

The actual areas which are currently irrigated appear, in a number of instances, to be less than they were 20 years ago. Some previously cultivated fields have reverted to scrub and herbage. Anecdotal information attributes this to the unreliable flow of water in the Koonap River and to the increased costs of pumping from the river. There also appears to be less flood irrigation than previously with more popular use of sprinkler, drip and microjet irrigation and centre pivot systems, powered by electricity.

Reports from previous years indicate that irrigated cropping has historically been largely devoted to support livestock production. Around 50% of irrigated land produces lucerne, and maize. Citrus, vegetables and other crops make up the other approximately 50%. Information from current remote sensing sources and the 2002 orthophotos indicate considerable growth in the area under citrus, pecan and avocado orchards. Information obtained from the ATWG indicates that livestock farming is still the dominant agricultural activity. More pastures are being irrigated at the cost of lucerne being produced as a cash crop. There appears to be reduced flood irrigation[1] of the pastures and lucerne (ATWG, 2013).

4.1.1 Changes in agriculture practices

Information obtained from the ATWG members indicates that there has been little change in the general agricultural systems since 1995. High input costs such as fertilizer and pumping costs, both dependent on escalating electricity prices, together with the unreliability of river flow, have led many farmers to focus on dryland livestock production rather than develop further areas under irrigation. There has been a significant change to centre pivot irrigation systems and a concentration on smaller land areas and intensive farming.

4.1.2 Historical returns per hectare

The gross margins reported in 1995 (DA-EC, 1995) were based on information supplied by Outspan International and Kat River Co-operative and have been remodelled for this Feasibility Study. The gross margins shown in Table 5 relate to high value crops, which are envisaged to be the main products from a proposed new Government Irrigation Scheme, by comparison with lucerne.

[1] Response to Question 8 ATWG meeting minutes (September 4th 2013)

Table 5: Historical Gross Margins for selected citrus and lucerne crops

Gross Margin	Navels			Clementines			Satsumas			Lucerne		
	Units	Unit price	Cost	Units	Unit price	Cost	Units	Unit price	Cost	Units	Unit price	Cost
Export	2 167	12	26 004	3 733	14	52 262	3 467	10	34 670	15	320	4 800
Local	833	2	1 666	1 600	3	4 800	1 867	2	3 734			-
Processing	333	1	333	55 000	-	-	-	-	-	-	-	-
Total (ZAR/ha)			**28 003**			**57 062**			**38 404**			**4 800**
Inputs												
Chemical	1	1 300	1 300	1	1 300	1 300	1	1300	1 300	1	63	63
Fertilisers	1	533	533	1	533	533	1	533	533	1	131	131
Salaries & wages	1	2 000	2 000	1	2 500	2 500	1	2500	2 500	1	76	76
Misc	1	58	58	1	58	58	1	58	58	1	986	986
Machinery costs	1	678	678	1	678	678	1	678	678	1	148	148
Electricity	1	600	600	1	600	600	1	600	600	1	191	191
Seed										1	464	464
Total Input costs (ZAR/ha)			**5 169**			**5 669**			**5 669**			**2 059**
Gross Margin (ZAR/ha)			**22 834**			**51 393**			**32 735**			**2 741**
			82%			**90%**			**85%**			**57%**

Table 5 illustrates that tree crops are likely to be the mainstay of commercially successful emerging farmers attracted to the envisaged Government Irrigation Scheme to be supplied by the proposed Foxwood Dam on the Koonap River valley. Lucerne, the most profitable of the other crops now cultivated in the area, achieves a much lower gross margin than that produced by citrus.

4.2 Proposed cropping

Due to the potential high margins that can be achieved with high value tree crops, and given the existing development of high value tree crop planting in the Koonap River valley, when assessing the financial potential for an Government Irrigation Scheme, this study has focused on high value tree crops, namely:

- Peaches
- Lemons
- Macadamias

However, this crop selection has been made for the purposes of carrying this feasibility study and it is noted that subject to appropriate detailed investigations at the time of implementation of an irrigation scheme other crops or combinations of crops may be considered.

4.3 Marketing channels

The ability to market the produce from a farm is essential to the survival of that business. Certain crops require greater value addition than others and this by definition will impact upon the cost of implementation. Currently in the region of Adelaide there is limited agro-industry.

According to the 1995 report Kat River Citrus Co-operative amalgamated with the Koonap River Citrus Co-op with all citrus packing being undertaken at Fort Beaufort. There are currently two

operational pack houses at Fort Beaufort and another is being planned for Cookhouse in the Fish River irrigation area.

In addition, for example, good transport networks are required to allow effective transport of produce to markets or beneficiation locations. In the ATWG meetings farmers complained that the rural road system serving the Koonap River valley was inadequate to support citrus export. It should therefore be noted that should the Foxwood project be developed, further work into this aspect will be required to allow the farmers to get produce to market efficiently.

With regard to the possible crops proposed in the irrigation model, particular market requirements should be noted:

- **Peaches** produced by this project on a limited small plot scale would be targeted at the local 'bakkie' or informal market where they are particularly popular and where everything is sold with no requirement for an outlet for the lower quality production as the marketeers take all qualities of production from the best to the worst which they then sort and sell generally to the local community.
- For the **lemons** it would be important to link with one (or more) of the local packing stations to enable the marketing to be carried out cost effectively.
- For **macadamias**, there is a good local and export market for the production. The decision needs to be made as to whether the emerging farmers wish to process the nuts or to sell them off the tree thereby delivering the production to a 'middle man' who would take care of processing and marketing. The cost of building a factory for processing macadamias is expected to be in the order of R25 million (2014 prices), the majority of this cost is down to storage and drying facilities as all the crop will need to be stored and dried down to 10-12% moisture during storage, from there it needs to be dried to around 3% for processing. This figure has been shown as a separate item in the 'cost to implement' tables. Macadamias require a greater level of work and a factory to achieve the required level of value addition sought by the marketplace.

5 IRRIGATION DEVELOPMENT – FINANCIAL MODEL

A financial model for the proposed irrigation development scheme in the Koonap River valley has been compiled to inform an Economic Impact Assessment (DWS, 2015) of Foxwood Dam. In order to establish a financially sustainable irrigation scheme, funding will be required to establish the scheme and to provide the necessary support for it to reach maturity and become successful in a self-sustaining way, ie where revenue exceeds operating costs.

Within the Economic Impact Assessment, it has been assumed that the capital cost of the dam is funded by Treasury. Funding would be required for the establishment of the irrigation scheme – most likely as a *loan* from Government – up until the point the scheme becomes financially sustainable.

5.1 Modelling methodology

The simplified modelling process includes:

- Determining the most appropriate crop types for the irrigation development.
- The capital cost of establishing 1 250 ha of irrigated farming for each selected crop type for a range of plot areas, ie 1 ha, 20 ha, and 50 ha.
- Estimating the Gross Margin, ie revenue potential less operating costs, for each crop type and farm size.
- Determining the peak funding necessary to establish the scheme, ie capital cost of establishment and cumulative annual operational cost less the revenue generated from crops produced, up until the year when the scheme becomes profitable.
- Determine Internal Rate of Return as an indicator of the bankability of the project
- Determine total accumulated earnings and profit earned as an indicator of the economic upliftment of individuals and sustainability of the farming model
- All prices given are ZAR and at 2014 prices

5.2 Assessment of farm parcel sizes

High value tree crops are considered the most appropriate for this project, based on historic farming trends in the region and Gross Margins for different crop types. Lemons, macadamias, and peaches are modelled here although other combinations of crops could be considered when the scheme is developed. In this way financial, market and agricultural risks can be mitigated and opportunity made for individuals to make business decisions with expert guidance.

In addition, three different farm size scenarios are considered with the proposed 1 250 ha scheme divided up into one of:

- 1 250 x 1 ha farms
- 62 x 20 ha farms
- 25 x 50 ha farms

These model permutations were developed to view potential incomes and expenses for various crops so that it would be possible to balance land area per emerging farmer with capital requirements to achieve a mix that benefited the greatest number of people for the most reasonable start-up cost. At the time of implementation of the irrigation scheme, during detailed design of the scheme, it is likely that a mix of crop types and farm sizes will be developed. These options have not been considered during this feasibility study.

5.3 Financial targets

In conceptualizing a new irrigation scheme, cognisance must be taken of the fact that the intention is that the emerging farmers become sustainable and commercially successful. In addition, a key role agricultural development plays in the socio-economic development of the country is the potential for significant employment. These matters are discussed in more detail in the Economic Impact Assessment report (DWS, 2015)

5.3.1 Management fees paid to farmers

The above models assume that the emerging farmers will draw a salary of R5 000 per month from the working capital (R60 000 per year). This by definition adds a very large amount to the costs of the 1 ha schemes given there are 1 250 individual farmers. The same R5 000 salary is applied for the 20 & 50 ha scenarios but there are few farmers in these cases. However. salaries for assistants have been included in the 20 & 50 ha scenarios but not in the 1 ha scenarios.

The allocation of a R5 000 annual salary to each emerging farmer, independent of farm size, reflects the fact that the individuals need to earn money from somewhere and the norm is that people travel to larger towns in order to earn money which would preclude them from tending their trees which in turn could well lead to a failure of the project.

5.3.2 Remuneration of farm workers

The minimum wage for a farm worker is proposed as **R104,50 per day** (2014 prices). This is used to back-calculate the employment generated by the farming venture from the earnings generated.

5.3.3 Minimum targeted farm income

The minimum net farm income of around **R300 000** per annum for emerging farmers is the target of the scheme at which point a farm can be considered independently 'successful'.

5.4 Modelling assumptions

Several assumptions and requirements listed below, have been built into the financial model:

- To establish 1 250 ha of irrigated agriculture on suitable soils along the Koonap River, which at present comprises portions of privately owned farms, it is estimated that 13 000 ha of land would have to be purchased. This is included as a capital cost and is used in all models of crop type and plot size.
- 10 000 m^3/a of water will be required from the yield of the dam for each 1 ha of irrigated land. There will be transmission and distribution losses that are estimated to be 20% of the water released at the dam. These losses are included in the 10 000 m^3/a yield.
- The price of water to the emerging farmer will be R0,60/m^3
- Training will be provided to each emerging farmer at a cost of R15 000 per farmer as a project support cost during the first year.
- A full time mentor would be available for the first year at a cost of R7 500 /day, ie an estimated R1 950 000 for a full year.

- The following minimum crop production and income is achieved by the emerging farmers are given in Table 6 below (the values used are standard market values):

Table 6: Assumed minimum crop production and income

Crop	Packing	% of total crop	Price	Quality/Market
Lemons	15 kg cartons	70	R 6,8 /kg	Export Quality
Lemons	Loose	30	R 700 /tonne	Juicing
Peaches	Loose	100	R 3 /kg	Informal market
Macadamia	Packed	30	R 90 /kg	Sound kernel
Macadamia	Loose	8	R 8 /kg	Unsound Kernel

- A minimum number of trees would be planted per hectare, based on current standard practice:

  Lemons 667 trees/ha
  Peaches 667 trees/ha
  Macadamias 247 trees/ha

- Annual attrition of trees is 0,25% with replacements planted each year.
- Full harvest is achieved for lemons and peaches in year 6 and macadamias in year 10.

5.5 Capital cost of establishment

The total cost of farm development and irrigation infrastructure is based on the cost of establishing 1 ha for each crop type and is scaled up for 1 250 ha. This assumption does not allow for benefits of scale for developing farms of 1 ha, 20 ha or 50 ha which may be applicable. These costs are detailed in Figure 7 below.

In addition to the cost of establishing farming infrastructure, the following once-off capital costs are included:

- Total land cost* 13 000 ha @ R 10 000 / ha
- Training R 15 000 per farmer in year 1
- Mentoring A full time mentor available for 1 year = 52 weeks x 5 days x R 7 500/day = R 1 950 000

Total Land Cost* Suitable land along the Koonap River for establishing new irrigation has been located at a feasibility level of detail and confidence and marked on a locality plan. For purposes of assessing the practicality and impact of developing the full 1 250 ha that can reasonably be served with a secure water supply for irrigation, ***an indicative layout*** is shown on Figure 6 in section 3.4. This layout was not discussed with the present land owners and has not been optimized for minimum cost of land or support services like access roads and power supplies. The only criterion used is to minimise the number of private properties that would have to be acquired in order to obtain the largest contiguous areas for new irrigation development. To establish 1 250 ha of irrigated agriculture on suitable soils along the Koonap River, which at present comprises portions of privately owned farms, it is estimated that 13 000 ha of land would have to be purchased.

A graph showing the spread of average capital expenditure costs (for all crops) for the establishment of the irrigation scheme is given in Figure 7 below. It has been assumed that the capital expenditure is incurred over a three year period. The detailed breakdown of the farm establishment cost is given in Table 7 below.

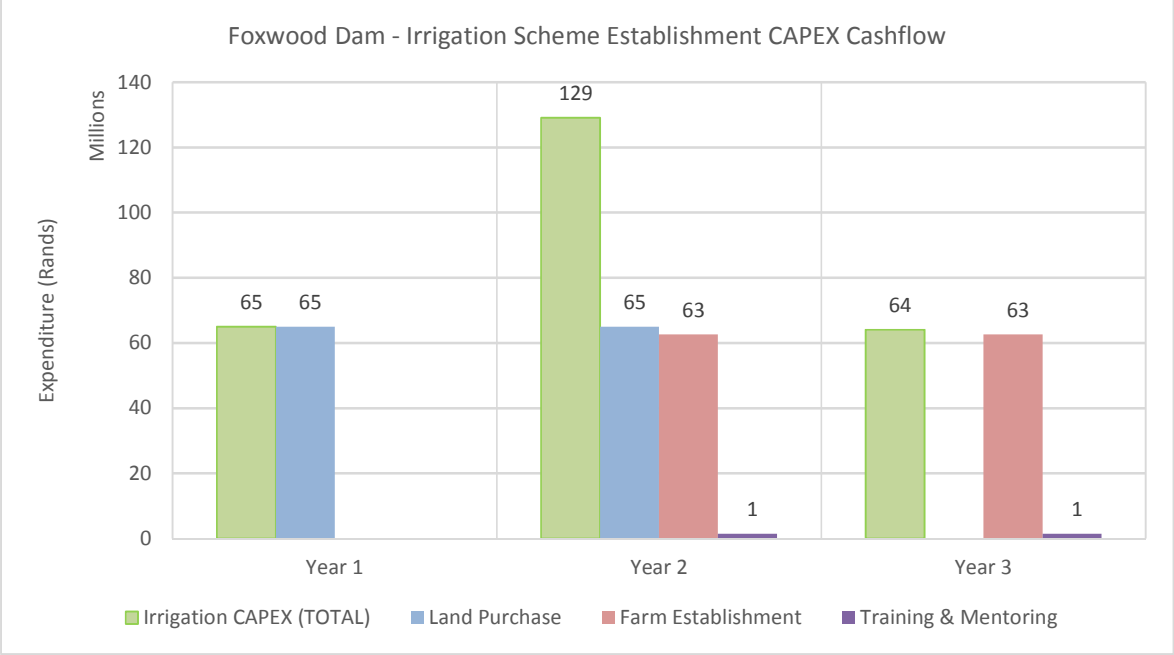

Figure 7: Irrigation scheme capital expenditure during establishment (all plot sizes)

This graph illustrates how the capital expenditure for the irrigation scheme has been assumed and input into the economics model. It has been assumed that the land purchase takes place over the first two years of the establishment of the scheme and the development of the on farm infrastructure etc takes place over the second and third year of the establishment of the scheme. Allowance for mentoring and training has been made in the second and third year. It is stressed that this is a simplification of the establishment process which has been made to allow basic economic assessment of the scheme. During the detailed design of the scheme at implementation stage (by others) further breakdown of the programme of establishment must be given.

