GUYANA LANDS AND SURVEYS COMMISSION

REGION VI Sub-Regional

LAND USE PLAN

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List of Acronyms

ACT	Amazon Cooperation Treaty
AEZ	Agro-Ecological Zone
BBP	Black Bush Polder
Ca	Calcium
CBD	Caribbean Development Bank
CHPA	Central Housing & Planning Authority
CSO	Civil Society Organisation
DFID	Department for International Development
D&I	Drainage and Irrigation
EEU	Ecological-Economic Units
EEZ	Ecological-Economic Zoning
EPA	Environmental Protection Agency
EPZ	Export Promotion Zone
FAO	Food and Agriculture Organisation of the United Nations
GFC	Guyana Forestry Commission
GGMC	Guyana Geology and Mines Commission
GINRIS	Guyana Integrated Natural Resources Information System
GIS	Geographic Information System
GLASP	Guyana Land Administration Support Programme
GLSC	Guyana Lands and Surveys Commission
GoG	Government of Guyana
GTZ	Gesellschaft für Technische Zussamenarbeit – German Technical Co-operation Agency
IDB	Inter-American Development Bank
ITU	Integrated Terrain Unit
K	Potassium
LDO	Local Democratic Organ
LTR	Land Tenure Regularisation
LUP	Land Use Plan
MCP	Manarabisi Cattle Pasture
MoF	Ministry of Finance
MoA	Ministry of Agriculture
N	Nitrogen
NDC	Neighbourhood Democratic Council
NDDP	National Dairy Development Programme
NDS	National Development Strategy
NGO	Non-Governmental Organisation
NRMP	Natural Resources Management Project
P	Phosphorus
PRA	Participatory Rural Appraisals
PRS	Poverty Reduction Strategy

List of Acronyms (cont'd)

RDC	Regional Democratic Council
RLMCC	Regional Land Management Coordinating Committee
SEU	Socio-Economic Unit
SMU	Soil Mapping Unit
UNDP	United Nations Development Programme
USBR	United States Bureau of Reclamation

East Berbice Sub-Regional

Concise

Land Use Plan

1. Introduction

In the discharge of its legal mandate, the Guyana Lands and Surveys Commission (GLSC) has completed a Regional Land Use Plan for East Berbice Region 6. It is the first Regional Land Use Plan undertaken by the Commission and, as such, serves not only as a regional plan but also as a technical model for the preparation of future regional plans for the rest of the country.

The methodology followed was that of the Food and Agriculture Organisation of the United Nations (FAO), with some additions as outlined in the Natural Resources Management Project (NRMP) Land Use Planning Manual, incorporating some Ecological-Economic Zoning (EEZ) approaches of the Amazon Co-operation Treaty (ACT).

The first step of the process was that of preparation. It included the setting up of the planning team, an introductory meeting with the Regional Democratic Council (RDC), identification and preliminary meeting of a steering committee, demarcation of the planning area, preparation of the work plan and base maps, stakeholder identification and the definition of the planning objectives.

In the second step, an assessment of the actual situation was undertaken. This fieldwork phase involved the collection and analysis of data, thematic map preparation of those data, the identification and analysis of any problems encountered during the fieldwork and a review of the planning goals and objectives in light of any data gathered during the fieldwork.

The Present Land Uses & Land Cover survey showed that:

- The majority of land (61%) is still under Primarily Natural Vegetation.
- The area cultivated is nearing its maximum irrigable capacity (130,650 acres gross – about 102,000 acres net).
- There is almost as much Abandoned Land (109,000 acres) as cultivated land.
- The majority of land (82%) is publicly owned:
    - 10% (59,000 acres) of public land has been abandoned.
    - 40% (51,000 acres) of private land has been abandoned.

In the third step, an analysis of potentials and conflicts was done. This included an assessment of land use potential, an analysis of stakeholder interests through a series of

public meetings and focussed stakeholder consultations, the identification of constraints and conflicts and the feedback of the results to the stakeholders.

2. Potentials and Conflicts Analysis

2.1. Constraints to development

The main constraints to development were identified as:

A. Water Supply

The area currently cropped is approaching its irrigable capacity and any further arable development will initially need to look at improving the efficiency of water use in the Drainage and Irrigation (D&I) areas and in the longer term, the provision of more water for irrigation from a Greater Canje Scheme, or the Corentyne River.

B. Drainage and Irrigation (D&I)

Lack of maintenance of the D&I system is the main constraint mentioned by farmers and is the most frequently cited reason for land abandonment and has led indirectly to the high rate of emigration.

C. Soils

The soils of the Planning Area are a constraint to agricultural development since they all need drainage and irrigation ***before*** they can be brought into production. They require a relatively high level of management for acceptable yields and the choice of crops that can be grown is very limited.

D. Access

There are two types of access constraint:

- Access to farmland along dams.
- Access to backlands and underdeveloped land.

E. Land Tenure

Insecurity of tenure is a constraint to agriculture since farmers are unable to access credit and may be unwilling to invest in land improvements.

F. Infrastructure and Marketing

The inadequate state of the transport infrastructure such as farm roads, ferry services and the lack of a deep water harbour are hampering development. This is exacerbated by a small internal market, meaning that farmers need to grow export crops – consequently, a rapid reliable infrastructure becomes more important.

2.1. Potential for development

The potential for development was evaluated by a combination of land capability and drainability (based on the premise that only gravity drainage is economically viable). This indicated that there are:

- **613,297** acres (86% of the total area) of Class I Good Agricultural Land & Class II Moderate Agricultural Land.
- **477,586** acres (67% of the total area) of relatively easily drainable, Class I and Class II agricultural land.
- **422,350** acres (59% of the total area) of relatively easily drainable, non-saline, Class I and Class II agricultural land.
- **303,226** acres (43% of the total area) of relatively easily drainable, available, Class I and Class II agricultural land.
- **250,936** acres (35% of the total area) of relatively easily drainable, available, **public**, Class I and Class II agricultural land.
- **52,291** acres (7% of the total area) of relatively easily drainable, available, **private**, Class I and Class II agricultural land.

3. Scenario Development

In the fourth step, land use options were evaluated and three scenarios were developed. These were submitted for public consultations prior to the identification of proposed land units and land use systems.

For each scenario, the Planning Area has been sub-divided into areas of similar constraints, development potential and land management needs. Maps of each scenario have also been produced.

3.1. The No Plan Scenario

The No Plan Scenario (see Figure A), is intended to reflect the situation in 2014 without any planned land use interventions - essentially a continuation of the status quo. The scenario assumes that a number of potential infrastructure developments do not take place. It also assumes that there is no Skeldon Expansion, no rehabilitation of the D&I system, no road improvements, no improvement to the Berbice River crossing and no Greater Canje Scheme.

The Map shows eight Land Management Units (**A.-H.**) and describes potential conflict situations. These are as follow:

A. Rice Growing Areas with Functioning D&I

This describes the Black Bush Polder (BBP) and Villages 52-74 areas. These areas will continue to grow rice although profitability will depend on the world market price for the rice. Late payment by millers will push many smaller farmers out of business, although

Land Tenure Regularisation (LTR) could reverse this trend. However, overall consolidation is expected to gather pace. D&I status will decline slowly with the need for constant maintenance. Water User Associations may be formed to better manage water allocation and usage. Conflicts will mainly be between farmers over dam maintenance, D&I maintenance and access, although conflicts with cattle farmers will increase over water allocation from the main feeder canals. Salinity problems may increase if the D&I system is not maintained and farmers refuse to pay the D&I rates thus, exacerbating the problem.

B. Guysuco Sugar Estates

The No Plan scenario assumes no Skeldon Expansion. Otherwise, the estates will continue to be as before with high maintenance, management and input costs and, like with the rice, profitability will depend on the world market price. Conflicts with surrounding inhabitants will increase with greater demand for housing and increased pressure to supply nearby farmers with 'sweet water'. The possibility of greater saltwater intrusion up the Canje is a concern, especially for Providence.

C. Largely Abandoned Lands

This describes most of the privately owned frontlands and the lower Canje area. This area continues to decline with no water for irrigation and poor drainage causing waterlogging in the wet season and a rise in the mosquito population. The land is used for extensive livestock grazing which exacerbates the waterlogging problem, since the surface soil is trampled and compacted. Some cash cropping is practiced on reefs under coconuts. Some areas are converted to aquaculture and some continue as more intensive livestock rearing and dairying. There are conflicts between livestock owners and householders and also with fish farmers. Small animal rustling is a problem. In some areas (Albion frontlands, West Canje), demand for housing is high and squatting is a problem. Conversion of former agricultural land to housing land is ongoing.

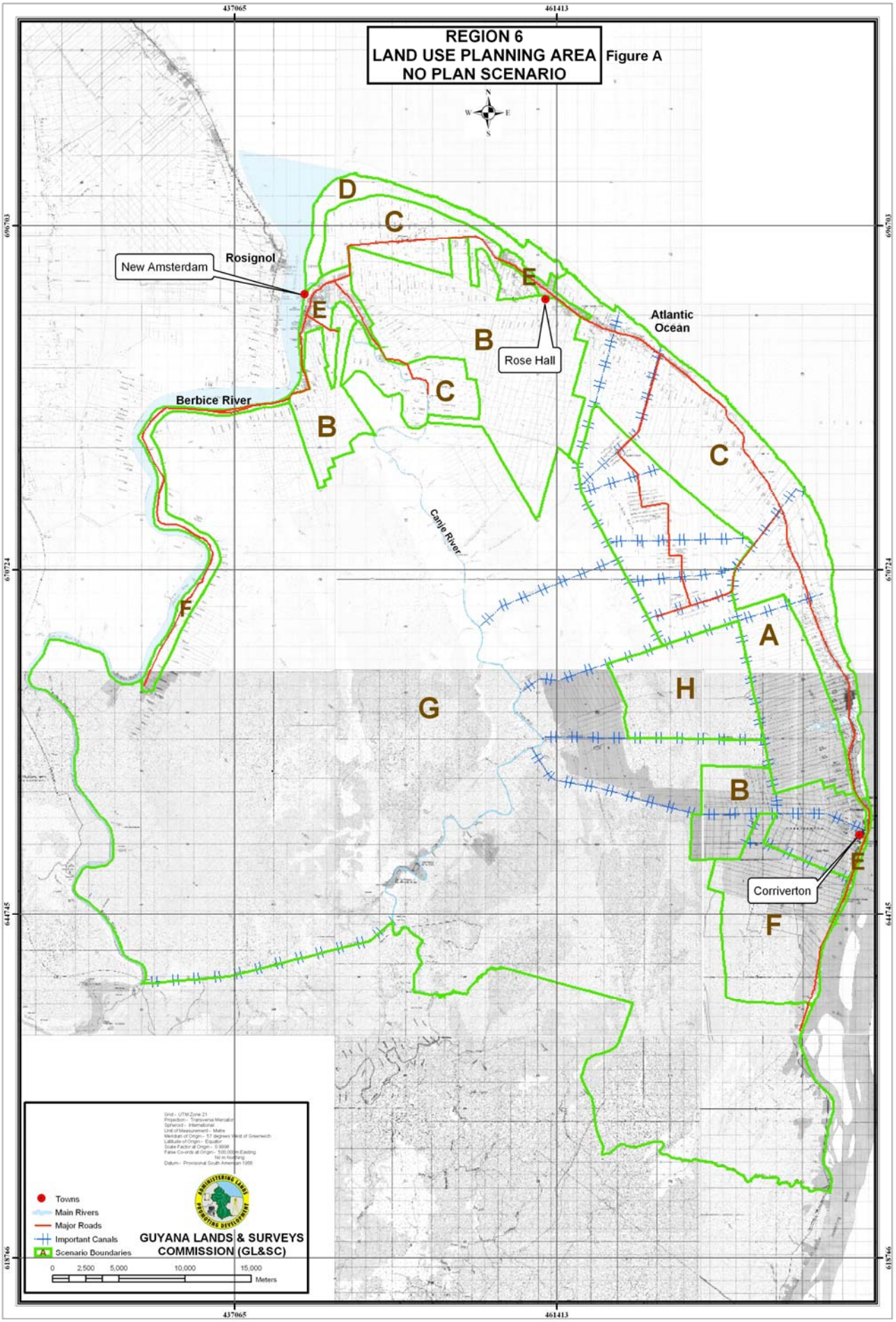
D. Mangrove

This area extends from New Amsterdam to Rose Hall, although there are also a few areas further east, though they have not been mapped. These areas provide shelter and breeding grounds for a wide variety of fauna and act as coastal protection. Their major pressure under the no plan scenario would be the northward expansion of New Amsterdam and Rose Hall, although this is unlikely given the difficulty in building on mangrove and the availability of other land.

