



Griff Thomas & Associates
Consulting Chemical Engineers

Northern Australia Task Force Secretariat
Department of the Environment & Water Resources
GPO Box 787
Canberra ACT 2601

16 August 2007

Submission on Development Potential

Dear Sirs,

We are submitting our concept on an Integrated Agro-Industrial Complex which we believe is ideal for development of the drainage divisions of the map accompanying your letter to us 17 July 2007. The IAIC concept is summarised in the attached note which covers the production of five to six products from two or three crops. The crops grow well in the catchment areas nominated. Their growth & the products themselves, provide considerable environmental as well as economic advantages. The flexibility inherent in the three feedstocks permits agronomic expansion into new areas.

Two of the crops; sugar cane & sweet sorghum are already grown commercially in two of the drainage divisions & the third, arundo donax, has great potential in all three divisions. All the crops are very efficient in capturing solar energy & carbon dioxide. At least two of the products, ethanol motor fuel & paper pulp will reduce current imports & are based on existing technology. A third, EcophosKP, is close to commercialization & has considerable environmental advantages over conventional acidic, leaching fertilizers. It will utilise currently uncommercial Australian phosphate minerals & replace apatite imports.

While cane sugar is already produced commercially in two of the divisions it's future would be guaranteed by integration with the other products nominated. Almost all of the technology involved is already in commercial operation but it's integration in the manner outlined, has never been applied before. Integration is the key to profitability. Recent excessive conventional fertilizer price rises have hit canegrowers hard & threaten the sugar industries existence.

Cattle are grazed in all three drainage divisions & many suffer from phosphorous deficiency to the extent they chew the bones of dead animals. Deficiency is relieved in part by phosphorous licks. The use of a cheap effective pasture fertilizer like EcophosKP could be more effective in developing the livestock industries.

We should also emphasise the environmental benefits of the IAIC approach. Firstly Ecophos KP is a non-acidic, non-leaching environmentally friendly fertilizer, unlike conventional acid based water soluble products which harm the marine environment downstream. Potash pulp, bleached with hydrogen peroxide is Totally Chlorine Free & does not generate dioxins. TCF pulp is also free of odours & marine pollution associated with conventional kraft pulping & chlorine dioxide bleaching. These effluents have raised major objections to a recent Tasmanian pulp mill proposal.

We trust you find the attachments interesting & would be pleased to expand on the concepts involved in Canberra after September, when the writer will be visiting relatives & technical associates in North America.

Yours truly

A handwritten signature in cursive script that reads 'Griff Thomas'.

GTA

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Consulting Chemical Engineers

April 2007

Griff Thomas B Sc, B E Chem

Griff is a well qualified & experienced consulting engineer with over 50 years experience working with the process industries of all continents particularly North America & Australasia. His experience has included:

1997 to date Principal of Griff Thomas & Associates Consulting Engineers

Specialising in the development of "environmentally friendly" fertilizers & waste utilization. Work has included design, modification & commissioning conventional & unconventional fertilizer plants in Australia & SE Asia. He has worked with CSIRO & the WA & NSW Agriculture on field testing of non-acidifying non-leaching plant available fertilizers. He has acted as an expert witness in patent infringement cases in Australia & USA. Clients include: Alcoa, Natcom, Thai Fertilizer, Nauru & Palau Phosphate mines, Baileys Fertilizer, Eimco International, various patent attorneys & AusIndustry.

1970-97 Director Spencer Thomas Associates Pty Ltd Consulting Engineers

His responsibilities included feasibility studies, testwork, supervision, design & commissioning of equipment & plant for:
Recovery & utilization of chemical, metallurgical, domestic & food processing wastes
Recovery of energy from wastes & byproduct streams
Fertilizer, uranium & gold extraction plants
Water & sewage treatment
Coal washing & coal utilization
Fluidised roasting, sulphuric acid manufacture & power generation from pyrite
Recovery of non-ferrous metals from pyrite calcines.
Treatment of gold extraction wastes to recover cyanide & copper
Auto-oxidation sulphuric acid processing
Alumina red mud processing
Ilmenite processing

Clients included: WMC, NorthWest Acid, Consolidated Goldfields, Elders Resources, Kinhill Engineers, ICI Malaysia, Pickands Mather, Kaurex, Caltex, Australian Queensland Victorian & WA Governments, Coalex & Bayswater Coal, Kobe Steel, Kanematsu, BHP, Queensland & NSW Electricity Commissions, Burmah Oil, Phosphate Mining Company of Christmas Is, Martin Bright Steels, Edgells, Brisbane Abattoir, Provincial Traders, Dorr Oliver, SCM, Baker Hughes, Unichrome, Laporte.