Table 7: Farm establishment cost by crop type for each 1 ha of land

	Lemons			Peaches			Macadamias		
	Units	**Unit price**	**Cost (R)**	**Units**	**Unit price**	**Cost (R)**	**Units**	**Unit price**	**Cost (R)**
Plant material	667	35,00	23 345	1 250	26,00	32 500	247	42,00	10 374
Fertilisers									
Maxifos	400	8,00	3 200	400	8,00	3 200	400	8,00	3 200
Dolomitic lime	2 000	0,50	1 000	2 000	0,50	1 000	2 000	0,50	1 000
Calcitic lime	10 000	0,50	5 000	10 000	0,50	5 000	1 000	0,50	500
Soil Analysis	4	120	480	4	120	480	4	120	480
Drainage	0	10 000	3 300	1	10 000	6 700	1	10 000	6 700
Contractor - earth moving and land prep	20	1 200	24 000	20	1 200	24 000	20	1 200	24 000
Microjet Irrigation system - from filter including windbreak	1	16 000	16 000	1	16 000	16 000	1	16 000	16 000
Tractor & implement cost	1	3 500	3 500	1	3 500	3 500	1	3 500	3 500
Labour cost	1	6 200	6 200	1	6 200	6 200	1	6 200	6 200
Mulch	1	14 000	14 000	1	14 000	14 000	1	14 000	14 000
Windbreaks	200	5	1 000	200	5,00	1 000	200	5	1 000
Trellising			-	1	12 000	12 000			-
Establishment cost for 1 ha			**101 025**			**125 580**			**86 954**
Macadamia processing factory									**25 000 000**
Total Establishment cost (1 250 ha) (during final two years of establishment)			**126 281 250**			**156 975 000**			**133 692 500**
Additional fixed costs:									
Land purchase cost (13 000 ha) (during first two years of establishment)			**130 000 000**			**130 000 000**			**130 000 000**
Mentoring (during final 2 years of establishment)			**1 950 000**			**1 950 000**			**1 950 000**

5.6 Operating costs and revenue

To determine the long term viability of the proposed irrigation scheme, the Gross Margin is calculated as the difference between the revenue potential from crop sales and the operating costs of farming operations. The projected gross margins for the three crops at full maturity is detailed in Table 8 below, based on a 1 ha area. This snapshot is provided to illustrate the potential long term gross margin that could be expected, as all crop types are in full production after this period.

Table 8: Gross Margin by crop on a 1 ha basis (water cost R0,60 /m³) (2014 prices)

Crop Type:	Lemons			Peaches			Macadamia		
	Units	Unit price	Cost (ZAR)	Units	Unit price	Cost (ZAR)	Units	Unit price	Cost (ZAR)
Sales [Kg / ha - Yr 10]	1 428	102,00	145 682	56 733	3,00	170 200	1 853	90,00	166 725
Juicing fruit	6 427	0,70	4 499				494	8,00	3952
Revenue Potential:			**150 181**			**170 200**			**170 677**
Input Costs:									
Chemical	1	6 000	6 000	1	7 500	7 500	1	3 000	3 000
Herbicides	1	1 000	1 000	1	970	970	1	1 050	1 050
Fertilisers	1	3 200	3 200	1	3 315	3 315	1	2 258	2 258
Salaries & wages	1	28 000	28 000	1	28 000	28 000	1	28 000	28 000
Misc	1	858	858	1	858	858	1	858	858
Water	1	6 070	6 070	1	6 070	6 070	1	6 070	6 070
Electricity	1	4 163	4 163	1	4 163	4 163	1	4 163	4 163
Fuel & oil	1	2 847	2 847	1	2 847	2 847	1	2 847	2 847
Insurance	1	1 255	1 255	1	1 255	1 255	1	1 255	1 255
Transport	95	10	952	1	-	-	1	-	-
Hire: bees & farm equipment	1	750	750	1	750	750	1	750	750
Repairs: vehicles & implements	1	4 781	4 781	1	4 781	4 781	1	4 781	4 781
Repairs: Fixed improvements	1	2 775	2 775	1	2 775	2 775	1	2 775	2 775
Administration	1	2 633	2 633	1	2 633	2 633	1	2 633	2 633
Total Input costs			**65 284**			**65 917**			**60 440**
Gross Margin			**84 897**			**104 283**			**110 237**
% of Turnover (TO)			57%			61%			65%
Management	12	5 000	60 000	12	5 000	60 000	12	5 000	60 000
Margin after management			**24 897**			**44 283**			**50 237**
% of Turnover (TO)			17%			26%			29%
Depreciation	**1**	**9 500**	**9 500**	**1**	**9 500**	**9 500**	**1**	**9 500**	**9 500**
Margin after management and deprec.			**15 397**			**34 783**			**40 737**
% of Turnover (TO)			10%			20%			24%
Return On Investment / Assets (ROI)			15%			28%			47%

Margins & Return on Investment calculated in Table 8 are based on a “management remuneration” of R60 000 per year for each farmer working 1ha. The same remuneration per farmer is assumed for units with 20 ha and 50 ha under irrigation. This is an over simplification which tends to make the larger units relatively more attractive when compared to 1 ha plots. However, the R60 000 salary acts as a basic incentive for the farmer to commit to the venture rather than seeking income elsewhere, such as in a town, to the detriment of the irrigation scheme.

5.7 Deficit funding

Deficit funding will be required during the period where revenue from crop sales is less than the required annual input costs. The funding required per year will be highest in the establishment stage during the years until crop production commences. The rate of funding required will decrease as crop production increases to full maturity. The time required for the selected crops to reach full maturity is approximately as follows:

- Lemons Year 5
- Peaches Year 5
- Macadamias Year 6

5.8 Peak funding of the cost of implementation up to self-sustainability

The total cost of establishing the full irrigation scheme is the cumulative deficit funding required. This is then the total subsidy required to establish an economically self-sustaining irrigation scheme. The cumulative deficit funding is the total input costs (capital and operational) less all revenue generated up until the year when no further deficit funding is required (ie when revenue generated exceeds input costs.) The breakdown of peak funding is provided in Table 9 below. Copies of simplified cashflow statements for the 20 ha schemes are included in Appendix C.

IRR is also calculated (at Year 15) as an indicator of the bankability of the project.

Table 9: Peak funding to reach self-sustaining farming operations (2014 prices)

	Crop Type	Land purchase (ZAR)	Mentoring & training (ZAR)	CAPEX (Farm establishment) (ZAR)	Working capital (Cumulative deficit funding) (refer cashflow spreadsheets in Appendix C) (ZAR)	Peak funding required to establish the project (ZAR)	IRR (@ year 15) %
1 ha	Lemons	130 000 000	20 700 000	126 281 250	472 898 047	749 879 297	**-9,63**
	Peaches	130 000 000	20 700 000	156 975 000	403 001 252	710 676 252	**4,53**
	Macadamias	130 000 000	20 700 000	133 692 500	528 507 135	812 899 635	**0,79**
20 ha	Lemons	130 000 000	2 880 000	125 271 000	147 734 717	405 885 717	**9,11**
	Peaches	130 000 000	2 880 000	155 719 200	135 177 201	423 776 401	**8,87**
	Macadamias	130 000 000	2 880 000	132 822 960	186 831 509	452 534 469	**6,47**
50 ha	Lemons	130 000 000	2 325 000	126 281 250	163 387 626	421 993 876	**7,33**
	Peaches	130 000 000	2 325 000	156 975 000	123 944 219	413 244 219	**9,31**
	Macadamias	130 000 000	2 325 000	133 692 500	173 684 300	439 701 800	**8,23**

- all figures are in Rand, except where noted
- The relatively large working capital indicated for 1 ha farms reflects the impact of the assumed R60 000 annual farmer salary.

The returns and profit that could be expected from such a scheme are given in Table 10 below. This financial data is input to the Economic Impact Assessment to evaluate the potential impact on the agricultural sector in the Nxuba Local Municipality in terms of job creation and GDP growth.

Table 10: Financial outputs from farming model for Economic Impact Assessment

		Peak funding	Total revenue in year 10 (1 250 ha)	Profit as & of revenue in year 10	IRR (@ year 15) %
1 ha	Lemons	749 879 297	R 190 136 584	11%	-9,63
	Peaches	710 676 252	R 212 749 377	36%	4,53
	Macadamias	812 899 635	R 213 346 250	46%	0,79
20 ha	Lemons	405 885 717	R 186 565 322	26%	9,11
	Peaches	423 776 401	R 211 047 382	24%	8,87
	Macadamias	452 534 469	R 206 223 441	35%	6,47
50 ha	Lemons	421 993 876	R 188 069 882	23%	7,33
	Peaches	413 244 219	R 207 488 784	24%	9,31
	Macadamias	439 701 800	R 212 814 214	38%	8,23

Figure 8 below illustrates the projected cashflow for the irrigation scheme. This illustrates the peak funding required to establish the scheme up until the point in time when the scheme operates profitably. The projection also estimates the further time that it will take for the funding to be paid back. Peak funding of approximately **R 437 million** would be reached after approximately **7 years** from the start of the irrigation scheme development. It is estimated that repayment of this investment from profits resulting from the irrigation scheme could be achieved within approximately 5 years after peak funding is reached, or 12 years from the start of the irrigation scheme development.

Revenue and profit values have been given at year 10 as this is reflective of the performance of the Irrigation Scheme once the farms have reached full maturity. IRR is given at year 15 as this ratio is useful to indicate the longer term bankability of the project.

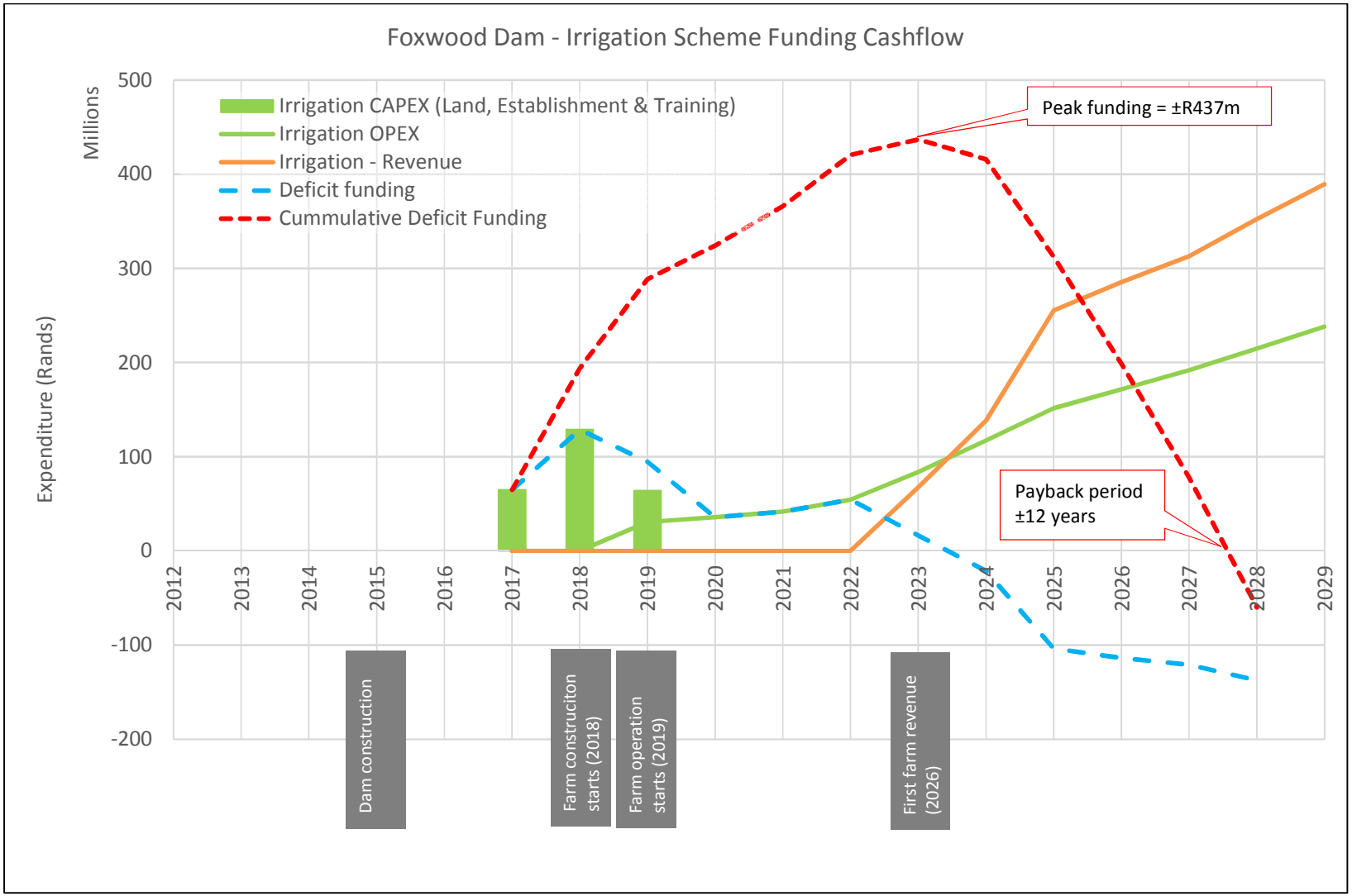

Figure 8: Foxwood Dam Irrigation Scheme Funding / Revenue Cashflow

6 INSTITUTIONAL ARRANGEMENTS & RISKS

6.1 Government Irrigation Scheme

The intention is to utilize the water resources of the Koonap River, the naturally occurring irrigable soils along the Koonap River downstream of the Foxwood Dam site, and the human resource potential in the Amathole District Municipality to stimulate socio-economic development. The depressed socio-economy of this district of the Eastern Cape is urgently in need of stimulus to address the major issues of poverty, work opportunities and equity. The concept of a Government Irrigation Scheme offers a vehicle for realizing the potential socio-economic value of these three main resources in a way that is consistent with the NDP.

The Department of Water and Sanitation has the mandate to develop the water resource potential and to make water supplies available for use in economic activities for the benefit of the country. This initiative will require the investment of large amounts of capital and can be contemplated only in the confidence that other government entities are in a position to identify and support individuals who are willing and able to participate as emerging farmers in a Government Irrigation Scheme. In such a developmental project the need for training, development, financial support and ongoing technical support of emerging farmers, for a long period into the future, is critically necessary for success. This implies the long term commitment of an appropriately resourced Implementing Agent.

The irrigable soils along the Koonap River are located on various properties in private ownership, usually of successful commercial farmers. In order to initiate and successfully develop the envisaged Government Irrigation Scheme it will be necessary for an Implementing Agent of the Government to, in a carefully planned and managed way, acquire land from private ownership, plan and develop the Irrigation Scheme on this land with the long term in view, and allocate this land in viable units to candidate emerging farmers.

Whereas in the past, many rural development agricultural schemes have focused on small holder and even subsistence farming to maximize the number of beneficiaries, in many cases this productivity of lands has dropped dramatically therefore being in contradiction to the necessary economic development within the NDP and ultimate failure of the schemes limiting the skills and capacity development of the emerging farmers. It is generally accepted that smallholder farmers in under developed regions such as South Africa will not be able to effectively utlitise the natural resource potential unless special support systems and appropriate sustainable technologies are adopted.

The principal risks regarding the irrigation development are the need for coordination between government departments for the development and operation of the irrigation scheme and the establishment of necessary correct institutional arrangements, proposals for mitigating those risks are outlined below.

6.2 Strategy and policy considerations

The proposed Government Irrigation Scheme has been conceived so as to address key directives and developmental objectives in the NDP and also to internalise the following two key elements of the NWRS.

- Development of Human Capacity and Skills
- Agricultural Development and Land Reform

The allocation of scarce and costly water for use by individuals who are selected as candidate emerging farmers must be supported by programmes for the development of the capacity and

skills of these emerging farmers. Skills are required to enable the candidates to use water responsibly and in the best way possible to improve livelihoods and in the most productive way possible. The capacity development programmes must also help Historically Disadvantaged Individuals (HDI) and the poor to participate actively and equitably in the process of informing the allocation of water.

These capacity development programmes must be developed and implemented cooperatively between the DWS, the Department of Agriculture, Forestry and Fisheries (DAFF), and the Department of Rural Development & Land Reform, and the Provincial Department of Rural Development and Agrarian Reform.

6.3 Stakeholder involvement

The NWRS recognizes that government alone cannot achieve developmental objectives and that partnerships with other organs of state and with key stakeholders are essential for success to be achieved. For this reason a detailed design of the envisaged Government Irrigation Scheme to be supplied with water from the proposed Foxwood Dam was not prepared without the active participation of stakeholders. The viability of the development proposal was, however, examined by modelling the likely economic performance of farming units on such an Irrigation Scheme where the main variables are:

- area of land under irrigation on a farming unit;
- methods for abstracting water in bulk from the Koonap River downstream of Foxwood Dam and its distribution to the farming units;
- crop type selection and crop combinations with a focus on macadamia nuts, peaches and lemons;
- financial and technical support for emerging farmers.