E. Urban Areas

This describes New Amsterdam, Rose Hall and Corriverton. There is likely to be pressure on these areas for expansion which, under the no plan scenario could see good agricultural land and mangrove forest converted to housing. Whilst it is considered unlikely that the mangrove will be affected, there will be pressure on good agricultural land, especially around New Amsterdam. Any expansion of Rose Hall should be laterally rather than towards the mangrove but Corriverton has no room to expand being backed by Guysuco's private land. The only potential areas for expansion of Corriverton are the

frontlands of Villages 70 to Springlands and south of Crabwood Creek, all on transported land.


REGION 6
LAND USE PLANNING AREA
NO PLAN SCENARIO
Figure A
437065
461413
696703
670724
644745
618766
New Amsterdam
Rosignol
Berbice River
Rose Hall
Atlantic Ocean
Canje River
Corriverton
A
B
C
D
E
F
G
H
Towns
Main Rivers
Major Roads
Important Canals
Scenario Boundaries
GUYANA LANDS & SURVEYS COMMISSION (GL&SC)
0
2,500
5,000
10,000
15,000
Meters

F. Mixed Arable/Livestock Agriculture

This describes two geographically distinct areas but with similarities under the no plan scenario. They are Crabwood Creek and south to Moleson/Jackson Creek and the frontlands of East Bank Berbice. In these areas, the poor D&I system will see a move away from arable agriculture (especially rice) into cash cropping and extensive livestock production. The livestock will be moved into the backlands for extensive grazing in the dry season but will be brought back closer to the homesteads in the wet season. There will be conflict between arable and livestock farmers over access to land and water, spoiling of crops by animals and wet season foraging. Cattle rustling in the backlands and loss of heads by drowning will continue to be major concerns. Cash crops will be susceptible to drought, flooding, waterlogging and disease and will only supply the local market. High transport costs on poor roads will also reduce any comparative advantage.

G. Natural Vegetation with Extensive Grazing

This describes the majority of the area, the backlands of either side of the Canje Creek, composed of bush, savannah and marshland. This area will be used for extensive grazing, primarily in the dry season, by an increasing number of farmers and an increasing number of cattle. This will result in more competition and the potential for overgrazing. Conflicts between livestock farmers and between livestock and arable farmers will increase and cattle rustling will continue to be a problem. The greater number of cattle will put more pressure on the few dams that reach into the backlands and these will require an increasing amount of maintenance to be suitable for motor traffic. In times of drought, they will be cut to flood pasture lands exacerbating any conflict. However, other trails may become usable and arable farmers and squatters will move in along them and cut out areas for rain fed cropping. These areas will not be fenced and will be a source of conflict between arable and livestock farmers.

H. Intensive Pasture

This describes the Manarabisi Cattle Pasture (MCP), which will continue to be operated as it is now. Any increase in heads will only serve to exacerbate any overgrazing. It is not expected that there will be any development in terms of drainage or forage seeding, although access from the frontlands may become easier with the completion of the dredging of the Yakusari Canal. Conflict with arable rice farmers over access and water and other livestock farmers over grazing rights and water is likely to increase. Rustling is likely to increase and loss of heads by drowning will continue to be a major concern.

3.2. The Medium-Term, Agriculture Led Scenario

This scenario (see Figure B), assumes that agriculture, the dominant sector within the Region, develops optimally through relatively easily attainable interventions, such as, road improvements and drainage maintenance. The scenario still assumes however, that the Greater Canje Scheme will not be built within the next 10 years so there is no major development of arable agriculture which would require drainage and irrigation for implementation.

The main drivers to development and assumptions under this scenario are:

- Rehabilitation of the main roads:
    - From New Amsterdam to Jackson Creek.
    - From New Amsterdam to Mara on the East Bank Berbice.
    - In BBP.

- Rehabilitation and realignment due to flooding of the road:
    - On Canje East Bank through New Forest to Vrede en Vriendshap.

- Rehabilitation and extension of the road:
    - From New Amsterdam through Sandvoort to Wyburg, Canje West Bank.

- Rehabilitation of the D&I infrastructure at Crabwood Creek, Villages 52-74 and BBP.

- The Skeldon Expansion scheme is functioning.

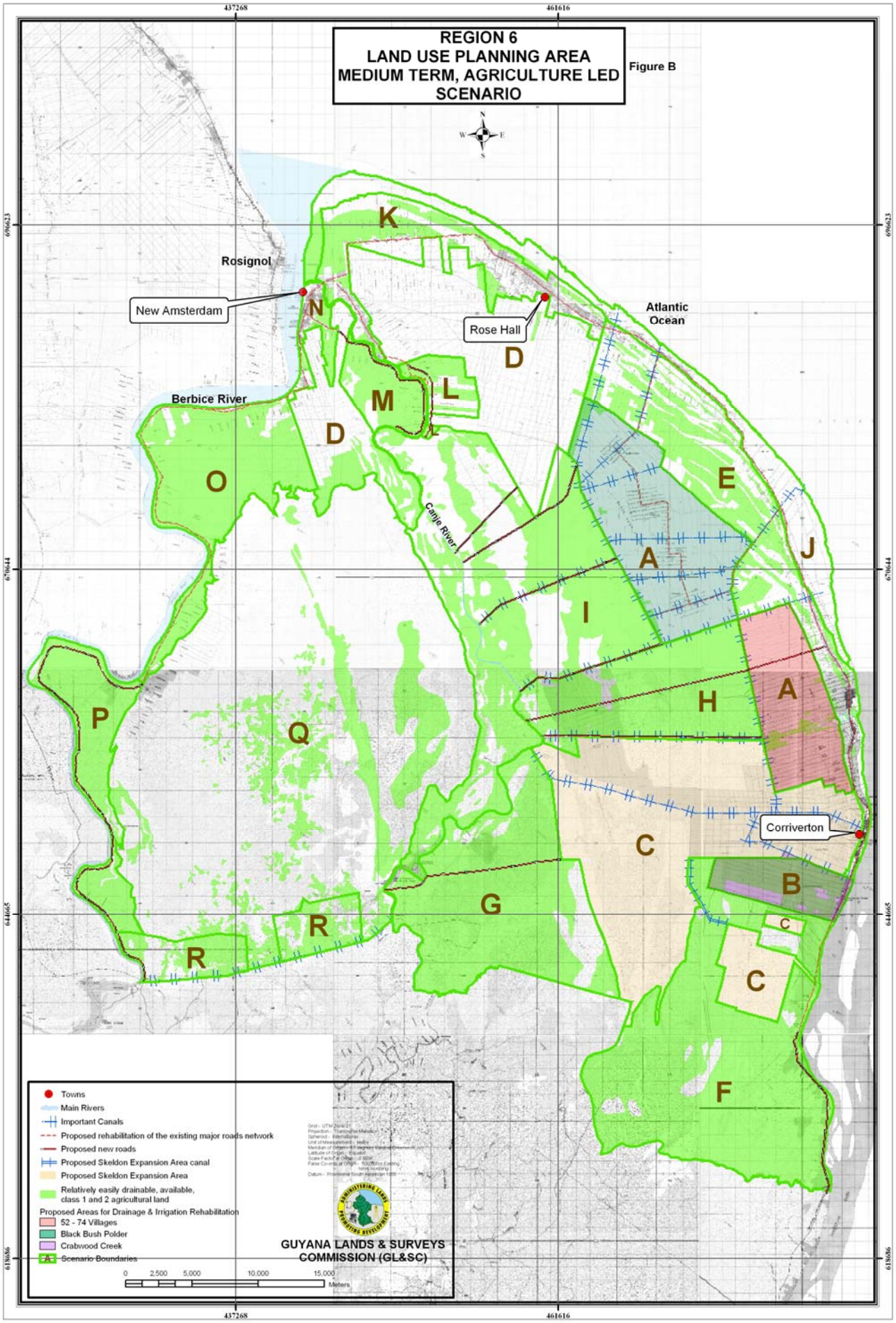
- Fair weather roads are developed from:
    - Moleson Creek to Orealla.
    - Along the Yakusari Canal to the Canje Creek.
    - The Village 57/58 dam through the MCP to the Canje Creek.
    - Along the Old Alness Water Path to the Canje Creek.

The Medium-Term, Agriculture Led Land Management Units

The Planning Area has been divided into eighteen land management units (**A.-R.**) described as follow:

A. Rice Growing Areas With Functioning D&I

This describes BBP and Villages 52-74 where D&I rehabilitation would have been undertaken. Irrigation would be more efficient and water user groups should have been formed to manage water allocation and drainage. Cost recovery through D&I rates should improve dramatically. Saline lands around Village 66 Creek could be brought back into production and, due to LTR; farmers should have greater security of tenure and would be able to coordinate planting and harvesting better. Land consolidation would probably still take place but marketing would be better since both the main road and the BBP road would have been upgraded. However, conflicts with cattle farmers over access to water and dam damage are likely to remain.


REGION 6
LAND USE PLANNING AREA
MEDIUM TERM, AGRICULTURE LED
SCENARIO
Figure B
437268
461616
696623
670644
644665
618686
Rosignol
New Amsterdam
Rose Hall
Atlantic
Ocean
Berbice River
Canje River
Corriverton
K
N
D
M
L
D
O
E
J
A
I
A
H
P
Q
C
B
C
G
R
R
C
F
Towns
Main Rivers
Important Canals
Proposed rehabilitation of the existing major roads network
Proposed new roads
Proposed Skeldon Expansion Area canal
Proposed Skeldon Expansion Area
Relatively easily drainable, available, class 1 and 2 agricultural land
Proposed Areas for Drainage & Irrigation Rehabilitation
52 - 74 Villages
Black Bush Polder
Crabwood Creek
Scenario Boundaries
0 2,500 5,000 10,000 15,000
Meters
GUYANA LANDS & SURVEYS
COMMISSION (GL&SC)

B. Crabwood Creek

The rehabilitation of the D&I system at Crabwood Creek would serve to revitalise the area and farmers could again be growing rice and cash crops in the first four depths and graze cattle in the backlands. Cost recovery through D&I rates should improve dramatically. The nearby Skeldon Expansion could provide alternative employment and the opening up of a road link with Orealla would create an impetus for expansion southwards. Conflict would remain between cattle and arable farmers and with Guysuco over water.

C. Skeldon Sugar Estate and Out-Growers

This would be *the* major development within the Region and would bring a further 21,500 acres of sugar cane into production along with 18,285 acres of conservancy and 4,200 acres of cattle pasture; a total land-take of 43,985 acres. The development can be expected to drive further development within the local area, especially since cattle farmers will have to move away from the conservancies (at least in the wet season) to find grazing land. This could be expected to move grazing lands to the west and south of the estate. Conflict between cattle farmers and the estate could arise if land for cattle is not resolved (see **H.**).

D. East Berbice Sugar Estates

These areas would remain largely the same as under the no plan scenario, there being little room or water for expansion. There is however, a small area of suitable land to the south of Providence that could be developed but this is considered to be unlikely since Guysuco will not want to affect the Canje Creek base flow by extracting any more water.

E. BBP & Villages 52-74 Frontlands

This area of private and publicly owned land currently contains large areas of abandoned land which will only be able to be rehabilitated to arable land if the D&I system is rehabilitated and if there is more water available than at present. Whether there will be more water available than at present, will depend on the rehabilitation of the D&I system at BBP and Villages 52-74 and the success of water user groups in optimising water use. If there is excess water available, then the non-saline land could be relatively easily reconverted to arable land. The saline frontlands however, will prove to be more problematic and in all probability will not be reclaimable. If this proves to be the case, then the land could become pasture, feedlots or holding areas for livestock when not in the backlands. Alternatively, the land could be used exclusively for rearing small livestock and some areas of land close to the road and areas of demand could be converted from agriculture to housing land.