1957-1970 Director & NSW Manager Dorr-Oliver Pty Ltd

Design & manufacture of equipment & complete process plant for the Australasian process industries.

Clients included: Most sugar mills in Australia & Fiji, Most Australasian paper mills, Australian Fertilizers, Pivot & CSBP, Mt Morgan, Mt Isa, Sulphide Corporation, BHAS, BH South, EZ, Comalco, Nabalco, Alcoa, Canberra City, MSW&DB, Auckland Drainage Board, Southland Abattoirs NZ, Chemocomplex Hungary.

1956-57 Dorr-Oliver Canada & USA Trainee

Study & design of equipment for metallurgical, paper pulp, sugar & effluent processing

1953-56 Dominion Scott Barron Canada

Design & sale of equipment for paper pulp production & black liquor recovery

1950-53 ICIANZ Chemist & Engineer

Assisted in the design & construction of new plant at Botany site

1949 Process Chemist National Oil Pty Ltd

Testing of shale oil refinery products, recommissioned high pressure retort

Patents Griff has been granted Australian & International patents on alumina thickener drives, roaster gas sulphuric acid plants, alkali processing of phosphate minerals. He has also lodged provisionals on "environmentally friendly" fertilizer & paper from annual crops

INTEGRATED AGRO-INDUSTRIAL COMPLEX PROFITABLE & FLEXABLE GTA 10 Nov 2006 mod 07 CONFIDENTIAL

An agro-industrial complex based on two or three feedstocks producing five or six products using an existing sugar mill & infrastructure would be profitable & insulated against world market price variations.

Agronomic & Mineral Inputs

Sugarcane
Sweet sorghum
Arundo Donax

Potash
Crandallites

Processing Outputs

Raw sugar crystals
Motor fuel ethanol
TCF Paper pulp
Environmentally friendly fertilizers
Lignin
Cellulose fines
Electricity

The only new major capital required for an existing sugar mill would be for an ethanol plant. A greenfield site would require a simple juice only operation to produce ethanol feed. With an existing mill the complex would allow full utilization of capital investment. The crops grow well in sugar areas; sweet sorghum in the slack cane season & *arundo donax* on marshy estuarine lands. All three crops have been processed to sugar, ethanol & commercial fibres.

Of the two minerals, potash is already used as fertilizer & is merely "borrowed" for pulp processing on its way to fertilize the cane fields. Uncommercial crandallite type phosphatic minerals occur as waste from mining the commercial phosphate mineral apatite. Unlike apatite, crandallites are unsuitable for conventional acid based fertilizer production. They can be converted by alkali wastes into "environmentally friendly" fertilizers, non-acidifying & non-leaching.

Unique features of the complex are noted below;

- (1) The crops are grown & processed on a year round basis with juices being converted to raw sugar or ethanol, bagasse fibre to paper pulp & fines to fuel & other uses.
- (2) The overall concept is unique & is based on potash pulping of depithed bagasse, with the waste pulping chemicals being converted to non-leaching non-acidic fertilizer. No expensive chemical recovery plant is required. The pulp is bleached with peroxide & is TCF (totally chlorine free). No dioxins in the pulp or effluent.
- (3) Pith & other fines must be removed to produce quality paper pulp. Fines can be used for fuel or to produce ethanol when cellulose to ethanol processing becomes economic.
- (4) The complex would provide major environmental benefits: "green petrol", "green paper", "green fertilizer" & "green power".
- (5) The complex could result in a three to fourfold increase in mill income with a significant boost to farm income & the local economy.
- (6) Apart from the fuel ethanol plant, no significant capital expenditure is involved.
- (7) Markets for the products are robust & their proportions can be varied to suit world markets & prices.
- (8) Existing milling equipment & infrastructure can be utilised on a year round basis. New equipment & operating procedures can be introduced progressively.
- (9) Some of the complex's features are based on considerable testwork, theoretical & practical knowledge, are confidential, subject to patents or patent applications. Royalties would be benefit initial participants.