The evaluation of various farming unit alternatives informed an estimate of the financial viability and sustainability of various scenarios and gave an indication of the optimum combination of parameters. Important criteria for gauging the merits of different scenarios were creation of sustainable job opportunities and contribution to the economic output of the region which have been assessmed further in the Economic Impact Assessment report (DWS, 2015). These criteria are consistent with NDP objectives.

6.4 Implementing Agent

It is recognized that the successful development of the envisaged Government Irrigation Scheme will be dependent on the availability of leadership and management from an appropriately mandated and resourced Implementing Agent. It will be important for that Agent to fully focus on the socio-economic development of the Eastern Cape and to be available to commit resources to the project for a long time.

It is important to note that the proposal is to utilize water and land resources in producing high value, permanent crops in developing emerging farmers. These emerging farmers should become commercially successful, creators of work opportunities for others, sustainable producers of food and other agricultural produce for the regional economy. They will, however, be reliant on the Implementing Agent to provide training and technical support, as well as structured financing and marketing services for a long time, possibly even indefinitely.

Throughout the consultation with farming stakeholders in the region through the ATWG it was apparent that there was a willingness in existing commercial farmers in the region to work in partnership with emerging farmers that would be given access to the resources of land and water. Options to develop schemes or roles through which the significant skills capacity and knowledge

of the existing commercial farmers can be leveraged to the benefit of the proposed Government Irrigation Scheme should be explored.

After consultations in Stakeholder Meetings, in the Project Steering Committee and with individual government departments it was concluded that the Eastern Cape Rural Development Agency (ECRDA) is well placed to fulfil the role of Implementing Agent. The availability of the Agency to undertake this responsibility has not been canvassed.

It is expected that there will be a need for a formal structure, such as a Water User Association (WUA), to which individual farmers are affiliated. Such a structure promotes the needs of the individuals and enables them to take responsibility and grow their independence from the State. The WUA will require critical capacities and resources and can, in time, relieve the Implementing Agent of many functions.

6.5 Land ownership

The concept of a Government Irrigation Scheme implies that emerging farmers are selected and trained for being established on farming units on a tract of State-owned land. The land on which such a scheme could be developed along the Koonap River is at present owned by individuals who are themselves successful commercial farmers. This land would have to be acquired by the State or the current land owners could become partners in the envisaged development, subject to mutually acceptable contractual arrangements. The intention is, however, that the emerging farmers who settle on the Irrigation Scheme become owners of the land on which they make a success of a farming venture. These land tenure arrangements are outside the mandate of DWS and have not been considered in further detail within this feasibility study.

7 CONCLUSIONS

The study has investigated the technical and financial viability of developing a Government Irrigation Scheme within the Koonap River valley downstream of the proposed Foxwood Dam site, outside of Adelaide in the Eastern Cape. Financial models for three high value tree crops (peaches, lemons and macadamias) were developed for three different farm areas (1 ha, 20 ha, 50 ha). Key assumptions made in the modelling process include:

- The capital cost of the dam is funded by Treasury
- To establish 1 250 ha of irrigated agriculture on suitable soils along the Koonap River, which at present comprises portions of privately owned farms, it is estimated that 13 000 ha of land would have to be purchased. This is included as a capital cost and is used in all models of crop type and plot size.
- The price of water to the emerging farmer will be R0,60/m^3
- A base salary of R60 000 per year is paid to individual farmers (for 1 ha, 20 ha and 50 ha) to encourage the minimum attention to farm management.
- The minimum net farm income of around R300 000 per annum for emerging farmers is the target of the scheme at which point a farm can be considered independently 'successful'.
- The minimum wage for a farm worker subsequently employed by emerging farmers is proposed as R104,50 per day.
- Prices given are 2014 prices.

Farm sizes of 1 ha, 20 ha and 50 ha were evaluated. The irrigation scheme considered three high value tree crops (peaches, lemons and macadamias). The 20 ha schemes generated favourable IRR and the average financial data from the three crops for 20 ha scheme were evaluated further within the Economic Impact Assessment module (DWS 2015) to determine socio-economic impact resulting from the scheme. Table 11 below shows key financial outputs from the farming model. Revenue and profit is shown as a snapshot at 10 years to illustrate the financial performance of the model once the farming operations reach full maturity. IRR is shown at 15 years to illustrate the long term bankability of the project. This data is input into the Economic Impact Assessment study (DWS, 2015).

Table 11: Financial outputs from farming model for 20 ha schemes (2014 prices)

		Peak funding	Total revenue in year 10 (1 250 ha)	Profit as % of revenue in year 10	IRR (@ year 15)
20 ha	Lemons	R 405 885 717	R 186 565 322	26%	9,11%
	Peaches	R 423 776 401	R 211 047 382	24%	8,87%
	Macadamias	R 452 534 469	R 206 223 441	35%	6,47%

The period over which funding would be required for the development and establishment of the irrigation scheme to reach financial viability – 7 years - is illustrated in
Figure 9 below. This figure also illustrates the estimated period over which repayment of the loan could be expected to take place – 5 years. **It is stressed that these figures have been based on the agriculture model developed for this feasibility study and must be reviewed as part of a detailed Irrigation Scheme feasibility study that must be carried out.**

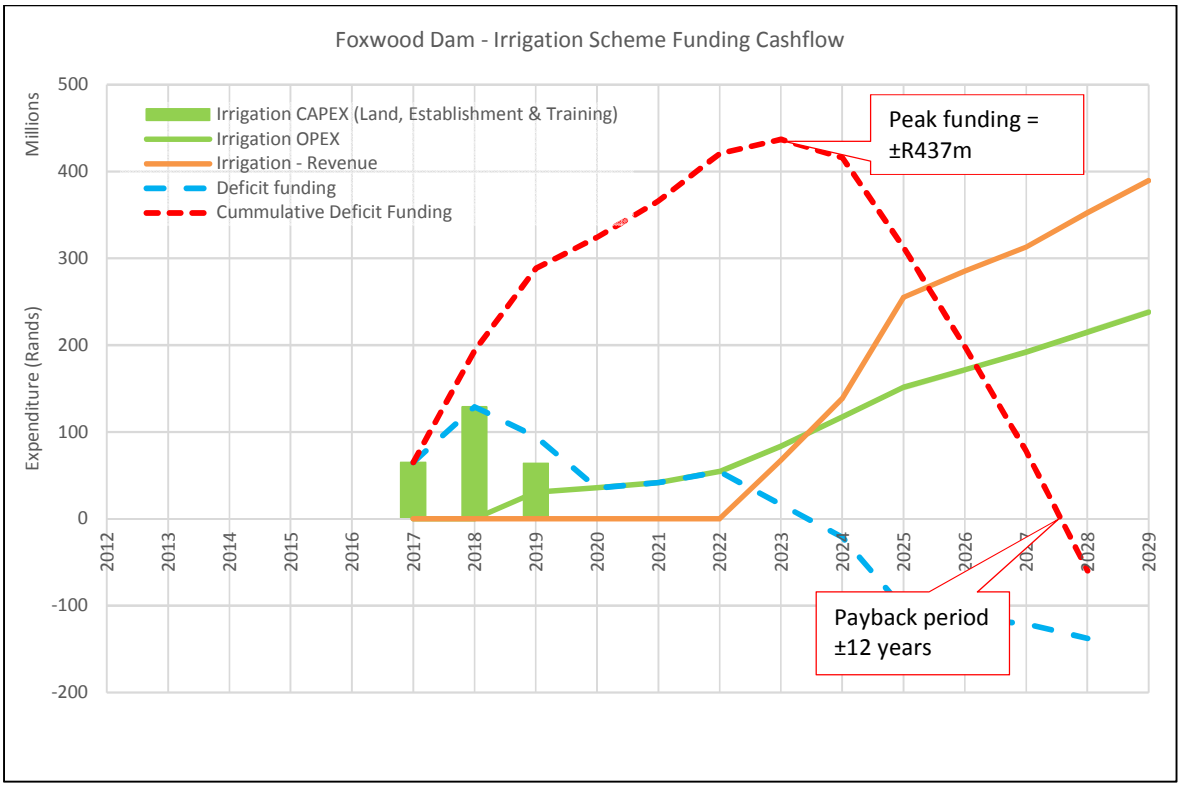

Figure 9: Foxwood Dam Irrigation Scheme Funding / Revenue Cashflow

Institutional Arrangements

The proposed Government Irrigation Scheme has been conceived so as to address key directives and developmental objectives in the NDP and also to internalise the following two key elements of the NWRS.

- Development of Human Capacity and Skills
- Agricultural Development and Land Reform

The allocation of scarce and costly water for use by individuals who are selected as candidate emerging farmers must be supported by programmes for the development of the capacity and skills of these emerging farmers. The successful development of the envisaged Government Irrigation Scheme will be dependent on the availability of leadership and management from an appropriately mandated and resourced Implementing Agent. It will be important for that Agent to fully focus on the socio-economic development of the Eastern Cape and to be available to commit resources to the project for a long time.

After consultations in Stakeholder Meetings, in the Project Steering Committee and with individual government departments it is concluded that the Eastern Cape Rural Development Agency (ECRDA) is well placed to fulfil the role of Implementing Agent. The availability of the Agency to undertake this responsibility has not been canvassed however it is essential that the role of Implementing Agent is mandated early in the development of the potential Irrigation Scheme.

8 REFERENCES

ATWG, 2013 Feasibility Study for Foxwood Dam, Minutes from Agricultural Technical Working Group, *Department of Water and Sanitation 2013* (refer Appendix B)

ATWG, 2014 Feasibility Study for Foxwood Dam, Minutes from Agricultural Technical Working Group, *Department of Water and Sanitation 2014* (refer Appendix B)

de Wet Shand, 1988 Samevatting van die bevindinge in verband met besproeiingsontwilleling in the Koonap besproeiingsgebied vol1, vol 2 *de Wet Shand, Agrecon Landbou Ekonomiese Konsultante, Dr A S Klaasens Grondkundige, 1988*

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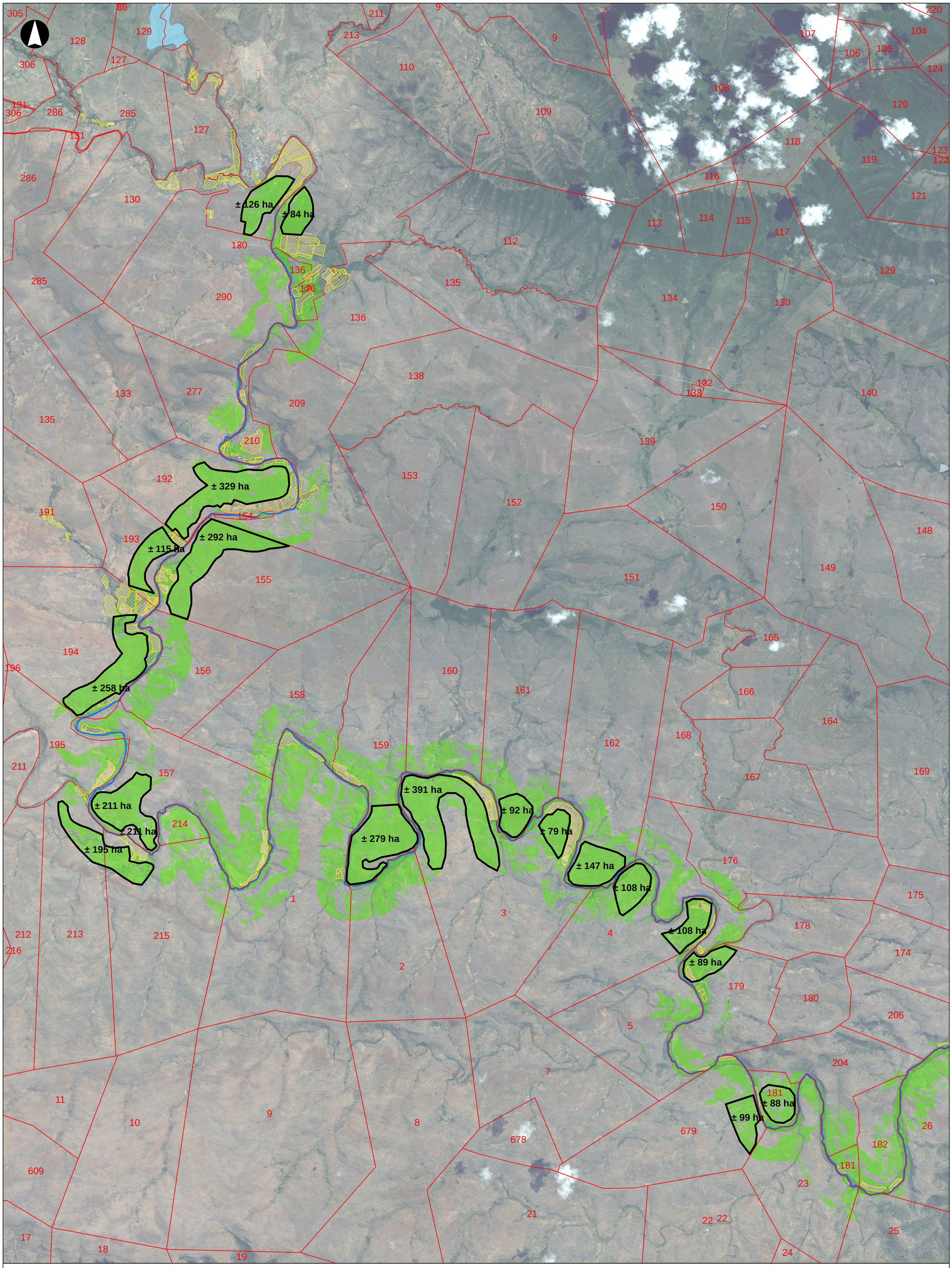
APPENDIX A: A3 REPORT IMAGES

225739-IRR-0501 Irrigation Potential Areas
225739-IRR-0503 Irrigation Model Block Layouts

A1



Legend

- River Line
- Areas of Interest
- Parent Farm
- Possible Irrigation Area
- Foxwood Dam

Farm Cropfields

- Low Cultivation

Issue	Date	By	Chkd	Appd
0B	2015-6-5	DR	JB	JB
0A	2014-10-31	YO	JB	JAH

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Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Metres
0 650 1,300 2,600

Client
Department of Water and Sanitation

Job Title
Feasibility Study for Foxwood Dam

Irrigation Potential Areas

Scale at A1
1:50,000

Job No	Drawing Status
225739-00	**Preliminary**

Drawing No	Issue
225739-IRR-0501	**0B**

MXD Location

20140328T 01:22:00 PM

A1

7/3/2014 9:29:29 AM

Legend

- Existing Roads
- Existing Other Access
- Proposed Road Network
- Pump Lines
- Contours 1m
- Plots 20ha
- Pack Shed
- Parent Farm

Issue	Date	By	Chkd	Appd
0C	2015-5-7	DR	JB	JB
0B	2014-10-31	YO	JB	JAH

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Metres
0 50 100 200 300 400

Client
Department of Water and Sanitation

Job Title
Feasibility Study for Foxwood Dam

Irrigation
Model Block Layouts

Scale at A1
1:12,500

Job No	Drawing Status
225739-00	**Preliminary**

Drawing No	Issue
225739-IRR-0503	**0C**

MXD Location

APPENDIX B: AGRICULTURAL TECHNICAL WORKING GROUP MINUTES

ATWG1 – September 2013
ATWG2 – September 2014

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

FEASIBILITY STUDY FOR FOXWOOD DAM

WP: 10580

AGRICULTURAL TECHNICAL WORKING GROUP
MIDGLEYS HOTEL, ADELAIDE

WEDNESDAY, 04 SEPTEMBER 2013

PREFACE

The Project Team (the Department of Water Affairs and Arup) wishes to thank all representatives of the various organisations who attended the first Agricultural Technical Working Group (ATWG) as part of the technical investigations for the Feasibility Study for Foxwood Dam in Adelaide.

Should participants who attended the meeting require any changes to these proceedings, please notify the Public Participation Office in writing within two weeks of receipt.

In some instances, the name of the stakeholder was not provided, and hence, these details are not captured in these proceedings. Should you, as a participant, recognise your input, it would be greatly appreciated if you could provide ACER (Africa) Environmental Management Consultants (ACER) with your details.

These proceedings are part of the public record for this project and have been placed on the website www.dwa.gov.za under the “Foxwood Dam” link.