F. Jackson/Moleson Creek and Lower Corentyne

This area lies to the south of Crabwood Creek and would contain the newly formed sugar cane out-growers at Jackson/Moleson Creek. With the expansion of Skeldon and the creation of the Halcrow Conservancy, it can be expected that there will be a renewed impetus to development within the area. The southern part would be opened up for development by the creation of a track from the new Moleson Creek School to Orealla.

However, it is also to be expected that this will be an area of conflict between, Guysuco, the out-growers, incumbent ranchers and new arable and cattle farmers.

G. Baracara Backlands

This area will become more accessible with the construction of the Skeldon Expansion and could become linked to the main infrastructure of the Region by the development of a road or track from the south-western corner of this expansion area to Baracara, a distance of some 12 km (7 miles). This would open the whole area up, although it is also likely to raise conflicts between incumbent and new cattle farmers as well as Guysuco.

H. Manarabisi Cattle Pasture

This area could be developed by providing better all-weather access with an extension of the Village 57/58 dam across the Seaford dam, through the cattle pasture and continued down to the Canje Creek crossing Sookram's dam. The whole area could then be provided with drainage and reseeded with suitable pasture grasses and fodder crops. The development of tube wells as watering points within the pasture land should also be investigated. This would ease the current conflicts between the cattle farmers and rice farmers.

I. BBP Backlands and Middle Canje

This relatively inaccessible area could be made more accessible by improving the Yakusari Canal dam in the east and the Port Mourant Canal and Old Alness Water Path dams in the west. The area has easily drainable land close to the Canje in the south and abutting BBP, with lower-lying areas of land that would be relatively difficult to difficult to drain between these areas and close to the Canje in the north. Without any more available water, the area can only be developed for cattle and rain fed arable cropping with its relative inaccessibility tending towards the former.

J. Mangrove and Coastal Frontlands

This area is essentially the same as under the no plan scenario with the mangrove acting as coastal protection. As with the no plan scenario, the major pressure could come from urban expansion, though again this is unlikely given the difficulty in building on mangrove and the availability of other land. The coastal frontlands that are not mangrove would be priority areas for aquaculture development.

K. No. 19 Road Frontlands

This area to the north of the main road is saline abandoned land currently used for intensive and extensive grazing and aquaculture. Since there is unlikely to be any more water available for rehabilitation of the saline land for arable crops, the main land uses are likely to be similar to the present and the no plan scenario ones, with the possibility of feedlot development and the expansion of aquaculture.

L. Lower Canje East

This area could be rehabilitated by upgrading and realigning the present road and by rehabilitation of drainage channels. The area's proximity to New Amsterdam and Rose Hall estate should then serve to promote cash cropping.

M. Lower Canje West

The driver to the development of this area would be the extension of the road from Sandvoort to Wyburg which would bring a relatively large area of long abandoned land back into use. Its proximity to New Amsterdam should serve to promote cash cropping but drainage will be required since flooding is a constraint in the riverain areas.

N. New Amsterdam

The urban area of New Amsterdam can be expected to grow and it is likely that agricultural land close to the town will be converted to housing or industrial use.

O. East Bank Berbice – North

This area from Rotterdam to Mara could be redeveloped by rehabilitating the main road and by D&I (though especially drainage) improvements. According to the local population, when the Mara road was built, it did not take drainage adequately into consideration, such that water backs up behind the road in the first depth lands and does not drain away quickly due to the sluices being too far apart and the façade drain being too long. A study of the drainage conditions should precede rehabilitation. The area is currently, largely abandoned and used for extensive grazing with small areas of cash cropping but can be expected to develop rapidly with these infrastructure improvements.

P. East Bank Berbice – South

This is the area south of Mara and includes Brandwagt Sari. Here, the construction of a road, flood protection and drainage will be required for any development of arable agriculture. The fact that the area is prone to flooding probably precludes any major development in the short to medium term.

Q. East Bank Berbice Backlands

This large area is underlain by very infertile toxic acid-sulphate soils which are also difficult to drain. This indicates that the area should be left in its natural state and only used for extensive dry season grazing.

R. Forestry Concessions

These two areas to the north of the Torani Canal should be left as forestry concession areas, despite the fact that they are located on relatively easily drainable, moderately good agricultural land.

3.3. The Full Development Scenario

The Full Development Scenario (see Figure C1 & Figure C2), assumes all the interventions mentioned in the medium-term, agriculture led scenario, and also several infrastructure developments, outlined in the National Development Strategy (NDS) and the Poverty Reduction Strategy (PRS). The promotion of regional development in the longer term is dependent on a number of interlinked infrastructure interventions, such as:

- Empoldering the Canje Basin – Canje Reservoir Scheme.

- A bridge across the Berbice River, projected from D'Edward to Seawell (Figure C1); Figure C2 shows the Everton Bridge scenario.
- A new road linking the bridge with the Moleson Creek stelling, and also with Brazil by connecting to the Linden Soesdyke Highway.
- A deep water harbour in the Berbice River estuary.
- An industrial and Export Promotion Zone (EPZ) near to the deep water harbour site.
- An airport in proximity to the EPZ.

Further, major arable development will require more water for irrigation, in which case, the feasibility of damming the Canje Creek upstream of the Torani Canal (The Greater Canje Scheme) should be re-examined.

Similarly, the feasibility of abstracting water from the Corentyne and Berbice Rivers should be investigated.

These interventions would serve to promote long term development within the Region which should be supported by:

- Improved, more market oriented extension services.
- The promotion of aquaculture, especially on abandoned saline land.
- The promotion of intensive livestock farming (including dairying) on saline land.
- Trials of potential crops for diversification, including fodder crops suited to saline and acid-sulphate lands.
- The promotion of industries and processes on the industrial estate that add value to local produce.

The Long Term Land Management Units

The Planning Area is divided into the following (**A.-W.**) land management units:

A. Rice Growing Areas with Functioning D&I

This area describes BBP and Villages 52-74 with a fully functioning and more efficient D&I system. Water user groups would have been formed and farmers have greater security of tenure following LTR. With improved infrastructure, farmers are able to invest to maximise production and would also be looking at diversifying into higher value export crops. The bigger farmers would also be interested in expanding their land holdings by taking up land in **H.** (between Villages 52-74 and the Canje) and **E.** (the frontlands). Whether these areas would be converted from livestock production and abandoned land to arable, would depend on a number of factors such as government policy, water availability, the worldwide economic situation, markets and land prices.

B. Crabwood Creek

In this area, the rehabilitation of the D&I system would revitalise the area and more efficient water use could see it functioning as a mixed agricultural area with cash cropping, especially important for both the local and export markets.

C. Skeldon Sugar Estate

This area would be fully functioning with a new mill, refinery and distillery in operation. These would process some products from the East Berbice Estates. Irrigation water from the Canje would be recycled via two new conservancies. Possible further areas of expansion could include the Baracara backlands (**F.**) or an expansion of out-growers in Jackson/Moleson Creek and south.

D. East Berbice Sugar Estates

With increased water availability, these estates could be looking to expand, ideally into the transported and easily drained land in East Bank Berbice (**R.**), lower Canje (**Q.**) and BBP backlands (**H.**). Additionally, if more land and water were available, management may move away from the more problematic saline frontland soils.

E. BBP & Villages 52-74 Frontlands

This area, currently characterised by coconut reefs and abandoned land, contains appreciable areas of saline land that is likely to prove to be problematic and costly to rehabilitate and in all probability will not be reclaimable. This area is a priority area for poverty alleviation and has potential for conversion to small animal rearing and dairying, since fodder crops and grasses are generally more tolerant of saline soils and irrigation water than most fruits or vegetables. The area would also be suitable for aquaculture. There are also appreciable areas of abandoned public land available that could be converted to small scale industry or housing, depending on demand.

F. Jackson/Moleson Creek and Lower Corentyne

This area could be transformed by the Skeldon Expansion with sugar out-growers and by better access to the south with a road to Orealla. With the possibility of a road from the Everton Bridge, it could become a frontier of agricultural development; an area of mixed farming with sugar cane out-growers, cash cropping, intensive pasture and aquaculture. This will however, require careful detailed planning to reduce potential conflicts.

G. Baracara Backlands

With more available water, this area could become a priority area for arable development given its proximity to the Canje Creek and the development of a road from Baracara to the Skeldon Expansion. However, it will be necessary to check the topography in greater detail since anecdotal evidence and the Macdonald survey of 1965 indicate an area of flooded land (marked as ‘swampy area’) opposite the Torani Canal/Canje confluence. The actual situation on the ground would need to be resolved, certainly prior to any arable development.

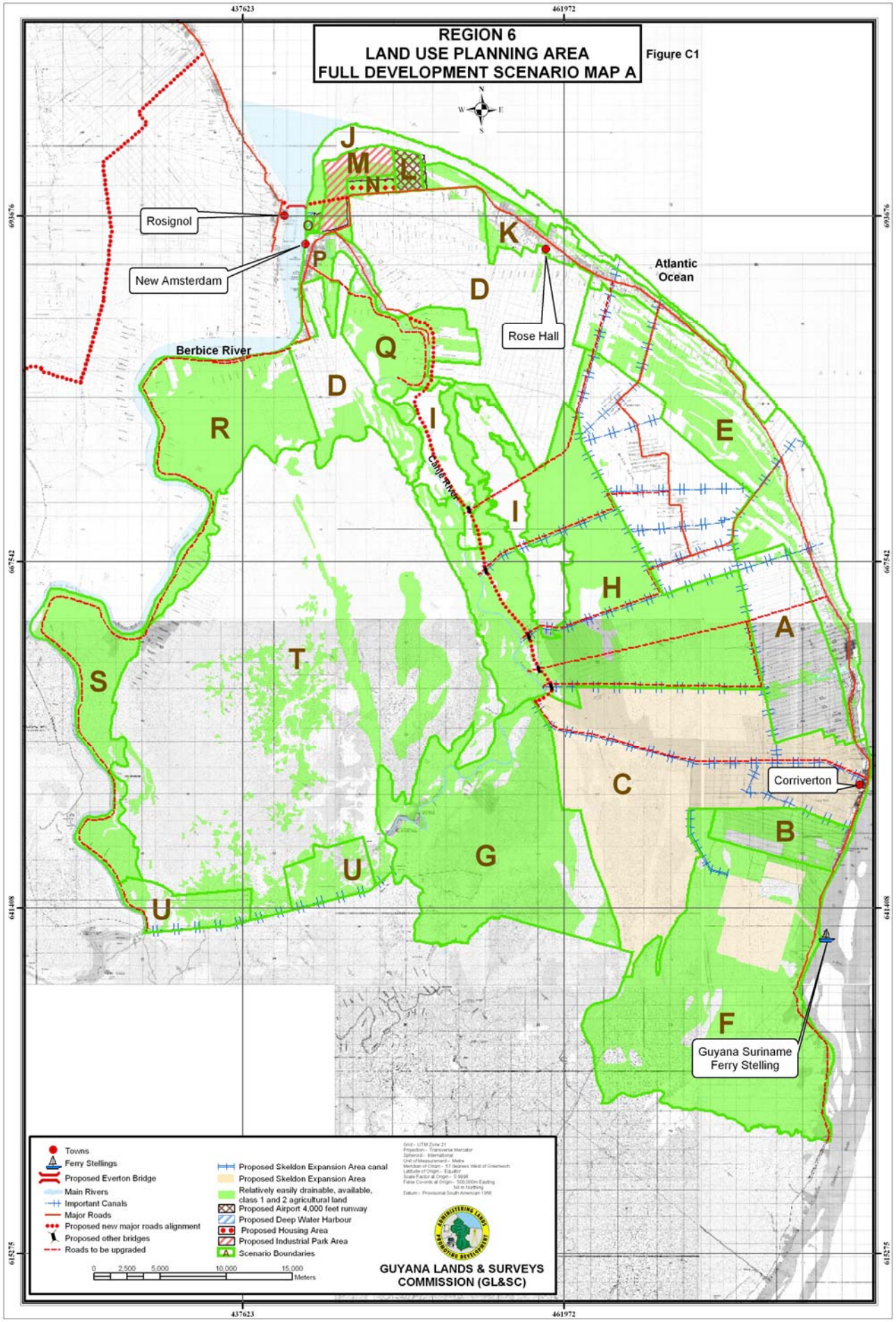
H. MCP, BBP Backlands and Middle Canje. Relatively Easily Drainable