NB. IRR & NPV calculations have not yet been carried out as capital required will depend on existing facilities & transfer pricing policies etc. The overall economics should be much more favourable than single crop single product operation & will be evaluated on a case to case basis.

Introduction



The export of phosphate has dominated the history of Christmas Island for over a century — since 1887, when the first phosphate rock samples were collected by the British Royal Navy ship 'Egeria'.

The interesting mix of people, culture and languages gives a good indication of the location of Christmas Island — 300 km south of Java, Indonesia, 1400 km south of Singapore and 2400 km north west of Perth, Western Australia. Christmas Island residents trace their roots to Singapore, Malaysia, Indonesia, China (PRC), the UK and Australia.

Christmas Island has undergone social and economic transformation with the recommencement of phosphate operations in October 1990. Christmas Island Phosphates Pty Ltd is now the first private enterprise on the Island that is wholly owned by local residents — every employee of Christmas Island Phosphates Pty Ltd is a shareholder of the mine, thereby ensuring future stability of supply to our markets.

Christmas Island Phosphates' main objectives are to:

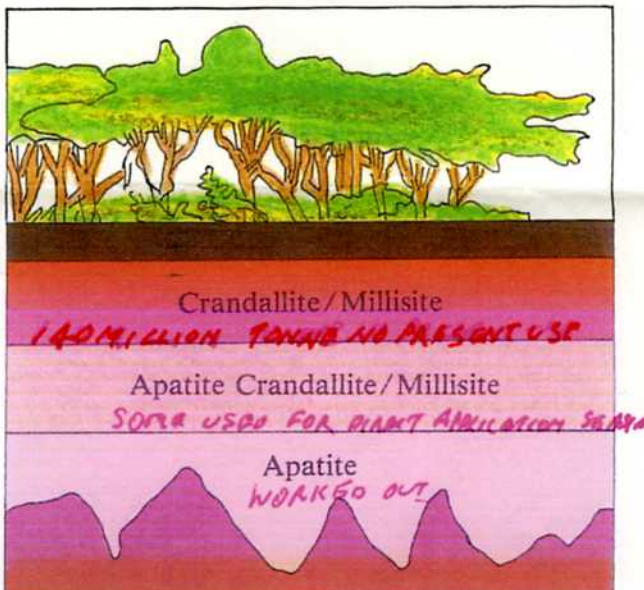
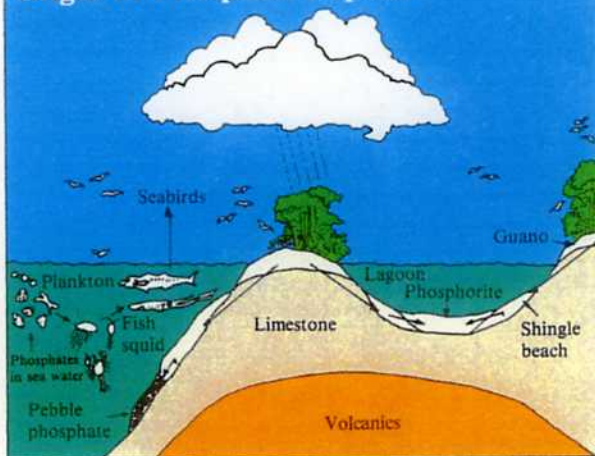
- continuously mine and improve the operations of the Island's phosphate industry
- actively promote and maintain high quality Christmas Island rock phosphate (CIRP) to meet customer requirements
- effectively carry out rehabilitation and conservation of the environment
- support and promote employee participation in the phosphate operations and in community activities, for the benefit of the Island
- and in so doing, sustain the interests of our shareholders and end-users alike

Geography/Geology

Approximately 140 sq km in area, the Island consists of a central plateau generally 180-240 metres high, rising to a maximum of 350 metres.