These proceedings have been:

Compiled by: ACER (Africa) Environmental Management Consultants
Reviewed by: Arup (Pty) Ltd
Accepted by: Department of Water Affairs

TABLE OF CONTENTS

1. ATTENDANCE

1.1 Attendance – Stakeholders

The following sectors and organisations were represented:

- Adelaide Farmers' Association.
- Department of Agriculture, Forestry and Fisheries (National).
- Department of Agrarian Development and Land Reform (Eastern Cape).
- Department of Water Affairs (Eastern Region).
- Khobonqaba Farmers' Association.
- Nxuba Local Municipality.
- Nxuba Community and Development Centre.
- Nxuba Ratepayers' and Residents' Association.
- Post Retief Farmers/Mohair Growers Association.
- University of Fort Hare.

An attendance register is provided in Appendix 1.

1.2 Attendance - Project Team

Name	Organisation	Role in the Project
Mr Bob Pullen	Arup	Study Leader
Mr John Allwood	Agri-Africa	Agricultural Specialist
Ms Bongi Shinga	ACER	Stakeholder Engagement Coordinator

2. APOLOGIES

The following apologies were received:

Name	Position	Organisation
Mr Stephen Mullineux	Chief Engineer: Planning	Department of Water Affairs
Mrs Sanet van Jaarsveld	Project Engineer – Options Analysis (North)	Department of Water Affairs
Mr Bryan Knox	Vice Chairman	Bedford Farmers' Association

3. WELCOME AND INTRODUCTIONS

Mr Pullen welcomed all stakeholders to the first Agricultural Technical Working Group (ATWG) meeting for the Feasibility Study for Foxwood Dam. He thanked all representatives for making time to attend the meeting.

4. INTRODUCTORY REMARKS

Mr Pullen indicated that the ATWG was first introduced six months ago at the initial stakeholder forum meeting held in April 2013. He said that ATWGs are convened as sub-committees of the Project Steering Committee to attend to specific matters of a technical nature. Currently, there is a need to give attention to matters relating to the potential for the development of new irrigation in the study area. Therefore, the objective of the ATWG is to coordinate and liaise with all relevant agricultural stakeholders in the project area to obtain their inputs.

5. OBJECTIVES OF THE MEETING

The primary objectives of the meeting were outlined as follows:

- Explain the scope of the project.
- Discuss the Terms of Reference (TOR) for the ATWG.
- Discuss matters relating to irrigation potential and/or new irrigation development.
- Review of the irrigation development in the area.

It was noted that the ATWGs are constituted as sub-committees of the Project Steering Committee and a record of all ATWG meetings will be kept.

6. APPROVAL OF THE AGENDA

The proposed Agenda was accepted without any changes. It was also noted that the focus of the meeting would be irrigation potential.

7. BACKGROUND TO THE FOXWOOD DAM PROJECT

Mr Pullen presented background to the Foxwood Dam Project. The following sections were covered in his presentation:

- Project Governance Structure.
- Objectives of the ATWG.
- Background to the Project.
- Implementation Programme, including the Feasibility Study Work Programme.
- Preliminary Study – technical progress to date.
- Stakeholder Engagement and Site Visits.
- Hydrology and Ecological Water Requirements.
- Potential Irrigation Development.
- Summary of issues raised by stakeholders to date.

A summary of the information presented is provided in Appendix 2. The issues raised and discussed following the presentation are provided in Section 7.1.

7.1 Questions for Clarification

No	Comment	Response
1	Mr Theo Geldenhuys, Department of Water Affairs noted that the firm yield of the dam is 11 million m^3 per annum. He assumes that is after 1.2 million m^3 has been taken off for Adelaide domestic water supply. The ecological water requirements are 11.1 million m^3 and irrigation requirements are also 11 million m^3. The current figures indicate that there will be a water shortage.	Mr Pullen explained that the estimated yield is available after taking account of the ecological reserve and all upstream abstractions. The yield was calculated on the basis of a shortage happening twice in a century on average. 10% of the available yield is required for domestic water use.
2	When you calculated the Ecological Water Requirements (EWR), did you consider Koonap as a non-perennial or a perennial river?	The EWR takes into account a number of aspects, such as the streamflow hydrology that has been measured in two places on the Koonap River for some years, the riverine ecology (the condition of aquatic plants and animals), the geomorphology and sediment concentrations. The Koonap River is a perennial river but the flow is erratic.
3	Mr Makhanya Mana emphasised the need to put the dam into the correct perspective. The dam was initially proposed for the commercial irrigators. Whatever is being done, the socio-economic development aspects need to be considered, viz. who will benefit? It is important to clarify this issue. We need to know that the historically disadvantaged will benefit. Poverty and the rate of unemployment need to be improved.	Mr Frikkie Wentzel clarified that this study is about understanding the irrigable land. It does not matter who gets to use the land for irrigation purposes. Mr Pullen concurred with Mr Wentzel's explanation. He added that a decision must be made about which pieces of land are irrigable if additional water becomes available. The dam has to be optimised, i.e. the ideal size of dam must be justified. Therefore, it is important to firstly understand the irrigation potential and, in later phases of implementation, enable new and perhaps existing, farmers to use the land and the water. The strategy regarding irrigation development takes into account the cost of water, the accessibility of the resource, the availability of farmers to use the resource, and other economic factors.

8. TERMS OF REFERENCE OF THE TECHNICAL WORKING GROUP

The Terms of Reference were presented to ATWG members for consideration and acceptance. Copies of the TOR were also provided to all representatives at the meeting. Mr Pullen explained in detail the functions of the ATWG as outlined in Section 3.1 of the TOR.

The TOR for the ATWG were accepted without any changes.

9. DISCUSSION - IRRIGATION POTENTIAL AND DEVELOPMENT

No	Discussion Comments/Points	Responses
1	Stakeholders suggested that the following organisations be invited to the ATWG: • Koonap Farmers' Association. • Grahamstown Farmers' Association. • Fort Beaufort Farmers' Association. • Department of Rural Development and Land Reform.	Ms Shinga noted the request for future invitations and for sending information already distributed to all ATWG members. It was confirmed that the Department of Rural Development and Land Reform were invited to the meeting but, unfortunately, there was no reaction from the invited representatives.
2	Mr Pullen requested the Department of Agriculture to explain how, in the past, the extent of irrigable soil was estimated.	Mr Kowie Joubert, Department of Agriculture (DoA) explained that a questionnaire was prepared and circulated to landowners within the study area. Landowners provided feedback to DoA on the area that they were irrigating at the time and the areas which they would like to irrigate in the future. It should be noted that these figures can be distorted because of landowners aversion to pay substantial water tariffs (operational and maintenance capital costs). The information volunteered was verified by DoA extension staff using aerial photos and maps and undertook sample verifications of the areas and of the irrigability of the land on site. The availability of land was found to be fairly accurate.
3	What is the status of the area owned by the municipality next to the dam site?	Approximately 350 ha on the commonage, called Khobonqaba, was earmarked for an agricultural project for emerging farmers. The expectation was that they would establish food gardens and small scale farmers. An allocation of water from a possible new dam was requested by the Nxuba Local Municipality. However, the 350 ha was never checked by the DoA and the understanding was that the water allocation could be used for domestic use. It was reported that a significant portion of land on the commonage has since been sold to private farmers.
4	Mr Kowie Joubert noted that the latest aerial photos show that there is a significant decrease in area under irrigation along the Koonap River since 1988.	Mr van der Meulen, Adelaide Farmers' Association reported that, in 2011 they had used Google Earth to check the areas actually under irrigation below the dam site. Approximately 636 ha was found to be irrigated at the time under a variety of crops. There was also about 130 ha which had previously been under irrigation. These rough

No	Discussion Comments/Points	Responses
		estimates account for about a total of 766 ha, which is very different from the figures in the presentation.
5	Mr John Allwood asked if there has been any change in crop patterns over the last few years.	Mr van der Meulen explained that new plantings in the area are mostly under avocados. Downstream farmers mainly concentrate on lucerne, maize, pecan nuts and citrus. Irrigated pastures are mainly for sheep farming.
6	Mr Allwood asked if there are any farms where there is potential for irrigation but where irrigation is currently not being practised.	This would require verification from the individual land owners.
7	Cllr Lombard mentioned that there could be potential for tree lucerne in the area (while he has read much about it, the potential of tree lucerne in the area needs to be investigated).	Comment noted.
8	Members were requested to comment on flood irrigation in the area.	ATWG members explained that flood irrigation is not commonly used in the area although it is still used by a few farmers. The main reason behind the move away from flood irrigation is the paucity of water.
9	Mr Allwood asked if the estimate of 800 mm for on field supplementary irrigation demand is reasonable.	800 mm would be sufficient for citrus but insufficient for irrigating pastures.
10	ATWG members were asked about the following:	
	10.1 What are the crop constraints in the area?	Mrs Knox indicated that the area is fairly isolated from produce markets and access to affordable transportation is an issue.
	10.2 Any cash crops in the area?	The input cost is very high for cash crops. That is why farmers do not plant cash crops in the Koonap River area. If there was a constant water supply, they would probably have crops like cabbages and potatoes. Mr van der Meulen indicated that cash crops are possible for the Fish River farmers and confirmed they do produce some cash crops.
	10.3 Are tomatoes not a potential crop in the area?	Farmers indicated that tomatoes are an extremely difficult crop to manage. Tomatoes are not a crop for every farmer; it is a specialised crop.
12	How can water be allocated to farmers who produce different crops? (Possible conflicts where farmers cultivate crops that require more water than their neighbours).	Mr Theo Geldenhuys explained that the Department of Water Affairs will issue a licence for the use of a specific volume or quantity of water. It will then be up to the farmer as to how he uses water allocation to best advantage.
13	Mr Pullen asked for advice on how best the study team can firm up on the potential for irrigable soils. How can the study team locate the existence of the best irrigable land on the map?	ATWG members indicated that in locating the best irrigable land, the distance from the dam by river should be considered because the further you go, the higher the losses.

No	Discussion Comments/Points	Responses
	He added that a feasibility study team is responsible for motivating to the Department of Water Affairs about the potential for irrigable land. Mr Pullen suggested that the ATWG members first concentrate on finding the irrigable land. Thereafter, issues around losses and efficiencies around distribution can be discussed. Does the team need to go to individual farms to obtain accurate information or are ATWG members able to point out where the best soils are located?	
	13.1 Dr van Tol, University of Fort Hare suggested that a proper soil survey may be necessary to find irrigable soils.	Mr Pullen responded that to do a detailed major soil survey without more focus on specific areas will be difficult due to the limited financial resources available for such a Feasibility Study.
	13.2 Mr Kowie Joubert suggested that we start having meetings with farmers' associations who can confirm the existing information with their members on a farm-to-farm basis. The the land owners are knowledgeable and will be able to share relevant and useful information. Farmer's Associations should coordinate a meeting with all farmers, provide maps and have a discussion. Mr Jan de Wet indicated that meetings with farmers will be an excellent opportunity to gather information around soil types in the study area.	This suggestion was noted for consideration.
	13.3 Another option would be to have meetings with landowners within a particular reach of the river. Alternatively, study team information can be given to the chairpersons of the various farmers' associations who will ask their members to confirm the information. Mr van der Meulen, Adelaide Farmers' Association has information that is quite useful which can be used to verify irrigable soils. This information can be obtained from Mr Kowie Joubert for all farmers' associations.	This suggestion was preferred by all ATWG members and the study team.
14	How many farmers are irrigating downstream of Foxwood Dam?	It was confirmed that there are about 20 farmers irrigating downstream of Foxwood Dam.
15	Who has accurate information on the boundaries of the commonage?	Ms Lulunto Mtyundyutho, Land Use Officer of Nxuba Local Municipality will have maps and plans.
16	What was the model that was envisaged by the municipality for upcoming farmers?	This information was not available at the meeting.

No	Discussion Comments/Points	Responses
17	Does urban agriculture still have relevance in the area? How must it be dealt with?	Mr Zweni indicated that he has been requested by the Nxuba Municipality Town Manager to look at the commonage policy. There are lots of problems in the area which include theft, hunters, etc. As such, he believes that developing in the commonage will be a waste of financial resources.
18	The Khobonqaba Farmers' Association was requested to make comments on the irrigation potential and development in their area.	Mr Zweni indicated that Khobonqaba is small scale and subsistence farmers who are part of the commonage. They will convene a meeting and discuss a way forward based on the ATWG's discussions, after which they will provide feedback based on their collective discussion. The representatives indicated that they would be interested in developing into successful commercial farmers as are the farmers in the other Associations. They do not aspire to small scale, subsistence farming.
19	Mr Zweni asked as to why there is not much focus on farms that were irrigated when they grew up many years ago. He is concerned that the inputs will be different from the various water users.	Mr Kowie Joubert suggested it may be a good idea to get an understanding of which farms are available for sale. This information could be used by the Department of Rural Development and Land Reform if there is a need for development.
20	Mr Bosch indicated that if there is going to be more water available, it will be used for pastures and citrus downstream of Foxwood Dam (the status quo remains). He estimated a split of 20% for citrus and 80% for pastures.	Noted, with thanks.
21	Mr Kowie Joubert was requested to make copies of the 1988 report available to farmers' associations so they can review the information, property by property, and when the ATWG members meet again, it will be an opportunity to reconcile all information.	Mr Joubert noted this request. To support this request, Miss Shinga was requested to share contact details of all farmers' associations with Mr Joubert.
22	Mr Wentzel asked if the study team will also require the amount of irrigable land upstream of the dam.	Mr Pullen indicated that this will not be required at this stage for the purpose of the Feasibility Study.
23	Ms Puleng Mofokeng, Department of Agriculture, Forestry and Fisheries noted the importance of allocating water for urban agriculture. This refers to small scale farmers, individuals in a community garden who are needing water to produce food, and, gardens at school ground, etc. At a community level there is a need to produce food and this must be taken into account.	Comment noted as part of urban agriculture.
24	Mr Makhanya Mana indicated that he is in need of space or a farm for daily agricultural activities. The economy of the area is predominantly driven by agricultural activities.	Noted, with thanks.

No	Discussion Comments/Points	Responses
25	Mr van der Meulen clarified that the Foxwood Dam study is focussing on farms, irrigation potential, etc and is not focussing on farm owners. As such all participants need to understand that we are talking as farmers and not as owners, with the ultimate goal to make valuable contributions to the development proposals of the area.	Noted, with thanks.

10. ARRANGEMENTS FOR THE NEXT MEETING

It was suggested and agreed that a similar discussion with the farmers should be arranged in approximately two months time, before the end of November 2013.

All ATWG members were reminded of the importance of ensuring that they also attend the upcoming meetings as representatives to ensure continuity.

Ms Shinga will send notifications to all ATWG members with a date proposal for the next meeting.

11. CLOSURE

Mr Pullen thanked all representatives for their valuable inputs and closed the meeting.