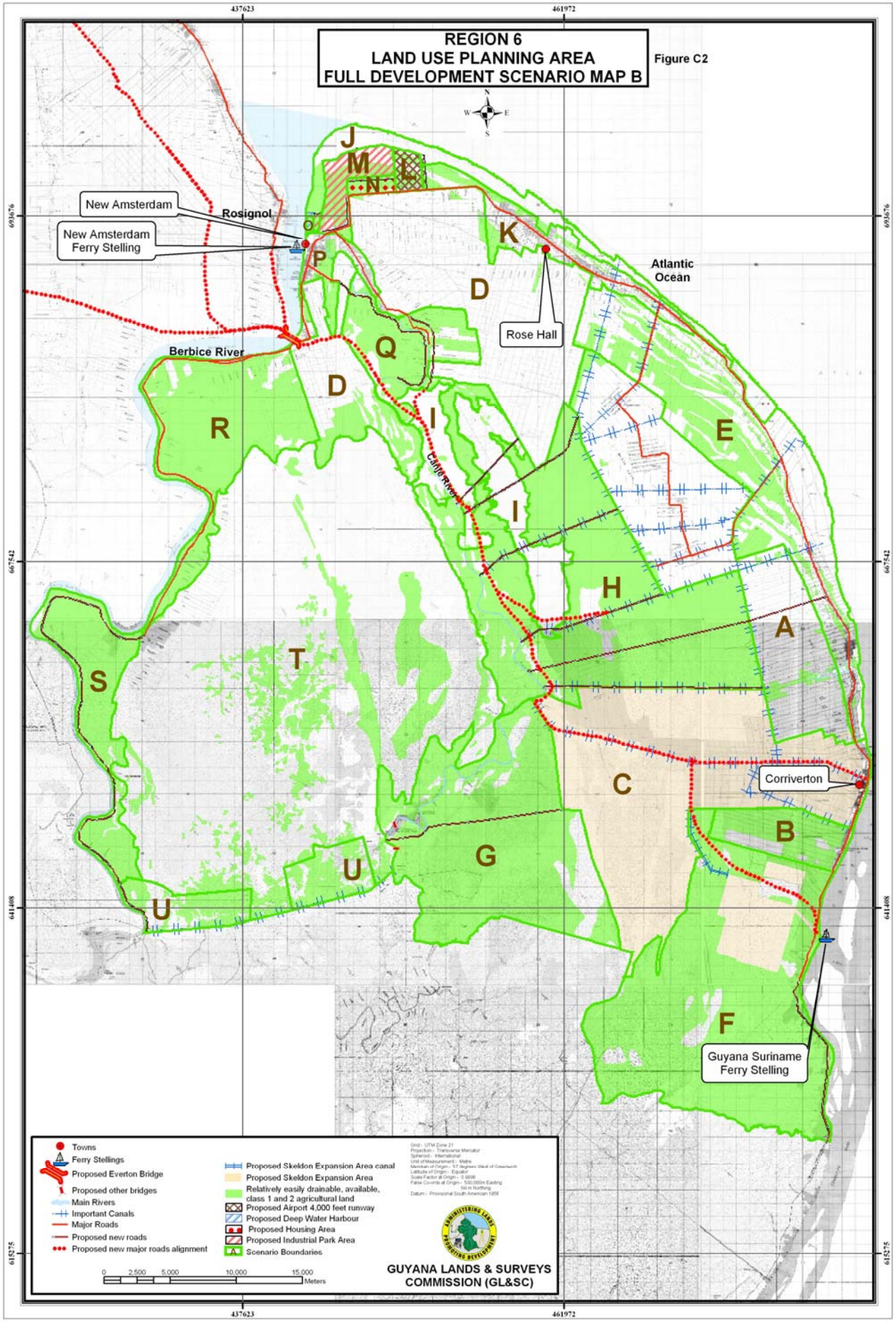
With more available water and with the potential of a road route opening up the area, this would also be a priority area for arable development, even though it currently contains

the MCP. How the land in **H.** and the areas around it are apportioned between arable farming and livestock rearing, will depend on the prevailing socio-economic climate and government policy at the time. The fate of the MCP will probably, largely depend on the degree of previous investment and its outcome in relation to the management of the MCP. If, as the medium-term, agriculture led scenario envisages, the MCP is rehabilitated, provided with access, drainage, fodder crops and tube wells, then the area is less likely to be converted to arable land, than if these interventions did not take place.

I. BBP Backlands and Middle Canje. Difficult To Drain

Being relatively difficult to drain, this will not be a priority area for drainage and arable development. It is more suitable for livestock rearing. However, it is likely to be waterlogged in the wet season limiting its potential to dry season grazing, aquaculture or even a conservancy in the case of the more eastern block. The area could be managed in association with block **H.**, specifically as a conservancy and dry season grazing, giving time for other grazing land in **H.** to recover and supplying arable land in **H.** with supplementary irrigation.


REGION 6
LAND USE PLANNING AREA
FULL DEVELOPMENT SCENARIO MAP A
Figure C1
437623
461972
693676
667542
641408
615275
Rosignol
New Amsterdam
Berbice River
Atlantic Ocean
Rose Hall
Corriverton
Guyana Suriname Ferry Stelling
J
M
L
N
O
P
K
D
Q
D
I
R
E
I
H
A
T
S
C
B
G
U
U
F
Towns
Ferry Stellings
Proposed Everton Bridge
Main Rivers
Important Canals
Major Roads
Proposed new major roads alignment
Proposed other bridges
Roads to be upgraded
Proposed Skeldon Expansion Area canal
Proposed Skeldon Expansion Area
Relatively easily drainable, available, class 1 and 2 agricultural land
Proposed Airport 4,000 feet runway
Proposed Deep Water Harbour
Proposed Housing Area
Proposed Industrial Park Area
Scenario Boundaries
0 2,500 5,000 10,000 15,000 Meters
GUYANA LANDS & SURVEYS COMMISSION (GL&SC)


REGION 6
LAND USE PLANNING AREA
FULL DEVELOPMENT SCENARIO MAP B
Figure C2
437623
461972
693676
667542
641408
615275
New Amsterdam
Rosignol
New Amsterdam Ferry Stelling
Berbice River
Atlantic Ocean
Rose Hall
Canje River
Corriverton
Guyana Suriname Ferry Stelling
J
M
L
N
O
P
K
D
Q
D
I
R
E
I
H
A
T
S
C
B
G
U
U
F
Towns
Ferry Stellings
Proposed Everton Bridge
Proposed other bridges
Main Rivers
Important Canals
Major Roads
Proposed new roads
Proposed new major roads alignment
Proposed Skeldon Expansion Area canal
Proposed Skeldon Expansion Area
Relatively easily drainable, available, class 1 and 2 agricultural land
Proposed Airport 4,000 feet runway
Proposed Deep Water Harbour
Proposed Housing Area
Proposed Industrial Park Area
Scenario Boundaries
0 2,500 5,000 10,000 15,000 Meters
GUYANA LANDS & SURVEYS COMMISSION (GL&SC)

J. Mangrove and Coastal Frontlands

This area is one that will need protection rather than development, especially since it abuts areas of major industrial development and potential pollution sites such as the airport, industrial park and deep water harbour. If feasible, suitable areas of coastal frontland without mangroves should be planted with mangrove.

K. Rose Hall Urban Area and Environs

This area could become a priority area of urban expansion given its proximity to the new infrastructure developments and the areas of long abandoned saline land which could be converted to housing or light industrial use. Depending on the degree of urban expansion, any areas of aquaculture could either stay, providing they are not a hazard to people (insects, disease, smell, effluent, etc.), or be moved away from the urban area to **E.** which would require compensation payment.

L. Airport

The Plan envisages a new 4,000 ft (1,220 m) runway, the same length as the proposed new runway at Ogle, which will be able to handle regional air traffic. Obviously, a feasibility study will have to be undertaken before an airport is constructed.

M. Industrial Park

The industrial park is envisaged as being located between the deep water harbour and the airport, to the north of New Amsterdam, on land that is currently used for extensive (and some intensive) grazing of livestock. A feasibility study on the proposed harbour should also include an estimation of the likely demand for land by industry and commerce and the development could then be phased to reflect the findings. The development also will need to ensure that there is as little impact on the mangrove forest as possible. The development of livestock farming within the Region is likely to increase demand for an abattoir and meat processing plants to add value to the product.

N. New Housing Development

Given that the full development scenario envisages a number of infrastructure developments, it can also be assumed that demand for labour will increase and that the rate of emigration will therefore slow. This will increase housing demand both from within the Region and from outside the Region. Since the main municipalities have little room to expand, a new housing area is envisaged to be located south of the industrial area but also in close proximity to the harbour, the airport, New Amsterdam and Rose Hall.

O. Deep Water Harbour

The site for the deep water harbour is proposed to be immediately to the north of the Canje Creek mouth on the Berbice River. This will involve the destruction of an area of mangrove vegetation which should be kept to a minimum.

P. New Amsterdam

With the proposed development of the deep water harbour, industrial park, airport and bridge, it can be expected that New Amsterdam will receive an economic boost, and its population will increase. Former agricultural land will be converted to housing use. Also,

some industrial land to the south of the town may become vacant if industry moves to the industrial park near the new harbour. This land could then be re-designated as housing land (assuming there is a demand), although pollutant contamination studies will be required before change of land use.

Q. Lower Canje

With improved access to both sides of the lower Canje, the area will be in a good position to take advantage of its location both to provide New Amsterdam and Rose Hall with food crops but also to diversify into high value export crops. However, the area may also come under pressure from Guysuco for conversion to sugar cane and from the expansion of New Amsterdam for conversion to housing land.