Christmas Island is an isolated sea mountain rising from a depth of 4500 metres on the southern edge of the Java trench, and is composed of volcanic rocks interbedded with coral limestone. The Island has been subjected to several phases of uplifting, forming a central plateau surrounded by five major escarpments or terraces.

Origin of Phosphate Deposits



The soil is all "phosphatised" and comprises 3 main mineral groups:

- **APATITE** — which occurs as deposits on an irregular Karst limestone surface with many pinnacles. It is the Carbonate-fluor-hydroxy variety with substantial CO₂ being included in the crystal structure. The apatite is normally fine grained being microscopic or submicroscopic.
- **CRANDALLITE / MILLISITE** — calcium, aluminium and iron phosphate minerals occurring in soil profiles derived from weathering and phosphatisation of carbonate and volcanic rocks.
- **Crandallite** — $\text{Ca}(\text{Al}, \text{Fe})_3(\text{PO}_4)_2(\text{OH}) \cdot 5\text{H}_2\text{O}$
- **Millisite** — $\text{Ca}(\text{Na}, \text{K})(\text{Al}, \text{Fe})_6(\text{PO}_4)_4(\text{OH}) \cdot 9.3\text{H}_2\text{O}$
- **BARRANDITE** — strengite / variscite combinations $(\text{Al}, \text{Fe})\text{PO}_4 \cdot 2\text{H}_2\text{O}$ phosphatised volcanic rock

In general, the surface soil or upper-layer phosphate is dominantly Crandallite/Millisite and has been classified C for mining and processing for "Calcination"

The Apatite (tri-calcium phosphate) lies in the limestone pinnacle base formation and has been designated A for "Acidulation"

Between these two zones is a naturally blended mixture, ie. a zone of approximately equal proportions of Apatite and Crandallite/Millisite which was called B for "Broyer" or fine grinding/milling required for Direct Application. This product is now marketed as CIRP (Christmas Island Rock Phosphate).

Current mining and processing is confined to CIRP and generally comprises natural-as-mined mixture of apatite crandallite/millisite, in about equal proportions, maintaining the phosphorus reactivity and availability aspects on tropical soils and crops.

GTA

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Northern Australia Task Force Secretariat
Department of the Environment & Water Resources
GPO Box 787
Canberra ACT 2601

23 August 2007

Our Submission on Development Potential 16 August

Dear Sirs,

We are enclosing copy of covering letter to the STA/C&D report on potential developments in North West Queensland & Adjacent Northern Territory. The report is of 575 pages & dated March 1977 but most of it is still relevant. We are also enclosing section of Fig 3.2.1 of that report which covers mineral deposits in the Carpentaria Drainage Division. These will have significant extra potential when integrated with the Agro-Industrial Complexes outlined in our submission 16 August..

Since issue of the report, some of the developments predicted in it have eventuated but the full potentials are far from being realised. Also since the report STA has become GTA since the demise of Doug Spencer.

Recently GTA has developed processes, with others, that will improve the potential still further. We can detail these processes at the appropriate time.

Regards

Griff Thomas

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Spencer Thomas
Associates Pty. Ltd.
Consulting

Cardno & Davie
Australia Pty. Ltd.
Engineers

in
Association

27th April 1977

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C&D

The Secretary
Department of National Resources
P.O. Box 5
CANBERRA CITY ACT 2601

EBB:RG

Dear Sir

Our ref: 1119A

NORTH-WEST QUEENSLAND & NORTHERN TERRITORY
DEVELOPMENT STUDY

In accordance with the Terms of Reference issued by the Steering Committee, we have completed our investigations into the potential development of the North-West Region of Queensland and the adjacent areas of the Northern Territory, together with associated infrastructure and social requirements related to the various possible developments.

We have much pleasure in submitting to you the Study Report.

Yours faithfully

Guffeth Thomas

Eric Brier

G. THOMAS
PROJECT DIRECTOR

ERIC B. BRIER
DEPUTY PROJECT DIRECTOR