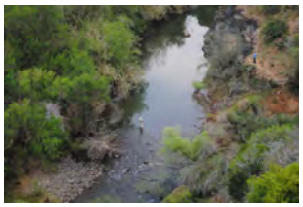
APPENDIX 1: ATTENDANCE REGISTER

No	Title	First Names	Surname	Position	Co/Org	Address	City	Postcode
1	Mr	John	Allwood	Consultant	Agri –Africa	6 Neole Rd Berea E	East Landon	5214
2	Mr	Emil	Bosch		Adelaide Farmers Association	4 Princess Street	Adelaide	5760
3	Mr	Johan	de Wet	Senior Engineer	Department of Cooperative Governance Municipal Infrastructure Support Agency	P O Box 68	Cannon Rocks	6186
4	Ms	Zandi N	Dyantyi	Acting Chair	Adelaide Small Farming	2015 New Area	Adelaide	5760
5	Mr	Theo	Geldenhuys	Chief Engineer	Department of Water Affairs- EC	Private Bag X68	Cradock	5880
6	Mr	Kowie	Joubert	Chief Engineer	Dept of Agrarian Development and Land Reform-EC	Private Bag x15	Stutterheim	4930
7	Mrs	Anne	Knox	Landowner	Bedford Farmers Association	P O Box 2	Adelaide	5760
8	Cllr	Ernie	Lombard	Proportional Representative Councillor	Nxuba Local Municipality	Private Bag X350	Adelaide	5760
9	Mr	Smuts	Mana	Director	Nxuba Community Development Centre	454 Borgweniloc	Adelaide	5760
10	Mr	Puleng	Mofokeng	Deputy Director	Department of Agriculture, Forestry & Fisheries	Private Bag 515	Silverton, Pretoria	0127
11	Ms	Lulunto	Mtyundyutho	Land Use Officer	Nxuba Local Municipality	Private Bag X350	Adelaide	5760
12	Mr	Morwape	Nchabaleng	Technician	Department of Agriculture Forestry and Fisheries	Private Bag 515	Silverton	0127
13	Mr	Bob	Pullen	Study Leader	Arup	Block D, Hatfield Gardens, Grosvenor St, Hatfield	Pretoria	0083
14	Mr	Leslie	Schaup		Adelaide Small Farming	1969 Area	Adelaide	5760
15	Mr	Luke	Van der Meulen	Chairman	Adelaide Farmers Association			
16	Dr	Johan	Van Tol	Lecturer Pedology	University of Fort Hare	Private Bag X1314	Alice	5700
17	Mr	Frikkie	Wentzel	Vice Chairman	Post Retief Farmers/Mohair Growers Association	Box 153	Adelaide	5760
18	Mr	Ronald Edward	Williamson	Vice Chairman	Adelaide Ratepayers Association	3 New Street	Adelaide	5760
19	Mr	Nzimeni Louis	Zweni	LED Officer	Nxuba Local Municipality	Private Bag X350	Adelaide	5760

APPENDIX 2: PRESENTATIONS

The size of this presentation is 22.5 MB

Please contact Bongi Shinga at bongi.shinga@acerafrica.co.za or 035 - 340 2715 should you require a copy of this presentation



Feasibility Study for Foxwood Dam

WP 10580

Agriculture Working Group Meeting

4 September 2013

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

Proposed Foxwood Dam

WP 10580

Agriculture Technical Working Group Meeting

Adelaide

4 September 2013

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

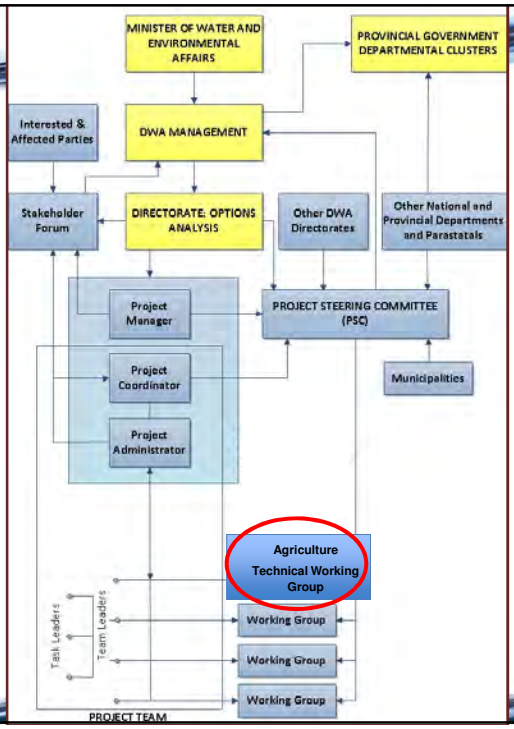
Sanet van Jaarsveld
Production Engineer
Options Analysis (North)

Menard Mugumo
Chief Engineer
Options Analysis (South)

Welcome

- Introductions & apologies
- Approval of the Agenda

Project Governance Structure



Agriculture Working Group

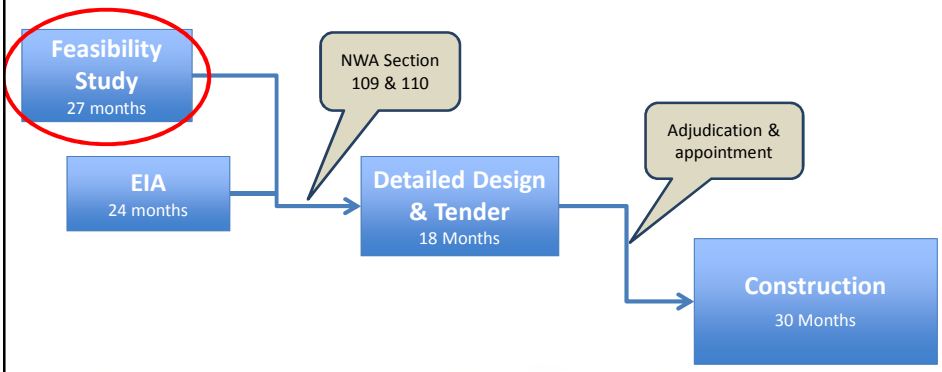
The objective of the forum is to:

- Ensure effective communication of advice between the Project Team and stakeholders in the agricultural sector.
- To identify realistic opportunities for new irrigation development below the proposed dam at Foxwood.
- To assist the Project Team in identifying cropping patterns that are appropriate.
- To report to the Project Steering Committee

Background

- Adelaide has suffered from domestic water shortages in the past
- Evaluations of viability of a storage dam in the Koonap River
  - For domestic supply & possible new irrigation development
  - Re-evaluation from time to time
- Ministerial interaction with Nxuba Municipality
  - New Feasibility study
  - Current water needs, policy imperatives of Government (rural development, job creation, equity in access to water)
  - Affordability of possible large dam
- To provide information for strategic decision making

Flow Chart to Implementation



7

Feasibility Study for Foxwood Dam

water affairs
Department: Water Affairs
REPUBLIC OF SOUTH AFRICA

Bob Pullen
Study Leader

8

Feasibility Study Work Programme

- Inception Report 3 months
- Phase 1: Preliminary Study 6 months
- Phase 2: Feasibility Study 18 months

Commencement: August 2012

1. Water Resources
2. Water Requirements
3. Irrigation Development
4. Bulk Raw Water Supply Infrastructure
5. Water Quality Assessment
6. Site Investigations
7. Dam Technical Details
8. Cost Estimate and Comparison
9. Land Matters
10. Regional Economics
11. Record of Implementation Decisions
12. Legal, Institutional and Financing Arrangements
13. Public Participation

Completion: October 2014

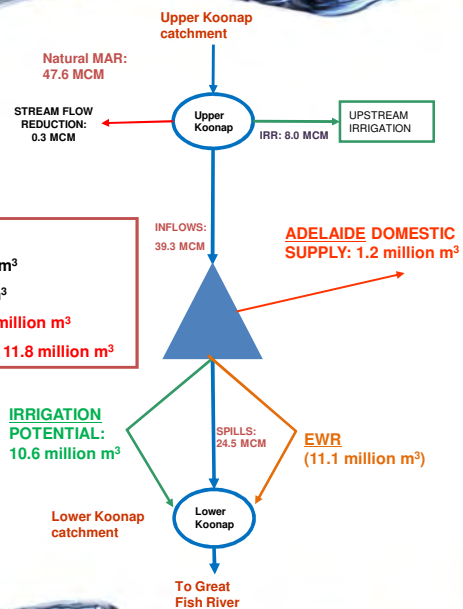
Preliminary Study: Technical Progress to Date

- Stakeholder engagement
- Environmental screening
- Geotechnical desk study
- Hydrology and ecological water requirements
- Potential irrigation development
- Alternative supplies

Stakeholder Engagement and Site Visits

- Meetings with:
  - Regional DWA
  - Nxuba LM
  - Amathole DM
  - Steering Committee
  - Stakeholder Briefings
- Site visits:
  - Environmental screening
  - Geotechnical reconnaissance

Hydrology & Ecological Water Requirements

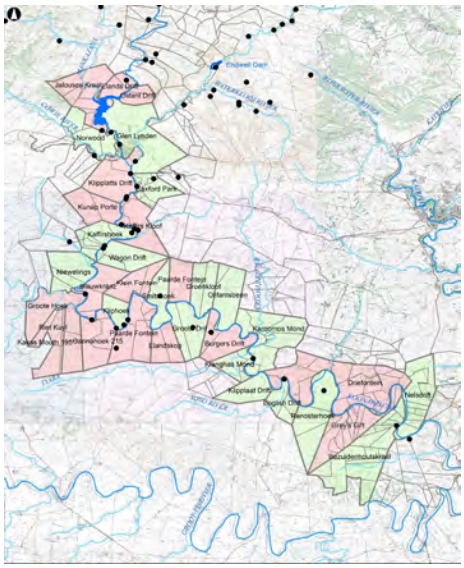


Network Legend

MCM -	million m³
SFR -	Streamflow reduction
IRR-	Irrigation abstraction
EWR-	Ecological water req.
MAR-	Mean annual runoff
SPL -	Spills
INF -	Inflows
Rel -	Releases
FSC -	Full supply capacity
DS -	Dead Storage

Potential Irrigation Development

- Foxwood Dam irrigation water potential: ± 1 300ha (800mm/a)
- Potential irrigable land downstream of Foxwood along Koonap : ±3 300ha (Provincial Agriculture report 1988)
- Estimate of actual irrigation (1988): ± 1 250ha
- Estimate of current irrigation (WARMS, 2012): ±460ha



Response to Queries Raised by Stakeholders

1. Irrigation and Water Supply
   - How big will the dam be?
   - Impact of dam on farms?
   - How will water get to new irrigation?
   - Who is the Water Service Authority and Water Service Provider?
2. Environmental and Social Impacts
   - Groundwater
   - Job opportunities and skills training
   - Improve livelihoods
   - Types of agriculture

Response to Queries Raised by Stakeholders

3. Capital Funding and Compensation
   - Government support
   - Compensation for losses
4. Time Frame
   - Phasing
   - Decision-making
   - Design period
5. Opportunities
   - Hydro-electric power
   - Improve livelihoods
   - Government policy priorities

Response to Queries Raised by Stakeholders

6. Previous Studies
7. Strategic Decision-making
   - Multi-purpose project
   - Size of development

Further queries and clarifications

Date of next Working Group Meeting: to be decided.

Thank you

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

FEASIBILITY STUDY FOR FOXWOOD DAM

WP: 10580

AGRICULTURAL TECHNICAL WORKING GROUP
MEETING 02 HELD AT
ADELAIDE GOLF CLUB

TUESDAY, 30 SEPTEMBER 2014

PREFACE

The Project Team (the Department of Water & Sanitation and Arup) wishes to thank all representatives of the various organisations who attended the first Agricultural Technical Working Group (ATWG) as part of the technical investigations for the Feasibility Study for Foxwood Dam in Adelaide.

Should participants who attended the meeting require any changes to these proceedings, please notify the Public Participation Office in writing within two weeks of receipt.

In some instances, the name of the stakeholder was not provided, and hence, these details are not captured in these proceedings. Should you, as a participant, recognise your input, it would be greatly appreciated if you could provide ACER (Africa) Environmental Consultants (ACER) with your details.

These proceedings are part of the public record for this project and have been placed on the website www.dwa.gov.za under the “Foxwood Dam” link.

These proceedings have been:

Compiled by: ACER (Africa) Environmental Consultants
Reviewed by: Arup (Pty) Ltd
Accepted by: Department of Water & Sanitation

TABLE OF CONTENTS

1. OPENING REMARKS

The Agriculture Technical Working Group (ATWG) preceded the Stakeholder Forum Meeting, which was held on the same day, 30 September 2014. As such, many stakeholders who are represented in both the Stakeholder Forum Meeting and ATWG attended the second session, which was the Stakeholder Forum Meeting.

2. ATTENDANCE

1.1 Attendance – Stakeholders

An attendance register is provided in Appendix 1.

1.2 Attendance - Project Team

Name	Organisation	Role in the Project
Mr John Allwood	Agri-Africa	Agricultural Specialist
Mr James Bristow	Arup	Project Manager
Mr James Hampton	Arup	Project Director
Mr Bob Pullen	Arup	Study Leader
Ms Bongi Shinga	ACER	Stakeholder Communication Coordinator
Mrs Sanet van Jaarsveld	Department of Water & Sanitation	Project Engineer – Options Analysis (North)

3. APOLOGIES

The following apologies were received:

Name	Position	Organisation
Mr Bryan Knox	Vice Chairman	Bedford Farmers' Association

4. WELCOME AND INTRODUCTIONS

Mrs Sanet van Jaarsveld welcomed all present to the second Agriculture Technical Working Group (ATWG) meeting for the Feasibility Study for Foxwood Dam. She thanked all representatives for making time to attend the meeting.

5. INTRODUCTION

This second meeting was aimed at providing feedback to ATWG. This meeting was convened to ensure that there is coordination with all relevant agricultural stakeholders in the study area during future phases of the project.

ATWG members were reminded that the objective of the ATWG is to coordinate and liaise with all relevant agricultural stakeholders in the project area to obtain their inputs.

6. OBJECTIVES OF THE MEETING

The primary objectives of the meeting were outlined as follows:

- Provide progress feedback to all members of the ATWG.
- Review key risks to irrigation development.
- Provide a platform to discuss matters relating to irrigation potential development and findings of the Feasibility Study.

7. APPROVAL OF THE AGENDA

The proposed Agenda was accepted with only one change.

Mr Mana representing the Nxuba Community and Development Centre requested that an item which deals with Local Social Facilitation be included in the Agenda. The Chairperson allocated this item under 'Open Discussion' Item 13 of the Agenda.

8. UPDATE ON THE TECHNICAL PROGRESS TO DATE

The technical presentation was divided into sections, which were presented by the technical team members, Mr Bristow, Mr Hampton and Mr Pullen. A summary of this presentation is included in Appendix 3.

Mr James Bristow started with the technical update on the findings and recommendation of feasibility study for the Foxwood Dam Project. The following sections were covered in his presentation:

Projected supply of water	1 MAR yield
Water Requirements	Local and regional domestic requirements Regional water resource context, Great Fish River Irrigation Development in the Koonap River Valley & Socio Economic Development

Mr James Hampton provided the technical update on the following aspects:

Proposed Dam Type – Composite Dam	Geotechnical conditions Available materials Spillway design Size of dam – 1MAR
Impact on land from the dam	Inundation area Diversion of R344
Impact on existing water users	Bulk supply infrastructure – diverted canal & new pipeline Improved assurance of supply Verification of WARMS database

Mr Bob Pullen covered the following aspects in his presentation:

Project and water costs and price	Project capital costs Water costs and price
Project Benefits	Socio-Economic Development through Irrigation Development Jobs and Economic Impact
Project Risks	Development of economically viable irrigation development

Mr Bob Pullen further provided detail on the review of risks associated with Irrigation Development.

- Appointment of an Implementing Agent with the long term view of seeing the project to maturity for at least 20 years.
- A development programme for the irrigation project to progress from the first acquisition of land for new development, through progressive addition of new land up to full development when 1250 ha are in the care of new farmers.
- A development plan providing for a practical range of irrigation unit sizes to accommodate farmers of various skills and capacities.
- A fair and objective basis for identifying, selecting and training candidate new irrigation farmers, not all of whom will necessarily be residents in the Nxuba Municipality.
- A well planned basis for managing the exit of candidate farmers from the project, and for enabling successful farmers to increase their enterprise by acquiring additional units.
- Monitoring of the development programme against the approved objectives for stimulating socio-economic development in the region.
- Securing a commitment to financing the capital cost and annual cost to establish new farmers up to financial independence and qualify for taking over title to the land that they developed into successful farming operations.

A summary of the information presented is provided in Appendix 3.

9. DISCUSSION

All issues raised and discussed following the presentation are provided in Appendix 1.

10. FEEDBACK ON IRRIGATION DEVELOPMENT

The Chairperson requested the ATWG members to provide feedback on the institutional arrangement for Irrigation Development. The following comments were raised and/or discussed:

Name and Organisation	Comment
Mr Kowie Joubert Dept of Agrarian Development and Land Reform, Eastern Cape	If one considers the scheme for irrigation development, there will be a number of pockets of small irrigation, when added together will add 1200 hectares of irrigation. There is an Eastern Cape Rural Development Agency (ECRDA). Their mandate is to facilitate rural development in the province, they can handle grants on behalf of farmers, act as the governments' agent for performing any development-related tasks. The ECRDA institution exists; it is functional and can be used to assist with irrigation development. There is no need to establish a new one. To establish a farmer and support irrigation development will be easy with the ECRDA. If there is an agreement on how the development should happen, and the funding is available, it is not necessary to create another agency.
Mr John Allwood Agri-Africa	There has to be a project motivation, which is approved by Treasury for the ECRDA to assist with Irrigation Development.
Mr Kowie Joubert Dept of Agrarian Development and Land Reform, Eastern Cape	He added that if a decision is taken by the government to proceed with the project, a joint decision will be made by the various role players who oversee the functioning of ECRDA.
Mr Frikkie Wentzel Post Retief Farmers/Mohair Growers Association	He suggested that the figures should include an allocation of money for acquiring land. **Response**: It was confirmed that the cost of land is included in the cost of the dam; it is part of project cost. The irrigation component is also included in the Economic Impact Assessment.
Mr John Allwood Agri-Africa	In the Fish River area, in order to apply the 6000 hectares per farmer, they had to acquire 30 000 hectares. As such, it all depends on the model that will be used for irrigation and the circumstances, such as irrigable land. This will need to be taken into account during the detailed investigations.