R. East Bank Berbice – North

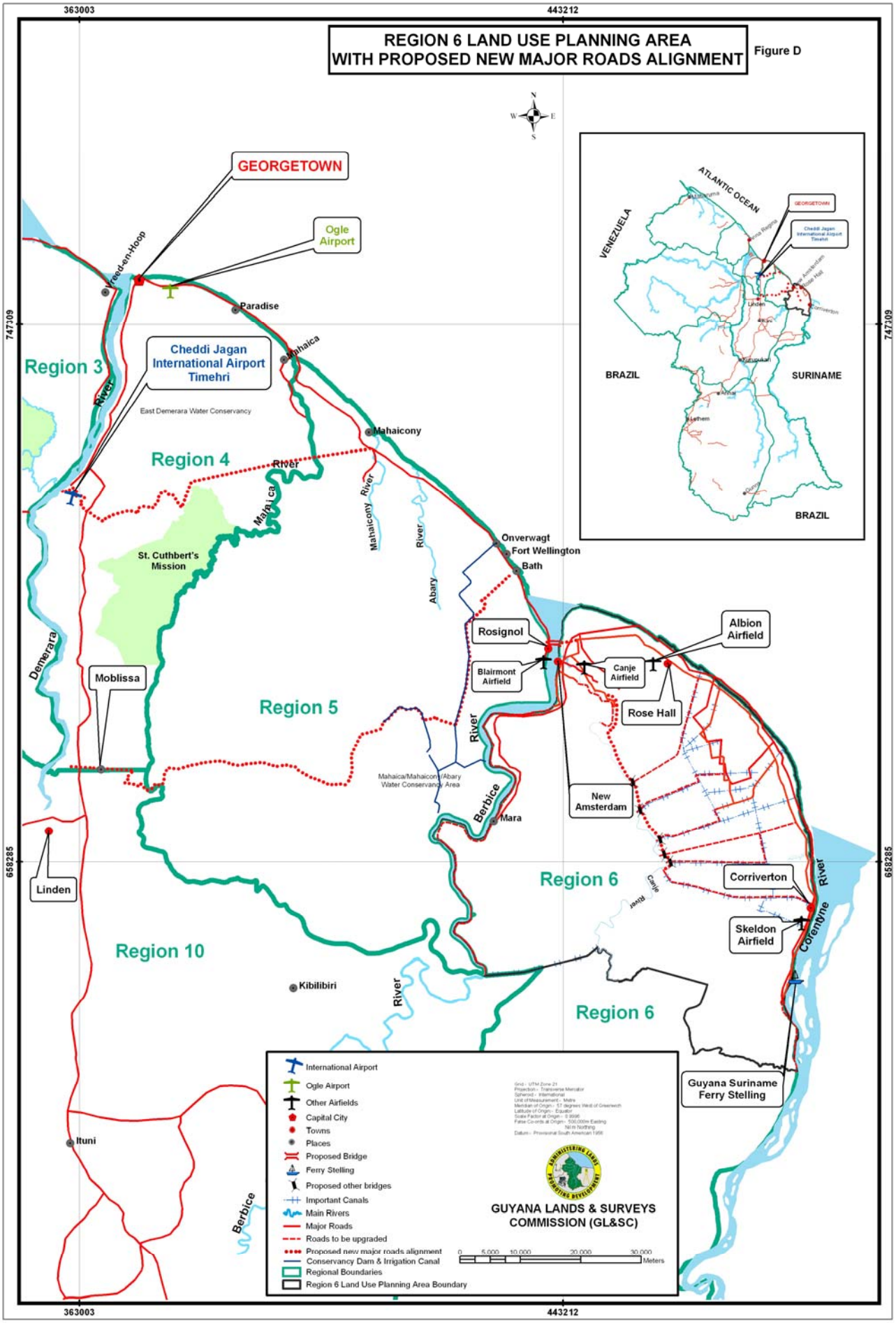
As with the lower Canje area, with improved access and drainage, this area will be in a good position to take advantage of its position close to New Amsterdam and the Berbice River bridge, to become an area of mixed farming with diversification into high value export crops. However, the area is likely to differ from the lower Canje area, in that, livestock will be a much more important component of the mixed farming system. The area is also suitable for aquaculture development, providing the drainage conditions have improved and the back dam has been rehabilitated to keep out the very acid water from the backland swamps.

S. East Bank Berbice – South

This area is similar in many ways to **East Bank Berbice-North**, but flooding and lack of access will be a major constraint to development.

T. East Bank Berbice Backlands

This large area of predominantly low-lying, poorly drained and difficult to drain pegasse soils should be left under natural vegetation and only used for extensive grazing. The fact that much of the area contains toxic acid-sulphate soils, precludes any development other than this.


REGION 6 LAND USE PLANNING AREA
WITH PROPOSED NEW MAJOR ROADS ALIGNMENT
Figure D
363003
443212
747309
658285
GEORGETOWN
Ogle Airport
Vreed-en-Hoop
Paradise
Cheddi Jagan International Airport Timehri
East Demerara Water Conservancy
Region 3
Region 4
Region 5
Region 6
Region 10
Mahaicony
Mahaica River
Mahaicony River
Abary River
Onverwagt
Fort Wellington
Bath
St. Cuthbert's Mission
Moblissa
Demerara River
Rosignol
Blairmont Airfield
Albion Airfield
Canje Airfield
Rose Hall
New Amsterdam
Corriverton
Skeldon Airfield
Berbice River
Mara
Mahaica/Mahaicony/Abary Water Conservancy Area
Linden
Kibilibiri
Ituni
Canje River
Corentyne River
Guyana Suriname Ferry Stelling
ATLANTIC OCEAN
VENEZUELA
BRAZIL
SURINAME
International Airport
Ogle Airport
Other Airfields
Capital City
Towns
Places
Proposed Bridge
Ferry Stelling
Proposed other bridges
Important Canals
Main Rivers
Major Roads
Roads to be upgraded
Proposed new major roads alignment
Conservancy Dam & Irrigation Canal
Regional Boundaries
Region 6 Land Use Planning Area Boundary
GUYANA LANDS & SURVEYS COMMISSION (GL&SC)
0 5,000 10,000 20,000 30,000
Meters

U. Forestry Concessions

These areas are more likely to be felled if road routes I or II (see **W.**) are built. The areas would then have potential for arable development or as stock holding areas in the wet season since they occupy some of the highest ground in the Planning Area.

V. Berbice River Bridge

There are two potential sites for a bridge link across the Berbice River – Brothers and Crab Island. Government has recently identified Crab Island as the preferred site. This will link to D'Edward on the west and Sea Well Palmyra on the east.

Of strategic importance, is the use of the bridge as a link between the Region and the Cheddi Jagan International Airport Timehri and also with Lethem and Brazil. This will also link with the inter-regional countries and the Brazilian traffic needed for the successful establishment of a deep water harbour.

W. Potential Link Roads

Potential road routes linking the Berbice River bridge to Moleson Creek and Lethem, are shown on the Map Figure D and described as follow:

I From D'Edward (Region 6) to Bath (Region 5), to the Mahaica Mahaicony Abary (Region 5) backlands, to the Linden Highway to Lethem and to Boa Vista (Brazil).

II (a) From Crab Island along the Grand Canal to Sea Well to the Corentyne Highway to Moleson Creek.

(b) From New Forest eastward along the Canje Creek to the Sandaka road.

Studies will have to be done to determine the precise alignment with respect to the river bank.

4. Land Use Policy Recommendations

The land use policy recommendations presented here are derived from the information and data gathered during the course of the baseline studies, relate to the potentials and constraints identified and provide a mechanism whereby the overall Plan's goals and its objectives can be realised.

In prioritising interventions that will have the greatest impact on most people within the Region, the development of infrastructure and the transport infrastructure in particular appears to be the most beneficial. Better roads to market, a faster crossing of the Berbice River and the development of a deep water harbour would facilitate achieving the Plan's goals of increased income generation and wider employment opportunities.

The most fundamental recommendation is the need for a national land use policy to guide the regional plans with a particular emphasis on establishing land use priorities, especially where different land uses, and different government agencies concerned with land, are in conflict. This conflict has not been a particular constraint to the Region VI Land Use Plan since the area is overwhelmingly rice, cattle and sugar, but it will be more important in other Regions where the different interests of forestry, mining, tourism and housing could conflict with each other.

The basis for this policy or series of policies could be a series of capability maps as advocated in the NDS. It is proposed that as a matter of policy, land with high to moderate capability for agriculture is retained for agricultural development, except where there is a pressing need of land for housing, industry or infrastructure. This policy will have little conflict with the mining and forestry sectors since the areas where these activities are most suitable tend to correspond to less suitable agricultural land. Where they do occur in conflict with more suitable agricultural land, then the particular local situation will be taken into account. A mine will generally provide greater economic benefit than agriculture so that should have priority but an area of good agricultural land within a forestry area could be demarcated as arable land to optimise the use of the resource and to provide wider employment opportunities and income generation.

However, within the agriculture sector, whilst the above policy would establish a priority for agricultural land in more suitable areas, further policies will be needed to guide the demarcation of arable and livestock farming and also in determining a strategy for the opening up of new agricultural lands.

The Region VI Land Use Plan has highlighted those areas with potential for further development. This has been based, not only on land capability but also on land drainability since it has been assumed that a policy of optimal development would seek to develop the most physically and economically feasible land first. Therefore, within the Planning Area, the total area of some 614,000 acres of good to moderate agricultural land is reduced by a third to 478,000 acres when ease of drainage is taken into consideration.

Whether this land is actually developed as arable land or for livestock, will depend on water availability and this is another area where policy decisions will have to be made. As stated before, the area of land currently cultivated is approaching the maximum area that can be cultivated, using the amount of water currently extracted from the Canje Creek. A national land use policy therefore needs to address this issue of water availability.

If this available land is to be brought into production, then essentially more water needs to be made available either by daming the Canje Creek upstream of the Torani Canal (The Greater Canje Scheme) or bringing water from the Corentyne River (which would involve the Government of Suriname). All these options are costly and a cost benefit analysis would need to be undertaken before any policy decisions could be taken.

These major water development schemes need to be integrated with the overall development of the country and particularly with infrastructure development. Past infrastructure development policy has appeared to be retrograde which has led to the poor state of the national transport infrastructure. The NDS and the PRS acknowledge this constraint and the development of the transport infrastructure is now regarded as a priority. For these reasons, many of the recommendations in the scenarios relate to the development of infrastructure, both locally to gain access to land and nationally, to integrate the country within the wider Region of north-eastern South America. This infrastructure development, whilst being beneficial *per se*, will also improve the marketability of crops and goods and will encourage farmers to diversify into higher-value export crops. This will help to achieve the wider goals of the Land Use Plan in terms of income generation and the provision of wider employment opportunities.

Another set of policy recommendations, many of which are interlinked, can help develop the area in the short term.

The first is that of a Drainage and Irrigation policy which should seek to maximise the efficiency of the D&I system, which will have the same effect as making more water available for irrigation. This has already been mentioned in the NDS and PRS and should result in the formation of Water User Groups who will have responsibility for the operation and maintenance of secondary and tertiary D&I systems. This should improve upon the undesirable state of much of the D&I system in the Planning Area but does require that government maintain the primary structures.

The second area of policy relates to the development of the livestock sector and includes areas of policy related to abandoned land and to the opening up of new lands. In the absence of any more irrigation water, the main thrust of major new agricultural development will be in the livestock sector. This can be achieved relatively easily by policy decisions, firstly to promote the livestock sector and secondly to allow the conversion of abandoned land (mainly former rice land) to intensive pasture and also by the provision of better farm to market roads and the construction of new roads to open up the backlands.

The Plan has identified areas most suitable for agricultural development but has not attempted to discriminate between areas suitable for arable and livestock, largely due to the fact that all areas suitable for arable development will also be suitable for pasture. This recognises that factors other than land suitability such as water availability, macro-economic policy and global markets will be more important in determining whether an area of land is developed for crops or livestock.

The constraint concerning the absence of demarcation between cropped areas and livestock pastures mentioned in the PRS does not appear to be a major issue within the Planning Area. However, with the potential increase of livestock numbers as farmers turn away from arable agriculture (as seen in the no plan scenario); it has the potential to be an area of future conflict. The government should therefore actively promote the

development of the livestock sector, particularly on areas of abandoned land, and should encourage research into the development of better pasture from saline and acid lands.

This policy does conflict somewhat with that of retaining the 'best' land for arable agriculture but if arable agriculture is not possible due to lack of water and the high cost of D&I provision, then pasture development can be justified. This development of the livestock sector however, will need to be serviced by upgrading the transport infrastructure and by facilitating the provision of new abattoirs. If, in the future, more irrigation water becomes available, then the land can be converted to arable land though some land should be retained for livestock.

The NDS identified the lack of a clear strategy for the opening up of new agricultural lands and also called for the identification of the most suitable areas for pasture. As seen before, this will always be difficult since land suitable for pasture will also be suitable for arable crops. However, given the high development costs associated with developing new arable land, the policy in this case should be to allow the development of new lands for both arable and pasture, whilst ensuring that any proposed arable development is guided towards the most suitable land, i.e. Class I and Class II Land. Ideally, all arable development should be on Class I Land, pasture located on Class III Land with a mixture of the two on Class II Land. The land capability maps produced from the Land Use Plan and especially the capability and drainability maps will enable a strategy for the opening up of new lands to be developed. This in turn will enable the Plan objectives of the identification of new lands for development and the allocation of unclaimed land to be realised.

The policy relating to abandoned land has been touched upon under the livestock promotion policy as mentioned before. Essentially, the policy on abandoned land should aim to get the land back into production as soon as possible. However, almost as much abandoned land is private land (51,000 acres) as public land (59,000 acres) and private land is four times more likely to be abandoned than public land (40% verses 10% of land use by tenure). However, it is felt that the policy relating to abandoned land should be one of promotion of alternative uses, allowing change of use rather than punitive measures such as taxation of unproductive land. This is largely because much of the land has been abandoned due to poor D&I maintenance.

The majority of abandoned land occurs in the frontlands where salinity is high. A change of land use is to be encouraged. This change of use could see land become used for aquaculture, livestock, housing and light industry. The policy on aquaculture should be to promote aquaculture, especially on saline former rice land, but far enough away from existing housing areas to minimise the mosquito problem.

The policy regarding the development of saline land should be to accept that the vast majority of saline land cannot be rehabilitated for arable agriculture and therefore to promote conversion to aquaculture, livestock and housing.
Policy should facilitate land use change but would also need to ensure that any new use fits in with the land capability and the recommended land uses outlined in this Plan. This

is based on land capability, but at the 1:50,000 scale, it is too broad for detailed planning. A framework for control of change of use on existing lands would need to be more detailed and to involve the Neighbourhood Democratic Councils (NDCs) and other local entities. This framework should accept the policies outlined before and guide the change from abandoned land to other uses.

Highly saline areas away from existing settlements would be most suitable for aquaculture. Areas close to current settlements and particularly in areas of housing demand could be demarcated for housing development. Other abandoned lands that are not saline (mainly second and third depth lands) should be demarcated for livestock and if there is a demand, other areas could be designated for light industry. Any application for a change of land use would have to be approved by the NDC, the RDC, the GLSC and, if necessary, the Environmental Protection Agency (EPA), which should ensure optimal development of the land resources.

5. Plan Administration

While awaiting a national land use policy which could act as a guideline for plan implementation, there is a need for a body or committee to implement a regional or sub-regional plan. Indeed, it could be argued that even with a land use policy in place there is still a need for a co-ordinating body. What is required is a high-level inter-departmental forum for land related issues. This would act as a conflict resolution mechanism between the different ministries and departments with an interest in land and land use planning and should aim to resolve typical problems of conflicting policies and programmes, inefficiency and any failure to effectively address and resolve problems. Full discussion of land issues at such a forum should result in rational decision making and in the formulation of rational programmes.

This forum should be at a relatively high level in government since it will need to co-ordinate inputs between agencies, manage the relationship between government agencies and the RDC and co-ordinate the Plan's implementation with national and sectoral policies. On a broader scale, the forum will need to address:

- The prediction and monitoring of land use needs and priorities.
- The development of information systems covering land resources, land use and its effects on the environment.
- The co-ordination of the formation, implementation and monitoring of development plan.
- The need for policy and/or structural changes.

This point towards a high-level forum made up of representatives of, amongst others, the GLSC, the Central Planning & Housing Authority (CHPA), the Guyana Forestry Commission (GFC), the Guyana Geology and Mines Commission (GGMC), the EPA, the Ministry of Agriculture (MoA), the Ministry of Public Works & Communication, the Ministry of Local Government and representatives from other relevant ministries. Without this overseeing and co-ordinating committee, there is the potential for a set of regional plans to be produced that are not 'joined-up', do not take national policies and strategies into account and, in the worst-case scenario, actually conflict with the national position.

Therefore, the setting-up of a national forum for the discussion and co-ordination of land issues would be an important step in the implementation process, in that, it could define responsibilities for the co-ordination of the activities, as well as overseeing the Plan's implementation. This forum could also monitor progress in attaining the Plan's goals through close contact with the RDC who would in turn be in close contact with the NDCs and with the public.

A case in point from the Region 6 Land Use Plan is the infrastructure development and its linkages with the rest of the country and neighbouring countries. The Berbice River and the road linkages to Moleson Creek need to be seen in the light of whatever the overall road strategy is for Guyana and between Guyana, Suriname and Brazil. Similarly, the Regional Plan also needs to take any municipal plans that may be forthcoming into account and vice-versa.

The fact that there are currently no approved municipal plans in Region VI, highlights the iterative nature of the Land Use Plan. The Plan has a 10 year time-frame and at the end of that time-frame (or sooner if needed), the outcomes of the Plan can be reviewed and a further 10 year plan produced, possibly including town plans for the three municipalities.

6. Plan Implementation

Being a Regional Plan, implementation should be through the RDC, with funding from central government. Central government will also need to instruct sectoral agencies for the implementation of specific sectoral development projects and facilitate the work of any private sector collaborators. Central government can also issue policy statements and guidelines as set out as mentioned before, as well as using incentives such as grants and subsidies and could also introduce regulations.

However, as the lack of Regional Development Plans following the new regional system in 1980 showed, RDCs do not have the capacity, in terms of capability, staff and equipment, to implement the Plan. The Plan will therefore have to be implemented by sector agencies such as the CHPA, the MoA and the Ministry of Public Works & Communication, possibly co-ordinated by the RDC.

This highlights a fundamental problem of plan implementation, in that government agencies and para-statal organizations are sectoral in their organisation (Agriculture, Forestry, Mining, Environment, etc.), yet land use planning is multi-sectoral and requires not only co-operation *between* these organisations but also co-ordination *of* these organisations if the Plan's goals are to be achieved. The implementation of the Land Use Plan needs to use the expertise of the various sector agencies without appearing to challenge their influence or budget.

Attempts to implement the Plan could be frustrated by ill-defined responsibilities for co-ordination of several activities and regional level administration, lack of involvement of local communities, inadequate co-operation between national and regional authorities, and between sectoral agencies leading to inefficient use of available expertise and lack of experienced staff.

It is recommended that the Regional Land Management Coordinating Committee (RLMCC) as described before, be established to monitor the implementation of the Plan. The RLMCC should comprise representatives of the RDC (Chairperson), the MoA, the Ministry of Public Works & Communication, the CHPA, the NDCs and the Municipalities.

In summary, implementation could be along the following lines.

- The Plan is accepted and ratified by Cabinet.
- The Plan is formally given to the RDC and circulated to all major stakeholders.
- A RLMCC is established.
- Actions needed to achieve the Plan's objectives are cost and a time-frame for implementation is established.
- Funding is identified – this will be from subvention and/or donor funding.
- The RDC implements projects consistent with the Plan.
- The RLMCC monitors progress and keeps in close contact with the RDC, the NDCs and the Municipalities.
- The RLMCC monitors any policy issues and programmes that may affect the Land Use Plan.
- Annual review of the Plan implementation and progress. This will indicate progress towards the objectives and can also highlight any problems encountered, additional budgetary requirements, and changes on the ground that may affect the intervention.

Appendix 1

Goals, Objectives and Methodology

1. Introduction

1.1. Legislative Background

The Local Democratic Organs Act of 1980 instituted a national system of local government through the establishment of the Local Democratic Organs (LDOs). The Act allowed for the division of Guyana into 10 Administrative Regions, which were further subdivided into sub-regions, districts, communities, neighbourhoods and co-operative units. The Act also provided for a RDC for each Region.

The criteria for the division into Regions were population, physical size, geographic characteristics, economic resources, existing and planned infrastructure and the potential for facilitating the most rational use and management of resources.

One of the mandates of the Regions, as envisaged in the 1980 Act, was the preparation of Regional Development Plans that would guide regional economic development. Due to budgetary and technical staffing constraints however, no regional development plans were ever produced.

This situation combined with the lack of a national land use policy resulted in institutional and legislative fragmentation and inadequate institutional communication. This was compounded by weaknesses in land administration and no formal regional planning.

The CHPA was responsible, through the Town & Country Planning Act, for physical development planning and the implementation of standards and land use development control. Under the Act, development schemes were able to be prepared for cities, towns and other areas. However, Georgetown was the only area with an approved scheme.

1.2. Rationale for Land Use Planning Within GLSC

In the absence of a national land use policy, decisions on land use and land resource allocation and management were made through sector-orientated approaches and institutions such as forestry and mining. National initiatives included the National Environmental Action Plan (1994), itself based on the National Forestry Action Plan (1989) and the Draft NDS in 1996, which was updated and revised in 1998 and 1999, and tabled in Parliament in 2000 and 2001.

The NDS led directly to the PRS (2001). These two strategies form the basis for development and policy formulation to improve the standard of living of Guyana.

Many of the recommendations of the NDS concerned natural resource management, land and land use planning, agriculture and environmental policy. Salient points were:

- The maintenance of the resource base of Guyana has been less a result of planning and direct action, than of low use due to the relatively small population and size of the country.

- The fiscal crisis in the 1970s and 1980s constrained the government's ability to manage natural resources and the environment.

- Policies, institutions and legislation were not yet in place to adequately manage the country's natural resources.

- Institutional weaknesses in and across sectors contributed to difficulties in the effective management of natural resources.

- The lack of security of land tenure and a strategic planning capability for sectoral development were also major constraints.

- Environmental management, in relation to development, is a cross-sectoral issue. However institutions and legislation tended to be designed only at sector level.

- The absence of clear policies and guidelines for integrated environmental management (especially of the coastal zone) was a major constraint.

- The lack of a general land use plan was seen to create land use conflicts which then had serious implications for the sustainable use of natural resources.

- As pressure on land resources increased, the need for a national land use policy and plan would become crucial, especially since such a national land use policy could be a strategy for attaining optimum land use towards national development.

- Given its historical role as manager of land resources in the country, and given that the Commissioner of Lands & Surveys is the custodian of all lands, the Lands & Surveys Department (as was) should be the final clearing house regarding land use.

- Given the previous points, and given the need for greater 'cost recovery' on government land, it was proposed to change the status of the Lands & Surveys Department to become a semi-independent GLSC with some degree of self-financing.

Out of this pressing need for strengthened and integrated land resources management, and given the parlous state of land administration in the country, the GLSC was created in June 2001, following ratification of the Guyana Lands and Surveys Commission Act 1999.

One of the functions of the GLSC as set out in the Act is:

> *'to prepare land use plans for Guyana or any part of Guyana, except any municipality, which is subject to a planning scheme (or interim development control pending the preparation of a planning scheme) under the Town and Country Planning Act'*
> (Part II, Paragraph 4(1) (r))

The work completed in Region 6 has established capacity within the Commission to undertake work in other Regions. It is the first Regional Land Use Plan undertaken by the Commission in the discharge of its legal mandate and, as such, serves not only as a regional plan but also as a technical model for the preparation of future plans for the rest of the country.

The work has been supported by key technical Divisions in the Commission, providing a strong basis for further technical development and capacity building.

1.3. NRMP Land Use Planning

The NRMP began in 1995, prior to the Draft NDS in 1996. This GTZ (Gesellschaft für Technische Zussamenarbeit – German Technical Co-operation Agency) funded Project sought, amongst other things, to develop a framework for land use planning in Guyana, strengthen institutional co-ordination and provide a legislative framework for natural resources management.

Central to these aims were, the establishment of a national centre for Geographic Information System (GIS) known as Guyana Integrated Natural Resources Information System (GINRIS) and the formulation of a land use plan for a pilot area that would serve as a training exercise in land use planning and test any chosen methodologies.

The pilot land use planning area selected by Government, spanned parts of Regions 3, 7 and 10 and included Bartica, Linden, Rockstone and Ituni. The Project took almost 5 years to complete (1998 to 2003) and provided important guidelines as well as lessons for future land use planning methodology in Guyana. The results of this work are discussed in greater detail in section 1.6.

1.4. Location

The area chosen as the location of the first GLSC Land Use Plan is the north of Region 6, East Berbice-Corentyne. Map 1 shows the location of Region 6 in the context of Guyana as a whole. The area is bounded by the Atlantic Ocean to the north, the Berbice River to the west, the Corentyne River to the East and the Torani Canal to the south. The area extends inland some 56 km (35 miles) from the coast with a width of about 64 km (40

miles) and covers an area of some 2,882 km^2 (1,112 square miles or 288,233 hectares or 712,223 acres).

1.5. Goals and Objectives of the Plan

Land use planning creates the conditions required to achieve types of land use which are sustainable, socially and environmentally compatible, socially desirable and environmentally sound. It sets in motion decision-making processes concerning the use and protection of natural resources; decisions which have been arrived at by participation and consensus rather than being imposed.