11. WAY FORWARD FOR THE PROJECT

The Chairperson informed ATWG members of the next project phase, the Environmental Impact Assessment, which has been commissioned by DWS. The EIA is estimated to be a two year process.

The key aspects which will be investigated during the EIA will include the following:

Environmental Impact Assessment	1. Dam construction 2. Dam inundation 3. Environmental Reserve 4. Environmental Impact Assessment

She requested the ATWG members to note that the EIA that has been commissioned only focuses on the development of the dam; it excludes the irrigation scheme development. The irrigation scheme may also be subject to a separate EIA. A recommendation will then be made to the relevant Ministers (Water & Sanitation, Agriculture and Environmental Affairs).

She further indicated that all future communication will be circulated by Nemai Consulting, the Environmental Assessment Practitioner (EAP) that has been appointed by DWS.

12. CLOSURE

Mrs van Jaarsveld thanked all ATWG members for their valuable inputs and closed the meeting.

APPENDIX 1: RECORD OF ISSUES RAISED AND DISCUSSED

- Should you as a participant at the meeting not agree to the way in which ACER has captured your issue, please submit your requested changes, in writing, within two weeks of receiving this document.

No	Name and Organisation	Comment	Response
1	Mr Stephen Mullineaux Department of Water & Sanitation	He requested commentary on the assurance of supply for the water users in the study area.	Mr Hampton stated that there are variations on the assurance of supply which are reported on fully in the Water Resources report.
2	A Stakeholder	How high is the dam wall?	The dam wall is 53 m high for the 1 MAR. The 53 m high is made up of 6.5 m of crest material and 47 m high at its lowest water point.
3	Mr Smuts Mana Nxuba Community & Development Centre	Will the size of the dam take into consideration the needs of Bedford and Fort Beaufort community? There was an indication from the Minister that if a dam is built in Adelaide, it will be for long-term water provision. As such, it is important not to exclude the neighbouring areas.	It was explained that the Feasibility Study has considered water requirements at a regional scale. As such, Fort Beaufort and Bedford are included in the current planning and recommendations. If the dam is built, it will cater for these areas including a high growth scenario in Adelaide.
4	Mr Smuts Mana Nxuba Community & Development Centre	He asked if the proposed Foxwood Dam is a multipurpose dam. He also questioned if it will be possible to develop a dam which includes recreational facilities for tourism development in the area.	It was confirmed that the dam is a multi-purpose dam. Adelaide, Bedford and Fort Beaufort were factored in the graphs which consider water requirements for the foreseeable future. Mr Mana was reminded that the dam which is being proposed is mainly for irrigation. As such, the water levels in the dam will fluctuate which may not suit recreational requirements, however this possibility is not excluded. There are also environmental aspects which will also need to be considered if the dam is used for recreational purposes.

No	Name and Organisation	Comment	Response
		He added that Adelaide is a small town, whatever development that is done should be earmarked to improve the socio-economic conditions of the area. The planning should be in line with the National Development Plans.	However, the Municipality can, together with the Department of Water & Sanitation, include conditions in their Integrated Development Plans, Spatial Framework, link specifications which will provide for sustainable development and improve livelihoods through using a dam as a recreational facility. There is however a process that will have to be followed. This is not something that can be decided upon by the municipality in isolation.
5	Mr Smuts Mana Nxuba Community & Development Centre	He requested specifics on the realignment of the road and confirmation if the roads will connect to Bedford.	A map provided on presentation shows the various road networks in the study area. The Feasibility Study has made proposals and also done cost comparison, however the actual road alignments will be subject to an Environmental Impact Assessment process. A Traffic Impact Study will be commissioned as part of the EIA.
6	Cllr Ernie Lombard Nxuba Local Municipality	Based on the current information, it is clear that the canal will be inundated. He understands that Amatola Water is currently spending millions of rands refurbishing the canal as part of improving domestic water supply. If one thinks of the cost that will be spent on the canal which will eventually be wasted.	Adelaide requires an immediate intervention to deal with domestic water supply. As such, Amatola Water cannot wait for the Foxwood Dam to be implemented. Based on project planning, it is estimated that it will take approximately 10 years for Foxwood Dam to be implemented. The need for domestic water supply is quite urgent and cannot be prolonged any further.
7	Mr Frikkie Wentzel Post Retief Farmers/Mohair Growers Association	He confirmed that there is extensive work which is being undertaken in the area, near the bridge and as part of the canal. In some instances new concrete walls are being built as part of the canal structure.	Mr Wentzel was thanked for sharing this information which will be taken into consideration during the EIA phase.

No	Name and Organisation	Comment	Response
8	Mr Smuts Mana Nxuba Community & Development Centre	He enquired about the difference of the funding requirement for the Foxwood Dam and Irrigation Development.	It was explained that Foxwood Dam funding refers to building of the actual dam structure. The irrigation development funding is the money required to assist the small scale farmers to be commercially viable.
9	Mr Smuts Mana Nxuba Community & Development Centre	He suggested that there should be a Local Social Facilitator for the project. This suggestion is not far away from what has been covered in the presentation, e.g. Implementing Agent. The reasoning behind his suggestion is that for a project of this nature, it is advisable to have meetings with the local community (he is not referring to stakeholders like it has been done for the Feasibility Study). The Local Social Facilitator should be appointed by DWS to fulfil a role of interacting with the community at large regarding the proposed project. Mr Mana was also concerned about the lack of accountability and responsibility from the municipality representatives. This indirectly affects continuity within projects.	This is one of the reasons that DWS established a Stakeholder Forum and a Project Steering Committee (PSC) during the Feasibility Study. Both these structures have provided a platform for interested and affected parties to give inputs into the study and share information with other stakeholders in the study area. It is not advisable to establish another new structure. There are recognised structures, including representatives of sectors, who have a mandate in terms of co-operative governance to liaise with the community. DWS relies on them as opposed to establishing new structures. In addition, the PSC continues to advise DWS on strategic matters relating to the study. The participation of I&APs will continue during the EIA Phase. The study team noted this concern with a view to examine consultation approach over and above the normal public participation process which is undertaken as part of the EIA.

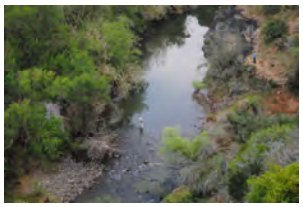
APPENDIX 2: ATTENDANCE REGISTER

No	Title	First Names	Surname	Position	Co/Org	Address	City	Postcode
1	Mr	John	Allwood	Consultant	Agri –Africa	6 Neole Rd Berea	East Landon	5214
2	Mr	James	Bristow	Project Manager	ARUP	Private Bag x1	Melrose Arch	2076
3	Mr	James	Hampton	Dam Engineer and Project Director	ARUP	X10 Melrose Arch	Johannesburg	2076
4	Mr	Bob	Pullen	Study Leader	ARUP	Block D, Hatfield Gardens, Grosvenor St, Hatfield	Pretoria	0083
5	Mr	Kowie	Joubert	Chief Engineer	Dept of Agrarian Development and Land Reform-EC	Private Bag x15	Stutterheim	4930
6	Cllr	Ernie	Lombard	Proportional Representative Councillor	Nxuba Local Municipality	Private Bag X350	Adelaide	5760
7	Mr	Smuts	Mana	Director	Nxuba Community Development Centre	454 Borgweniloc	Adelaide	5760
8	Mr	Stephen	Mullineux	Chief Engineer: Planning	Department of Water & Sanitation – Eastern Cape	Private Bag x68	Cradock	5880
9	Mr	Frikkie	Wentzel	Vice Chairman	Post Retief Farmers/Mohair Growers Association	Box 153	Adelaide	5760
10	Mrs	Sanet	Van Jaarsveld	Production Engineer	Department of Water and Sanitation	P/Bag x313	Pretoria	0001
11	Ms	Bongi	Shinga	Stakeholder Communication Coordinator	ACER (Africa) Environmental Consultants	PO Box 503	Mtunzini	3867

APPENDIX 3: PRESENTATIONS

The size of this presentation is 26.5 MB and can be emailed upon request

Feasibility Study for Foxwood Dam



Agricultural Technical Working Group Meeting
29 September 2014 9:30am

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Feasibility Study for Foxwood Dam

Agricultural Technical Working Group Meeting 02
Adelaide
29 September 2014

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

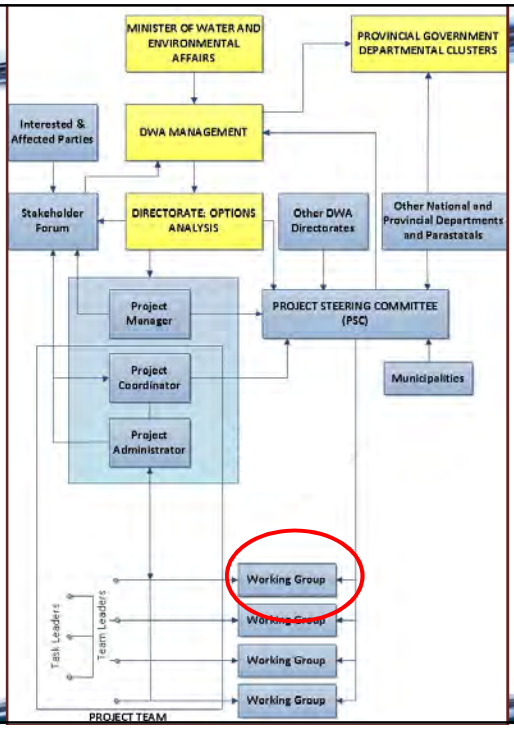
Sanet van Jaarsveld
Project Engineer
Options Analysis (North)

Welcome

- Previous ATWG held September 2013.
- Update on technical progress to date.
- Review of key risks to Irrigation Development
- Approval of the Agenda

Project Governance Structure

Agricultural Technical Working Group



Feasibility Study Work Programme

☑ Inception Report	3 months	**Commencement: August 2012**
☑ Phase 1: Preliminary Study	6 months	
• Phase 2: Feasibility Study	18 months	

1. Water Resources
2. Water Requirements
3. **Irrigation Development**
4. Bulk Raw Water Supply Infrastructure
5. Water Quality Assessment
6. Site Investigations
7. Dam Technical Details
8. Cost Estimate and Comparison
9. Land Matters
10. **Regional Economics**
11. Record of Implementation Decisions
12. **Legal, Institutional and Financing Arrangements**
13. Public Participation

Completion: October 2014

Technical Feedback

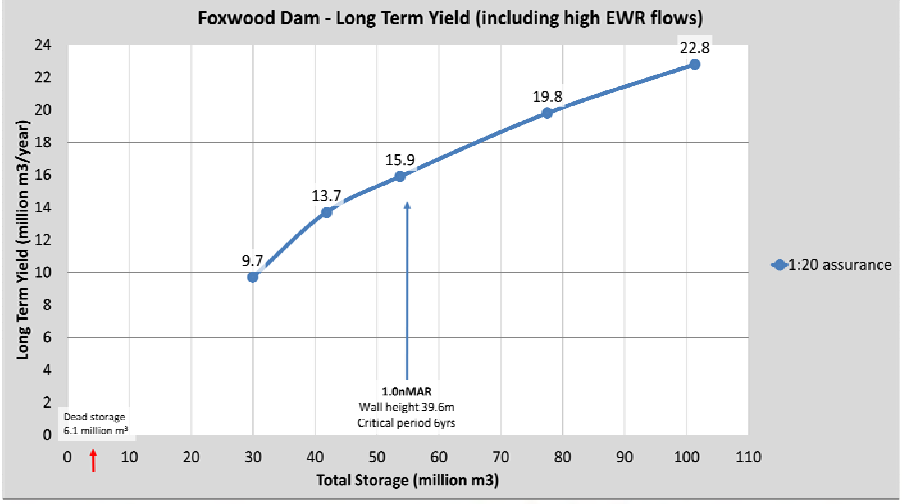
- Water Resources
- Water Requirements
- Proposed Dam
- Land Matters
- Irrigation Development
- Economic Impact
- Legal, Institutional & Financing Issues

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

PSP Team

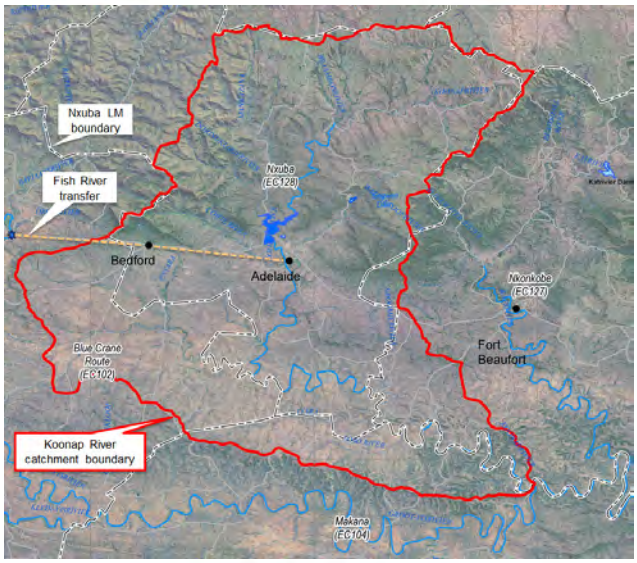
James Bristow
James Hampton
John Allwood
Bob Pullen

Available Water – Koonap River Catchment Hydrology



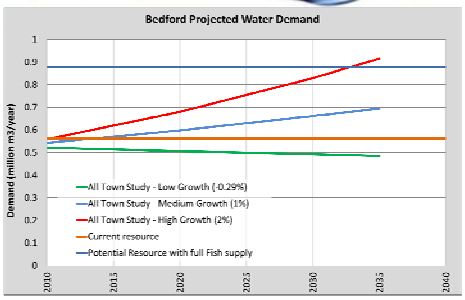
Local Domestic Water Requirements and Resources

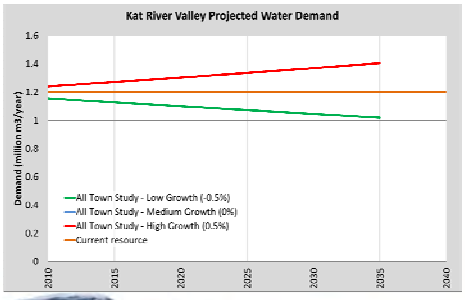
- Adelaide
  - Koonap River
  - Groundwater
  - Fish River Transfer
- Bedford
  - Andrew Turpin
  - Fish River Transfer
  - Groundwater
- Fort Beaufort
  - Kat River & Dam
  - Groundwater



Bedford & Fort Beaufort Need

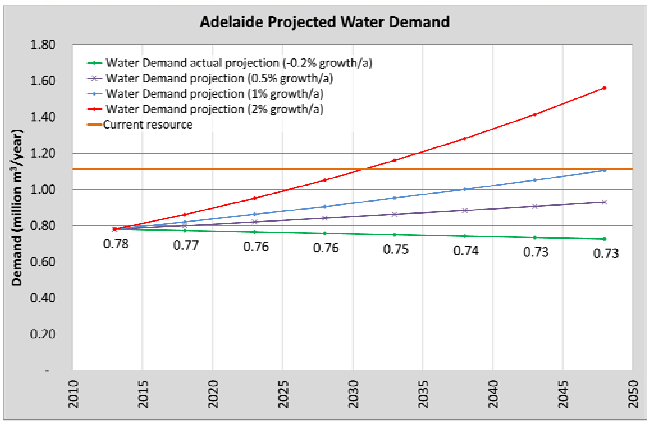
- Information taken from DWA Reconciliation Stategies (2010)
- Demands estimated and projected from WSDP information
- Except high growth scenario for Bedford (by 2033) current resources meet current and projected demands