The objectives of any land use plan are:

- **Social Justice**
  Planning should take all sectors of society into account.
- **Long Term Sustainability Of Natural Resources**
  The use of the land should correspond to its natural potential.
- **Acceptance and Social Compatibility**
  Any measures need to be desired, accepted, supported and carried out by those affected by them. They need to be socially compatible and culturally suitable.
- **Economic Efficiency**
  Any measures need to contribute to the long term economic security and to improve the living conditions and overall regional economic development.
- **Viability**
  The planned measures need to be viable in terms of technology, economy and organisation.
- **Regional Equity and Spatial Diversification**
  Any planned measures should ensure the best possible supply to the Region dependent on its facilities and the optimal use of available means.
- **Poverty Alleviation**
  The future land use should contribute to the reduction of poverty and to the improvement of the living conditions of the affected population.
- **Conflict Avoidance**
  Land use conflicts should be avoided or settled through the creation of mechanisms for conflict resolution.

The goals and objectives of the Land Use Plan should also complement the goals and objectives of any national plan. The principal goals of the NDS are:

- Rapid growth of average real incomes.
- Poverty alleviation/reduction.
- Satisfaction of basic social and economic needs.
- Sustainment of a democratic and fully participatory society.

With the objectives for the agricultural sector being:

- to contribute to the increase of incomes, particularly rural incomes, and the reduction of poverty by:

1. Increasing the revenue derived from agriculture by improving efficiency and resource use, thus increasing productivity in farming and processing, and by tailoring production to the needs of the market, both domestic and international.

2. Targeting the resource-poor for special attention to enhance their opportunities for betterment (Ministry of Finance, 1996).

With these central ideas in mind, the goals and objectives of the Land Use Plan for Region 6 are outlined:

Goals and Objectives of the Land Use Plan

For Region 6 (Berbice)

Goal

- **To improve the livelihoods of all residents of the planning area by:**
  - Fostering income generation by optimal allocation and development of physical resources.
  - Providing wider employment opportunities for the Region's population.

Objectives

- **To establish priorities in regard to land use and infrastructure development.**

- **To develop extra-regional linkages that would strengthen the Region's competitive position.**

- **To enable GLSC to define policies and plans with specific relation to:**

  - The identification of new lands for development.
  - The allocation of unclaimed land for development.
  - The creation of a framework to enable land use change.
  - The promotion of infrastructure development.

- **Capacity building within GLSC through the development of a methodology for land use planning for use in the rest of Guyana.**

- **The initiation of a wider review of the national framework for development planning and control. The identification of which agencies are responsible for which aspects and how they work together to provide efficient land management.**

Outputs

- **Plan implementation through inter-agency cooperation.**

- **The capacity within GLSC to produce land use plans for other Regions.**

1.6. Methodology

1.6.1. NRMP and the EEZ Methodology

Under the NRMP, a pilot land use planning exercise was undertaken in an area spanning parts of Regions 3, 7 and 10. This exercise took the best part of 5 years to complete (from 1998 to 2003) and provided important lessons for future land use planning methodology in Guyana.

The NRMP originally proposed to use the EEZ land use planning methodology, which is based on the FAO Agro-Ecological Zones (AEZ) methodology, but which was devised specifically for the Amazon Region and adopted by the countries of the ACT as a possible land use planning tool (TCA, 1997).

The EEZ methodology is similar to that of the FAO land use planning methodology, but gives much more prominence to the biological environment in terms of biodiversity and the socio-economic environment in terms of land tenure, occupation, population, infrastructure and administrative setup, than the FAO methodology.

Initially, the EEZ methodology creates 'Ecological Units' from a description of the physical environment (Geology, Soils, Slope, Climate, etc. which make up Integrated Terrain Units-ITUs) and the ecological environment (Vegetation Type, Diversity, Canopy Height, Distribution Of Fauna, etc.), and then further creates 'Ecological-Economic Units-EEUs' by integration with the socio-economic environment (Population, Land Use, Infrastructure, etc.-Socio-Economic Units or SEUs). This is known as the Phase of Analysis.

There then follows the 'Modelling Phase', essentially an analysis of the potential, constraints and conflicts where the EEUs and the SEUs defined as before, are queried to find their potential both of the natural system (production potential, vulnerability, ecological value, etc.) and of the socio-economic system (activities, infrastructure and services).

This is followed by an 'Integration Phase' involving the development of scenarios, where the two potentials are integrated into EEZs or management units and land use options are developed. Whilst the system allows for community participation throughout, it is at this phase that the stakeholders are contacted and their comments and preferences incorporated into the plan.

The derived zones of land use are then integrated into a plan, the products of which are called EEZ maps since both ecologic and economic variables have been considered.

The EEZ methodology is a sound one and it was attempted by the NRMP in the land use plan of the pilot area. However, problems with the methodology were encountered which

led the NRMP to recommend that the EEZ methodology should not form the basis for future land use planning in Guyana (NRMP, 2003a).
The problems encountered were:

- Lack of methodological clarity. There are no well-documented and detailed guidelines to the methodology available. The NRMP had to develop a procedure for the EEZ from scratch.

- No clear criteria were available as to the selection of information layers for ITU analysis. The results depended considerably on the variables selected.

- As an example, it was found that soil data dominated the variables, even when the available ecological and economic data were incorporated in the delineation of the EEUs.

- Lack of information. Specifically, the available information on abiotic variables was not sufficient or detailed enough to be used for ITU definition. Also, different scales of data led to difficulties in overlaying data, some data sets were incomplete, and time and cost restraints meant that data gaps could not be filled in at a reasonable cost.

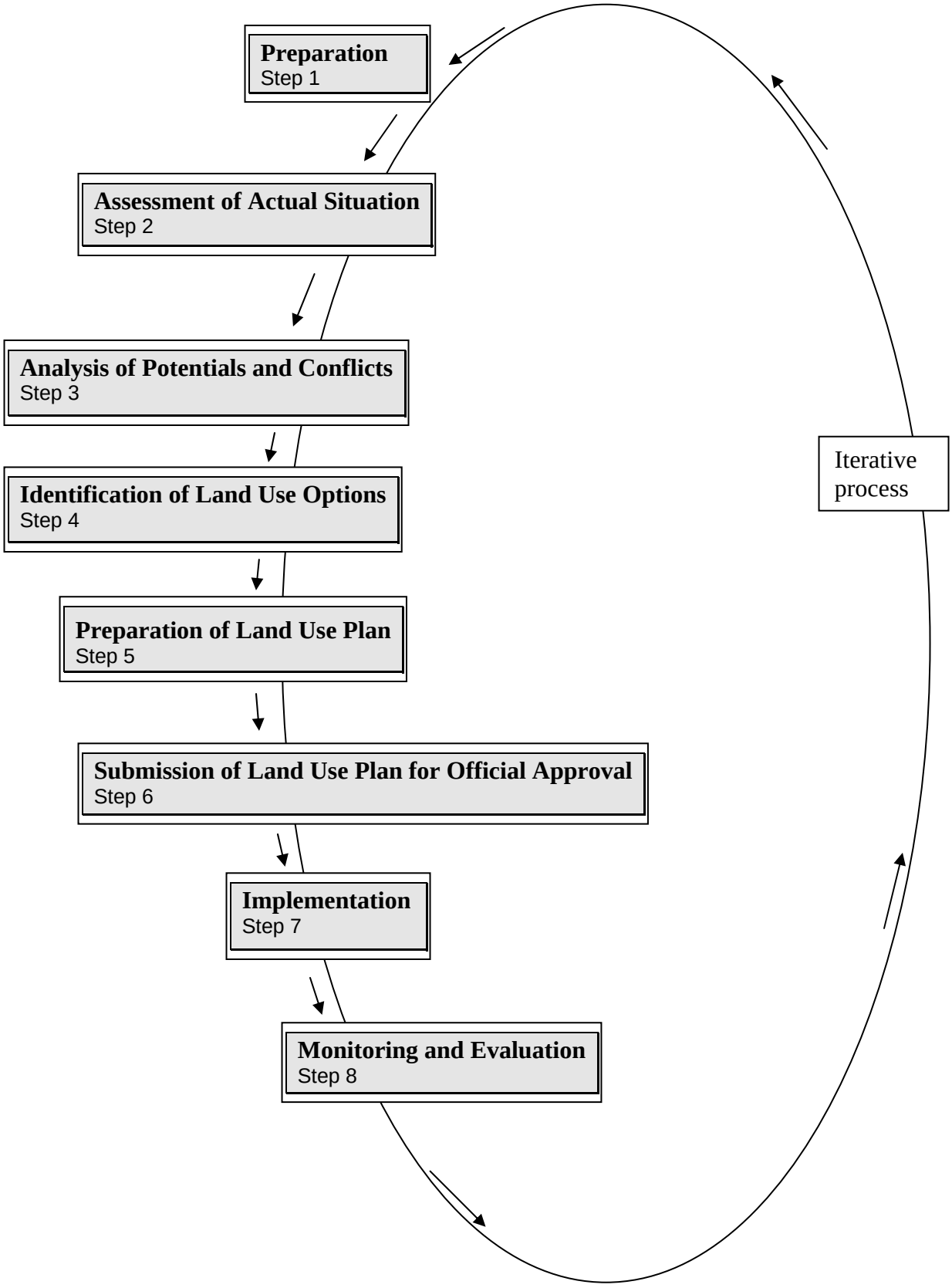
It was concluded that the defined EEUs did not lead to a sound analysis of land use options and were not really suitable for the preparation of future land use scenarios. The NRMP therefore recommended that the land use planning methodology for Guyana should be a blend of the FAO and EEZ approaches and that a manual would be written to guide future work (NRMP, 2003b).

For these reasons, and since it was always proposed to undertake the current land use planning exercise rapidly, within a one year time-frame, the methodology followed is essentially the FAO methodology with some additions as outlined in NRMP, 2003b.

1.6.2. The FAO Methodology

The FAO methodology is shown in Figure 1.1. and is described in greater detail. One of the most important features to note about the methodology, is that it is an iterative process, i.e. it is continuous.

Figure 1.1. The FAO Land Use Planning Methodology



Step 1

Preparation

- Set Up Planning Team
- Steering Committee
- Demarcation Of Planning Area
- Prepare Work Plan and Schedule
- Prepare Base Maps
- Stakeholder Identification
- Definition Of Planning Objectives

Step 2

Assessment of Actual Situation

- Collection and Analysis Of Data
- Map Preparation
- Identification and Analysis Of Problems
- Review Of Planning Objectives

Step 3

Analysis of Potentials and Conflicts

- Assessment Of Land Use Potentials
- Analysis Of Stakeholder Interests
- Identification Of Constraints and Conflicts
- Feedback To Stakeholders and Communities

Step 4

Identification of Land Use Options

- Identification Of Land Use Areas Requiring Change
- Development Of Scenarios
- Evaluation Of Land Use Options
- Presentation Of Proposed Land Units/Land Use Systems

Step 5

Preparation of Land Use Plan

- Preparation Of Land Use Plan and Maps
- Consultation and Review Of Land Use Plan

Step 6

Submission of Land Use Plan for Official Approval

- National and Regional Levels

Step 7

Implementation

Step8

Monitoring and Evaluation

Step 1 of the FAO methodology is that of preparation and includes such activities as setting up the planning team, the preliminary meeting of a steering committee, the demarcation of the planning area, the preparation of the work plan and base maps, stakeholder identification and the definition of the planning goals and objectives. These activities were undertaken within the first few weeks of the Plan's initiation between late February and early March 2003.

Step 2, the assessment of the actual situation is the main fieldwork phase of the Plan definition and involves the collection and analysis of data, thematic map preparation of those data, the identification and analysis of any problems encountered during fieldwork and a review of the planning goals and objectives in light of any data gathered during the fieldwork. These activities commenced in late March/early April 2003 and continued until mid-August 2003. Fieldwork was completed at the end of May 2003 but the map production phase took until August 2003.

Step 3 is the analysis of the data in terms of potentials and conflicts and includes an assessment of land use potential, an analysis of stakeholder interests, the identification of constraints and conflicts and the feedback of the results to the stakeholders. This part of the Plan, with its many different activities, stretched from May 2003 when initial stakeholder consultations were held through to January 2004 when, following the analysis of potentials and conflicts, the results were supposed to have been reported back to the communities.