Adelaide Need

- Sufficient resource for current projections
  - Koonap canal
  - Fish River transfer
  - Municipal borehole
- Shortages possible by 2031 if 2% growth experienced
- Existing resources can be developed:
  - Off-take channel capacity & dam volume
  - Groundwater potential
- Adelaide Koonap extraction <u>included</u> in river hydrology

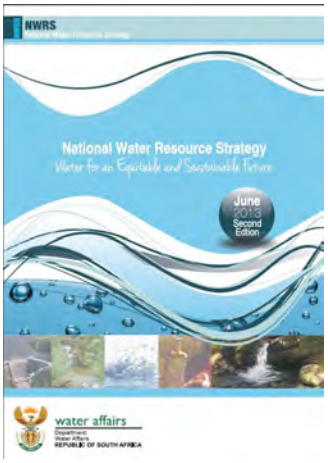


- Koonap Canal & Dam potential increase – 0.5 million m^3/a
- Borehole potential increase – 0.5 – 1.0 million m^3/a

Strategic Objectives

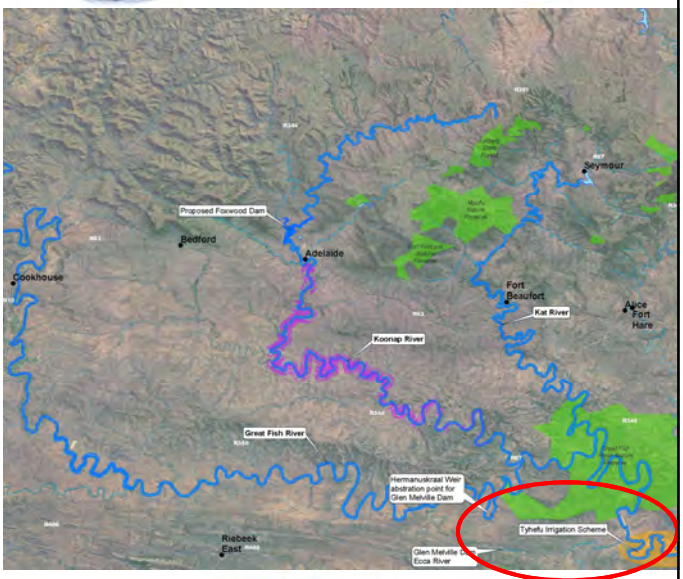
- Opportunity for water resource development to enable regional socio-economic development.
- Aligned with NDP / NWRS2

"Water for an Equitable and Sustainable Future"



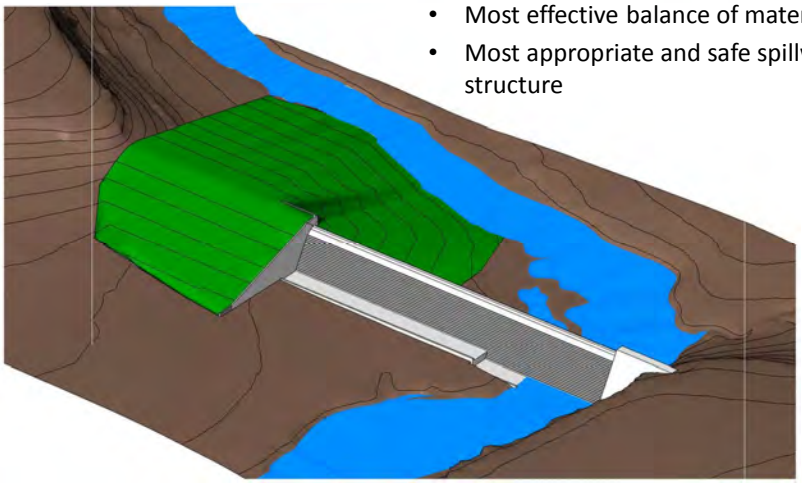
Fish River Context

- Multi-purpose dam
- Consider opportunity for regional impact
- Confluence of Koonap with Fish River is downstream of Great Fish River GWS
- Foxwood is ±150km from Koonap / Fish confluence
- Focus on water use within the Koonap River Valley



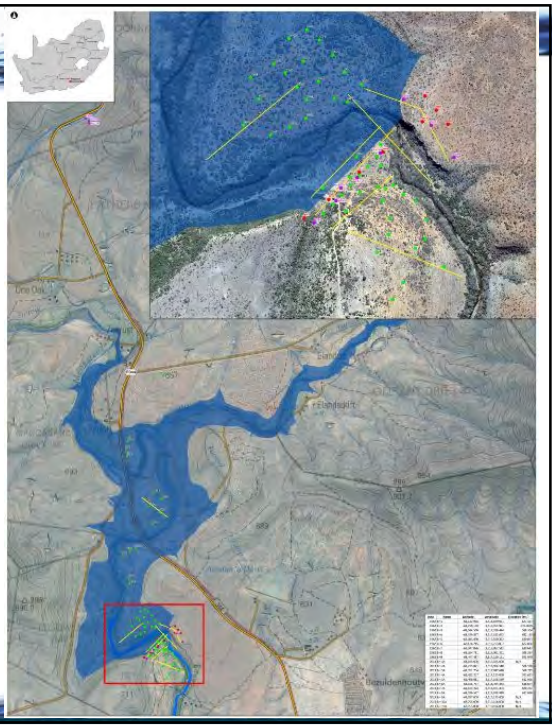
Proposed Dam – Composite Gravity Concrete & Earthfill

- Most cost effective
- Most effective balance of materials
- Most appropriate and safe spillway structure



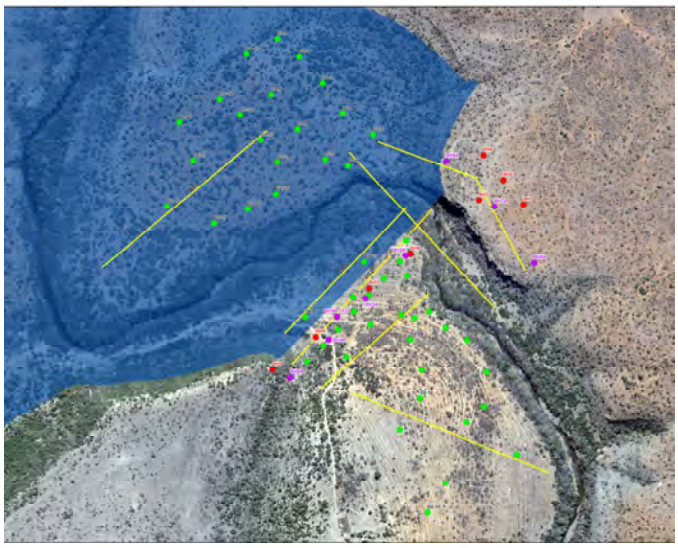
Site Investigation – Foundations & Materials

- Mudstone & Sandstone – excavation
- Core material
- Rockfill materials
- Concrete material



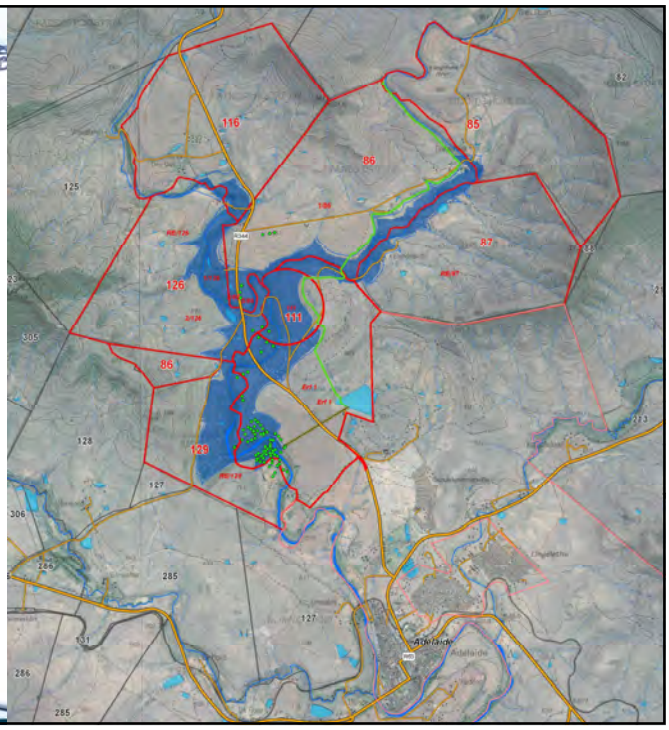
Site Investigation – Foundations & Materials

- Foundation Conditions
- Seismicity
- Boreholes
- Trial Pits

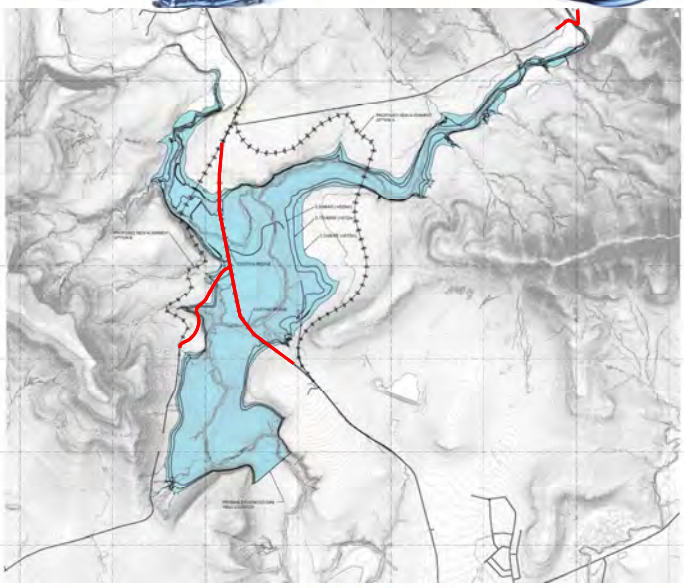


Land Matters – inundation from the dam

- Dam site & inundation area
- Temporary works – cofferdam, contractor site, camp etc
- Borrow pits / quarry for construction material & haul roads
- Relocate existing canal & provide new pipeline
- R344 relocation



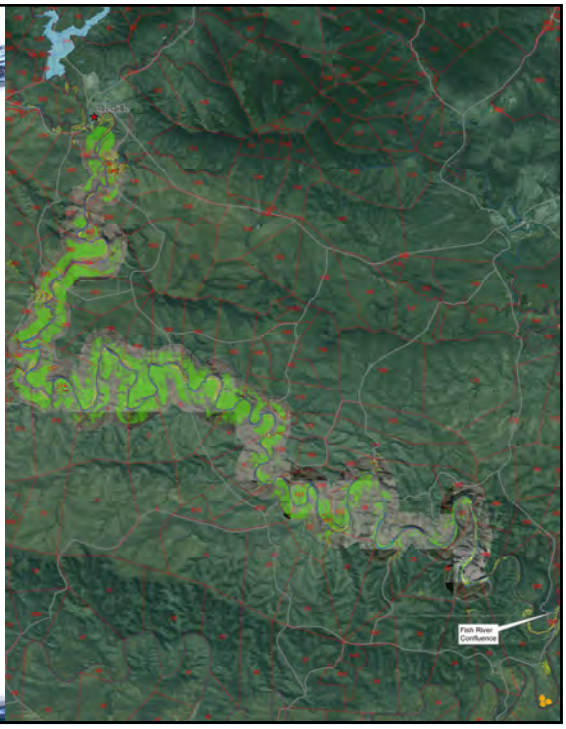
R344 Road & farm roads



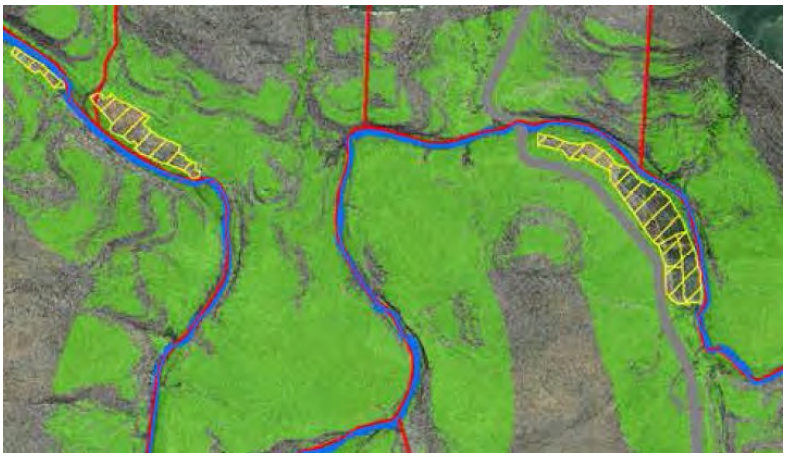
Potential for development of new irrigation

- Water (1 250 ha)
- Existing users
- Irrigable land, criteria:
  - >450mm soil depth
  - 12% slope

  (3 000 ha identified)
- Constraints
  - No single block of irrigable soil
  - Numerous blocks on private properties



Detailed mapping



Irrigation Model – Assumptions & Outputs

- High value crops for sustainable commercial irrigation in long term
- Annual irrigation 800 mm/annum = 8 000 m^3/ha/annum.
  (after 20% losses from dam to farm)
- Provision made for full time training and mentoring up to full production of crops and beyond.
- A development and management Agency, funded by government to implement and manage the irrigation scheme, is envisaged.

Crop Type	CAPEX Investment	Cumulative OPEX input until profitable	Peak Funding (CAPEX + OPEX input until profitable)	Time for farms to become profitable
Lemons	R 288	R 273	R 561	5
Peaches	R 306	R 290	R 597	4
Macadamia Nuts	R 279	R 239	R 519	6

All values in R millions, 2014 prices

Irrigation Model – Financial Model & Outputs

Year - Irrigation Development Project	1	6	7	8	9	10
Employment Impact						
Existing Agriculture Employment	1 422	1 494	1 509	1 524	1 539	1 555
Irrigation Development Jobs	**677**	**1 160**	**1 354**	**1 547**	**1 740**	**1 934**
Total Agriculture Jobs	2 099	2 654	2 863	3 071	3 279	3 489
Economic Impact						
Existing Agriculture GVA (million Rands)	R 40	R 42	R 43	R 44	R 44	R 44
Irrigation Development GVA (million Rands)	R 70	R 121	R 141	R 161	R 181	R 201
Irrigation Development as % of total	64%	74%	77%	79%	81%	82%
Growth of total Agriculture GVA	**9.5%**	**6.4%**	**11.2%**	**10.1%**	**9.1%**	**8.4%**

Irrigation Development Risks

- Appointment of an Implementing Agent with the long term view of seeing the project to maturity for at least 20 years.
- A development programme for the irrigation project to progress from the first acquisition of land for new development, through progressive addition of new land up to full development when 1250 ha are in the care of new farmers.
- A development plan providing for a practical range of irrigation unit sizes to accommodate farmers of various skills and capacities.
- A fair and objective basis for identifying, selecting and training candidate new irrigation farmers, not all of whom will necessarily be residents in the Nxuba Municipality.
- A well planned basis for managing the exit of candidate farmers from the project, and for enabling successful farmers to increase their enterprise by acquiring additional units.
- Monitoring of the development programme against the approved objectives for stimulating socio-economic development in the region.
- Securing a commitment to financing the capital cost and annual cost to establish new farmers up to financial independence and qualify for taking over title to the land that they developed into successful farming operations.

Project Economic Impact - Methodology

1. Establish current Socio-economic baseline:
   - Demographics and Population growth,
   - Employment and unemployment trends,
   - Skills profile and requirements,
   - Gross Value Added (GVA) for economic sectors,
   - Employment per GVA sector, and
   - Service delivery indicators for the region.

2. Evaluate project impact on socio-economic baseline:
   - Improvement on the above indicators,
   - Opportunities for BEE in the Value Chain, and
   - Upstream and downstream opportunities for the agro-industry. [National Development Plan etc.]

Project Economic Impact – Jobs & GDP

	Foxwood Dam	Irrigation Development	Combined Total
Funding Requirements			
Capital Expenditure – Construction & Setup	R 1 464 m	R 279 m	R 1 743 m
Working Capital input until profitable	R 10 m	R 239 m	R 249 m
Total funding commitment until profitable	R 1 474 m	R 518 m	R 1 992 m
Impact on Jobs			
Construction & Agric. employment – Peak jobs	958	1 186	2 144
Sustainable employment at year 10	19	1 186	1 205
Economic Impact			
Gross Domestic Product (GDP) – in Year 10	R 17 m	R 527 m	R 544 m

Legal, Institutional & Financial Arrangements

Legal Compliance

National Environmental Management Act and regulations – authorization

- National Water Act
- ESTA
- Expropriation Act

Preparedness for implementation

Institutional Arrangements

- Ownership
- Operation and maintenance
- Funding

Options to be considered

Financial Arrangements

Status of the water infrastructure

- National water infrastructure?
- Regional objectives
- Purpose – economic user sectors
  - socio-economic growth
  - other

Funding capacity – balance sheet

Sources of funding

Bankable Project

Project Risks for Resource Development

Risk	Mitigation	Action & Responsibility
Environmental Impact Assessment – delay of authorisation for project	Appointment of Environmental Assessment Practitioner	National DWS
Development of sustainable agricultural model	Agricultural Working Group	PSC & CCAW
Project Funding – changing Treasury priorities	Awareness of Treasury policy	National DWS
Road diversion Timing and Schedule Implication	Consultation with EC Roads Department	PSP
Ownership and administration of water resource	Project Module: Institutional Arrangements	DWS

General Discussion & Way Forward

Thank you

APPENDIX C: 20 HA FARM SIMPLIFIED 10 YEAR CASHFLOW STATEMENTS

Lemons Projected Annual Cash Flow / 20 ha													
	Hectare:	20	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
Trees / Ha Established @ m x m	5.0	3.0											
		667	13 340	13 340	13 340	13 340	13 340	13 340	13 340	13 340	13 340	13 340	13 340
Yield													
Fruit sold loose	70.00%		-	-	-	-	8 476	16 953	28 255	28 255	28 255	28 255	28 255
Fruit for juice	30.00%		-	-	-	-	54 491	108 982	181 637	181 637	181 637	181 637	181 637
Revenue / Ha			-	-	-	-	902 735	1 805 471	3 009 118	3 009 118	3 009 118	3 009 118	3 009 118
Fruit	15kg box	102	-	-	-	-	864 592	1 729 183	2 881 972	2 881 972	2 881 972	2 881 972	2 881 972
Fruit for juice	kg	0.70	-	-	-	-	38 144	76 288	127 146	127 146	127 146	127 146	127 146
Production, Development & Services													
Manpower			168 023	196 026	224 030	252 034	280 038	308 041	336 045	392 053	448 060	504 068	560 075
Production			180 795	210 730	240 668	487 326	733 984	1 052 882	1 082 820	1 142 696	1 202 572	1 262 448	1 322 324
Administration			5 304	6 188	7 072	7 956	8 840	9 724	10 608	12 376	14 144	15 912	17 680
Allocations			36 533	34 431	39 350	44 269	49 188	54 106	59 025	68 863	78 700	88 538	98 375
Indirect Costs			120	140	160	180	200	220	240	280	320	360	400
Overheads			9	11	12	14	15	17	18	21	24	27	30
Harvest			-	-	-	-	71 909	143 818	239 696	239 696	239 696	239 696	239 696
TOTAL DIRECT COSTS			348 818	406 757	464 698	739 360	1 085 931	1 504 741	1 658 561	1 774 445	1 890 328	2 006 212	2 122 095
TOTAL INDIRECT COST			36 653	34 571	39 510	44 449	49 388	54 326	59 265	69 143	79 020	88 898	98 775
TOTAL OVERHEAD COST			5 313	6 199	7 084	7 970	8 855	9 741	10 626	12 397	14 168	15 939	17 710
GRAND TOTAL OPERATING COSTS			390 783	447 526	511 292	791 778	1 144 173	1 568 808	1 728 452	1 855 984	1 983 516	2 111 048	2 238 580
TOTAL CAPEX			2 020 500										
Deficit Funding - Income Less Total Capex & Operation Cos			-2 411 283	-447 526	-511 292	-791 778	-241 438	236 663	1 280 666	1 153 134	1 025 602	898 070	770 538
Deficit Funding - Accumulated			-2 411 283	-2 858 810	-3 370 102	-4 161 880	-4 403 318	-4 166 655	-2 885 990	-1 732 856	-707 254	190 815	961 353
INVESTMENT RETURN - 15 Years		IRR											
NET CASHFLOW: DIRECT & INDIRECT		9.4%	-2 405 970	-441 328	-504 208	-783 809	-232 583	246 403	1 291 292	1 165 531	1 039 770	914 009	788 248
NET CASHFLOW: DIRECT, INDIRECT & OVERHE		9.1%	-2 411 283	-447 526	-511 292	-791 778	-241 438	236 663	1 280 666	1 153 134	1 025 602	898 070	770 538
INVESTMENT RETURN - 10 Years		IRR											
NET CASHFLOW: DIRECT & INDIRECT		3.4%	-2 405 970	-441 328	-504 208	-783 809	-232 583	246 403	1 291 292	1 165 531	1 039 770	914 009	788 248
NET CASHFLOW: DIRECT, INDIRECT & OVERHE		3.1%	-2 411 283	-447 526	-511 292	-791 778	-241 438	236 663	1 280 666	1 153 134	1 025 602	898 070	770 538

Peaches Projected Annual Cash Flow / 20ha

	Hectare:	20	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
Trees / Ha Established @ m x m	4.0	2.0											
		1250	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000
Yield													
Fruit sold loose	100.00%			0.0	0.0	0.0	340399	680798	1134663	1134663	1134663	1134663	1134663
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Revenue / Ha				R 0	R 0	R 0	R 1 021 197	R 2 042 394	R 3 403 990	R 3 403 990	R 3 403 990	R 3 403 990	R 3 403 990
Fruit	kg	3		R 0	R 0	R 0	R 1 021 197	R 2 042 394	R 3 403 990	R 3 403 990	R 3 403 990	R 3 403 990	R 3 403 990
Production, Development & Services													
Manpower		R 28 004		196 026	224 030	252 034	280 038	308 041	336 045	392 053	448 060	504 068	560 075
Production		R 28 194		201 625	229 819	258 013	286 207	314 401	342 595	398 983	455 371	511 759	568 147
Administration		R 62 634		66 801	67 772	68 744	69 715	70 687	71 658	73 601	75 544	77 487	79 430
Allocations		R 6 089		34 431	39 350	44 269	49 188	54 106	59 025	68 863	78 700	88 538	98 375
Indirect Costs		R 20		140	160	180	200	220	240	280	320	360	400
Overheads		R 30		11	12	14	15	17	18	21	24	27	30
Harvest		R 1 142		-	-	-	388 736	777 471	1 295 786	1 295 786	1 295 786	1 295 786	1 295 786
TOTAL DIRECT COSTS				397 651	453 849	510 047	954 980	1 399 914	1 974 425	2 086 821	2 199 216	2 311 612	2 424 007
TOTAL INDIRECT COST				34 571	39 510	44 449	49 388	54 326	59 265	69 143	79 020	88 898	98 775
TOTAL OVERHEAD COST				66 811	67 784	68 757	69 730	70 703	71 676	73 622	75 568	77 514	79 460
GRAND TOTAL OPERATING COSTS				499 033	561 143	623 252	1 074 098	1 524 943	2 105 366	2 229 585	2 353 804	2 478 023	2 602 242
TOTAL CAPEX			2 511 600										
Deficit Funding - Income Less Total Capex & Operation Costs			-2 955 548	-499 033	-561 143	-623 252	-52 901	517 451	1 298 624	1 174 405	1 050 186	925 967	801 748
Deficit Funding - Accumulated			-2 955 548	-3 454 581	-4 015 724	-4 638 977	-4 691 877	-4 174 426	-2 875 803	-1 701 398	-651 213	274 754	1 076 502
INVESTMENT RETURN - 15 Years		IRR											
NET CASHFLOW: DIRECT & INDIRECT		10.8%	-R 2 889 710	-R 432 222	-R 493 359	-R 554 495	R 16 829	R 588 154	R 1 370 300	R 1 248 027	R 1 125 754	R 1 003 481	R 881 208
NET CASHFLOW: DIRECT, INDIRECT & OVERHEADS		8.9%	-R 2 955 548	-R 499 033	-R 561 143	-R 623 252	-R 52 901	R 517 451	R 1 298 624	R 1 174 405	R 1 050 186	R 925 967	R 801 748
INVESTMENT RETURN - 10 Years		IRR											
NET CASHFLOW: DIRECT & INDIRECT		5.4%	-R 2 889 710	-R 432 222	-R 493 359	-R 554 495	R 16 829	R 588 154	R 1 370 300	R 1 248 027	R 1 125 754	R 1 003 481	R 881 208
NET CASHFLOW: DIRECT, INDIRECT & OVERHEADS		3.1%	-R 2 955 548	-R 499 033	-R 561 143	-R 623 252	-R 52 901	R 517 451	R 1 298 624	R 1 174 405	R 1 050 186	R 925 967	R 801 748

Macadamia Nut Projected Annual Cash Flow / 20 Ha

	Hectare:	20	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
Trees / Ha Established @ m x m	9.0	4.5											
		247	4940	4940	4940	4940	4940	4940	4940	4940	4940	4940	4940
Yield													
Sound Kernel / Ha	30.00%		0	0.0	0.0	0.0	2957	5174	13305	19218	23653	31044	36958
Unsound Kernel / Ha	8.00%		0	0.0	0.0	0.0	788.4	1379.8	3547.9	5124.8	6307.4	8278.5	9855.4
Revenue / Ha			R 0	R 0	R 0	R 0	R 266 095	R 465 666	R 1 197 426	R 1 729 616	R 2 128 758	R 2 793 995	R 3 326 185
Sound kernel		90	R 0	R 0	R 0	R 0	R 266 095	R 465 666	R 1 197 426	R 1 729 616	R 2 128 758	R 2 793 995	R 3 326 185
Unsound kernel		8	R 0	R 0	R 0	R 0							
Production, Development & Services													
Manpower		28 004	168 023	196 026	224 030	252 034	280 038	308 041	336 045	392 053	448 060	504 068	560 075
Production		25 877	155 808	181 685	207 562	233 439	259 316	285 193	311 070	362 824	414 578	466 332	518 086
Administration		62 634	76 000	78 620	81 240	83 860	86 480	89 100	91 720	96 960	102 200	107 440	112 680
Allocations		6 089	36 533	42 621	48 710	54 799	60 888	66 976	73 065	85 243	97 420	109 598	121 775
Indirect Costs		20	120	140	160	180	200	220	240	280	320	360	400
Overheads		30	180	210	240	270	300	330	360	420	480	540	600
Harvest		1 028	-	-	-	-	67 491	118 110	303 712	438 695	539 932	708 660	843 643
TOTAL DIRECT COSTS			R 323 831	R 377 711	R 431 592	R 485 473	R 606 845	R 711 344	R 950 827	R 1 193 571	R 1 402 570	R 1 679 060	R 1 921 804
TOTAL INDIRECT COST			R 36 653	R 42 761	R 48 870	R 54 979	R 61 088	R 67 196	R 73 305	R 85 523	R 97 740	R 109 958	R 122 175
TOTAL OVERHEAD COST			R 76 180	R 78 830	R 81 480	R 84 130	R 86 780	R 89 430	R 92 080	R 97 380	R 102 680	R 107 980	R 113 280
GRAND TOTAL OPERATING COSTS			R 436 663	R 499 303	R 561 942	R 624 582	R 754 712	R 867 971	R 1 116 212	R 1 376 474	R 1 602 990	R 1 896 997	R 2 157 259
TOTAL CAPEX			1 739 080										
Deficit Funding - Income Less Total Capex & Operation Costs			-2 175 743	-499 303	-561 942	-624 582	-488 618	-402 305	81 215	353 142	525 768	896 998	R 1 168 925
Deficit Funding - Accumulated			-2 175 743	-2 675 046	-3 236 988	-3 861 569	-4 350 187	-4 752 491	-4 671 277	-4 318 134	-3 792 366	-2 895 368	-1 726 443
INVESTMENT RETURN - 15 Years		IRR											
NET CASHFLOW: DIRECT & INDIRECT		8.9%	-R 2 099 563	-R 420 473	-R 480 462	-R 540 452	-R 401 838	-R 312 875	R 173 295	R 450 522	R 628 448	R 1 004 978	R 1 282 205
NET CASHFLOW: DIRECT, INDIRECT & OVERHEADS		6.5%	-R 2 175 743	-R 499 303	-R 561 942	-R 624 582	-R 488 618	-R 402 305	R 81 215	R 353 142	R 525 768	R 896 998	R 1 168 925
INVESTMENT RETURN - 10 Years		IRR											
NET CASHFLOW: DIRECT & INDIRECT		-2.5%	-R 2 099 563	-R 420 473	-R 480 462	-R 540 452	-R 401 838	-R 312 875	R 173 295	R 450 522	R 628 448	R 1 004 978	R 1 282 205
NET CASHFLOW: DIRECT, INDIRECT & OVERHEADS		-6.0%	-R 2 175 743	-R 499 303	-R 561 942	-R 624 582	-R 488 618	-R 402 305	R 81 215	R 353 142	R 525 768	R 896 998	R 1 168 925

APPENDIX D: WATER PUMPING COSTS

APPENDIX D: Water Pumping Costs

Water distribution methodology

Water will be released into the Koonap River and will be extracted from the river and pumped to distribution centres on each of the main four areas illustrated on Figure 6. The table below shows the water requirements by main area along with the daily and hourly pump rate for each distribution centre (DC) including capital and operational costs and an average operational cost per cubic metre of water

Irrigation requirements		8000	m³/ha/annum				
Area A		Area B		Area C		Area D	
20.6	164800	21.5	172000	21.3	170400	21	168000
19.6	156800	20.9	167200	20.1	160800	24.4	195200
20.9	167200	19.9	159200	21.9	175200	23	184000
19.9	159200	20.7	165600	25.3	202400	20.2	161600
22.5	180000	21.1	168800	22.1	176800	20.4	163200
20.9	167200	26.1	208800			20.6	164800
20.4	163200	21.5	172000			22	176000
20.9	167200	25.9	207200			21	168000
20.1	160800	21.8	174400			21.2	169600
27.1	216800	25.8	206400			20.2	161600
22.4	179200	22.7	181600			20.7	165600
19.6	156800	20	160000			22.7	181600
20.2	161600	21.4	171200				
21.3	170400						
24.6	196800						
321	**2568000**	**289.3**	**2314400**	**110.7**	**885600**	**257.4**	**2059200**
Per DC	**856000**		**771467**		**442800**		**686400**
Per day/DC	**4703.3**		**4238.8**		**2433.0**		**3771.4**
Per hour/DC	**522.59**		**470.98**		**270.33**		**419.05**
	3		3		1		3
Capital Cost DC	2 250 000		2 250 000		750 000		2 250 000
Water out	1 500 000		1 300 000		500 000		1 200 000
Storage dam 5,500m³	12 000 000		12 000 000		6 000 000		6 000 000
Total	***15 750 000***		***15 550 000***		***7 250 000***		***9 450 000***
Repairs & maintain	787 500		777 500		362 500		472 500
Electricity - water in	75 000		75 000		25 000		75 000
Electricity - water out	40 000		24 000		16 000		24 000
Total	***902 500***		***876 500***		***403 500***		***571 500***
Water pumped per year	**2 568 000**		**2 314 400**		**885 600**		**2 059 200**
Operational Cost/m³	**0.3514**		**0.3787**		**0.4556**		**0.2775**
Average cost calculation							
Total water used	***7 827 200***						
Total operational cost	***2 754 000***						
	0.352						

The above table leads to the conclusion that to abstract the water from the river and deliver it to each individual farm will cost R0,352 /m³ worked on an operational cost only basis, i.e. that the necessary infrastructure capital cost has been put in place by Government. The capital cost of the water supply infrastructure (R48 million) is included within the Economic Impact Assessment (DWS 2015)

If this distribution cost is added to the currently assumed R0,60 then the final cost per cubic metre would be set at R0,95. The effect on this can be seen in the table below in terms of additional Peak funding and the reduction in the IRR of each option.

Water @ R0.959/m³	20 ha Farm (Each)		
Enterprise	CAPEX	Peak funding	IRR %
Lemons	R 2 020 500	R 4 544 118	7.78
Peaches	R 2 511 600	R 4 832 677	7.66
Macadamia Nuts	R 1 739 080	R 3 967 169	5.27