Step 4, the identification of land use options, in many ways occur at the same time as **Step 2** and **Step 3**, in that the identification of any areas requiring change and the evaluation of land use options first becomes apparent during the fieldwork in **Step 2**, though the development of scenarios and the presentation of proposed land units and land use systems is only possible after thematic map preparation and the analysis of potentials and conflicts. This Step then, whilst being considered during fieldwork in May 2003, was primarily undertaken in September/October 2003.

Step 5, the actual preparation of the Land Use Plan and maps took place in September to October 2003 with the consultation and review of the Plan being carried out in November 2003.

Step 6, the submission of the Plan for official approval will take place following acceptance of the Plan in **Step 5**.

Step 7, the implementation of the Plan will take place according to the Plan's time-frame between 2004 and 2014.

Step 8, monitoring and evaluation of the Plan should take place during and after the course of the Plan's lifetime.

1.6.3. The Methodology Of The Land Use Plan For Region 6

1.6.3.1. Plan Preparation

The Land Use Plan for Region 6 began at the end of February 2003.

The first task was that of initiating the land use process and ensuring the participation of all stakeholders. To these ends, the following tasks were undertaken during this phase.

A. ***Setting up the Planning Team***
The planning team was initiated in late February 2003 and comprised: The Commissioner of the GLSC, three support staff of the Land Use Planning and Policy Section-GLSC, a consultant to the GLSC and one representative each from the Ministry of Fisheries Crops & Livestock-National Dairy Development Programme (NDDP) and from the MoA. The Planning Team first met in early March 2003 followed by several other meetings.

B. ***Demarcation of the Planning Area***
The planning area was demarcated in early March 2003, though the southern boundary was subsequently changed to incorporate the planned Skeldon Sugar Estate Expansion, following the first Steering Committee Meeting.

C. ***Setting up the Steering Committee***
An initial meeting was held with the RDC at which the proposed land use planning exercise was introduced and discussed. The RDC was asked to comment and to suggest representatives for the Steering Committee. The first Steering Committee Meeting was held in New Amsterdam on April 4, 2003, with further meetings held on June 24, 2003 and October 13, 2003.

D. ***Preparation of the work plan and base maps***
The planning team drew up a work plan and a start was made on the collation of material for the base maps.

E. ***Stakeholder Identification***
The identification of stakeholders was made at this time. The Stakeholder Analysis follows:

Background
The goal of Phase II of the Guyana Land Administration Support Programme (GLASP) has been to improve sustainable livelihood options for all land users, but particularly poor and vulnerable groups. In order to identify all land users with an interest in the GLASP Phase II and to facilitate their participation, a comprehensive analysis of primary and secondary stakeholder groups was completed.
In the long term, the GLSC must seek to regularise tenure on all classes of land to enable the government to establish priorities with regard to land allocations, land use and changes of use. The GLSC now requires a capacity to analyse and develop plans and policies for the development of public land in all aspects. Specifically, the GLSC will

require the capacity to direct potential investors to the best land, to define policies and plans for the allocation of unclaimed land for housing development and to develop strategies for land use change in agricultural land.

The Region 6 (Berbice) Land Use Plan (LUP) is intended to act as a means of developing methodologies which may then be applied in other parts of the country. An integral part in the development of a land use plan is the identification of stakeholders. A summary is provided for the primary and secondary stakeholder groups in relation to the Region 6 LUP.

At the inception of GLASP, a comprehensive list of primary and secondary stakeholders was identified for the main GLASP Project components. A detailed list was prepared and refined as fieldwork and consultations progressed. The list presented here includes only those groups with an interest in the Region 6 (Berbice) land use planning exercise.

Primary Stakeholders are land users likely to be directly affected, either positively or negatively, by the LUP, whilst **Secondary Stakeholders** include all other people and institutions with a possible interest or intermediary role.

1. Primary Stakeholders

The primary stakeholders are those who use the land in the area. These include farmers and all other land users with an interest in or claim to land, including agricultural co-operatives and commercial corporations. This broad group of land users can be grouped according to:

- Scale of enterprise and reliance on agricultural income.
- Type of farming. Rice, Sugar, Fruit & Vegetables and Livestock.

Scale of enterprise

Rice farmers generally cultivate larger holdings in comparison to non-farmers. The GLASP Phase I survey results indicate a guideline average farm size of six acres for non-rice farmers and 22 acres for rice farmers. These averages were adopted in the GLASP Phase II for the grouping of primary stakeholder farmers into small and large scale.

A distinction was also made between part-time and full-time farmers. Farmers who rely on agriculture as their main source of income are likely to be more affected by the LUP decisions than those who are not. This is due to the fact that for them, land will be a more important asset for sustaining a secure livelihood. Farmers who gain more than half their income from agriculture have been defined as ‘full-time’ and those who gain more than half their income from other sources as ‘part-time’.

Those groups with a commercial interest in agriculture and industrial development have also been identified as being primary stakeholders.

2. Secondary Stakeholders

The secondary stakeholder groups include all other individuals and institutions with a possible stake, interest or intermediary role in the LUP. These include Government

Ministries, Regional Government Organisations, Para-statals, Civil Society Organisations (CSOs) and Non-Governmental Organisations (NGOs).

Government Ministries, Regional Government Organisations and Para-statals, generally have a recognised role in infrastructure planning and their interests in the LUP can therefore be more clearly defined. Government and Regional Institutions with a direct interest would include *inter alias:*

The MoA, the Ministry of Amerindian Affairs, the Ministry of Housing & Water (CHPA), the GLSC Regional Offices, the RDC, and the NDCs.

CSOs and NGOs through their development, advocacy, service provision activities and local community representation, could however, have a particular role in the LUP. These groups are likely to include:

- Farmer Groups such as the Rice Producers and Cattle Farmers Association.
- Community Development Committees.

Table 1.1. LIST OF PRIMARY STAKEHOLDERS

PRIMARY STAKEHOLDERS	MAIN INTERESTS	POTENTIAL PROJECT IMPACT	PRIORITY OF INTEREST
General Public			
Full-Time & Part-Time Farmers	➢ Improved management of D&I. ➢ Greater security through better information on future development plans.	**+** **+**	**1**
GUYSUCO	➢ Resolution of squatter problems on GUYSUCO land. ➢ Land allocations for housing and other developments.	**+/-** **+**	**4**

Table 1.2. LIST OF SECONDARY STAKEHOLDERS

SECONDARY STAKEHOLDERS	INTERESTS	POTENTIAL PROJECT IMPACT	PRIORITY OF INTEREST
Central Government			
MoA	➢ More effective co-ordination between sector organisations. ➢ Improved information for land policy decisions.	+ +	**1**
Ministry of Amerindian Affairs	➢ Possible encroachment on Amerindian Lands. ➢ Improved access to schools and clinics.	+ +	**1**
Ministry of Housing & Water (CHPA)	➢ Access to land for commercial developments. ➢ New housing developments.	+ +	**2**
Ministry of Human Services and Social Security	➢ Improved administration of social services through better information.	+	**2**
Ministry of Tourism, Industry & Commerce	➢ Improved control of tourist developments. ➢ Improved guidelines for land development.	+ +	**3**
Ministry of Information (Guyana Information Service)	➢ Contents of public information campaign. ➢ Contents of press release.	+/- +/-	**4**

Table 1.2. LIST OF SECONDARY STAKEHOLDERS

SECONDARY STAKEHOLDERS	INTERESTS	POTENTIAL PROJECT IMPACT	PRIORITY OF INTEREST
Regional Government			
GLSC Regional Offices	➢ Improved management of public land. ➢ Improved information for the general public.	+ +	**1**
RDC	➢ Improved management and planning for the development of public land. ➢ Improved information for detailed land development planning and infrastructure development.	+ +	**3**
NDC	➢ Improved infrastructure planning.	+	**3**

Table 1.2. LIST OF SECONDARY STAKEHOLDERS

SECONDARY STAKEHOLDERS	INTERESTS	POTENTIAL PROJECT IMPACT	PRIORITY OF INTEREST
Para-statal Organisations			
D&I	➢ Collection of D&I rates. ➢ Improved collaboration with Water Users' Associations.	+ +	**2**
EPA	➢ Environmental implications of planning decisions. ➢ Improved guidelines for land use.	+/- +	**3**
Guyana Energy Agency	➢ Improved information to guide future development and planning.	+	**3**
GFC	➢ Potential conflicts with forestry concessions.	+/-	**3**
GGMC	➢ Potential conflicts with mining development.	+/-	**3**

Table 1.2. LIST OF SECONDARY STAKEHOLDERS

SECONDARY STAKEHOLDERS	INTERESTS	POTENTIAL PROJECT IMPACT	PRIORITY OF INTEREST
Donors			
Department For International Development (DFID)	➢ Poverty alleviation. ➢ Environmental protection strengthened.	+ +	**1**
Inter-American Development Bank (IDB)	➢ Improved information for infrastructure investments.	+	**1**
GTZ	➢ Improved information for land use planning. ➢ Improved information for land policy development.	+ +	**3**
Caribbean Development Bank (CDB)	➢ Improved information for project funding.	+	**4**

+ Positive - Negative
1 - Highest Priority 2 - Medium Priority
3 - Marginal Priority 4 - Lowest Priority

F. Definition of Planning Goals and Objectives

The planning goals and objectives were drawn up at this stage. These were based on the wider recommendations of the NDS and the PRS as well as the East Berbice Physical Development Plan (Bishop, 2002), and were discussed both by the planning team and the steering committee.

1.6.3.2. Assessment of the Actual Situation

This phase of the land use planning exercise concentrated on the more detailed technical aspects of the work. The main focus was the assessment of the actual situation on the ground and involved data collection through fieldwork, reports and maps, and interviews and discussions with stakeholders.

Thematic map production followed, along with the identification and analysis of any problems encountered during fieldwork and a review of the planning goals and objectives in light of any data gathered during the fieldwork.

A. Collection and Analysis of Data

The data collected came from many sources including:

- Administrative Structure – from existing maps.

- Population – from census data and a United Nations Development Programme (UNDP) human development study (unfortunately the 2001 census data was not available).
- Land Resources – from existing reports and maps, backed up by fieldwork.
- Present Land Uses & Land Cover – from fieldwork and existing mapping.
- Land Tenure and Land Occupancy – primarily from existing fieldwork mapping.
- Infrastructure and Services – from fieldwork and existing mapping.
- Employment and Income – from existing reports.
- Poverty – from an existing study.

Data quality varied from very good if old for most land resources data, to patchy and difficult to map for most socio-economic data such as employment and income.

In a departure from the NRMP manual, no Participatory Rural Appraisals (PRA) were carried out as such, although stakeholder interests were taken into account through a series of public meetings, by focused discussions with stakeholder representatives and by talking to farmers during the course of fieldwork. The issues raised are discussed further in Appendix 3.

B. Map Preparation

The thematic maps were prepared at the GLSC immediately following the fieldwork phase. They were prepared and produced in the software ArcGIS 8.2 by ESRI and include:

- Population
- Socio-Economic Infrastructure – schools, hospitals, police stations, etc.
- Infrastructure – roads, canals, ferry stellings, etc.
- Administrative Divisions
- Soils – Soil Mapping Units (SMUs)
- Soil Drainability
- Soil Natural Drainage
- Soil Acidity
- Soil Fertility
- Soil Capability
- Present Land Use & Land Cover
- Land Tenure
- Land Occupancy
- Flooding Hazard
- Forestry Concessions

C. Identification and Analysis of Problems

The identification and analysis of problems was ongoing from the initial reconnaissance fieldwork, through the first steering committee meeting, through meeting farmers on the

land during the main fieldwork phase and during the public meetings and focused stakeholder consultations that were held in May 2003.
At this time, the area was sub-divided into 12 planning zones, based primarily on socio-economic criteria, and the characteristics, constraints, potential and issues affecting these zones were noted. This served to structure the analysis of potentials and constraints, which consisted of querying the thematic maps indicating the actual situation, highlighting problem areas and indicating possible solutions to identified problems. This resulted in a re-drawing of the planning zones, including physical and environmental criteria as well as socio-economic criteria. The combination of these criteria then formed the basis for scenario development and ultimately the areas of proposed land use. This is discussed further in Appendix 3 and in the East Berbice Sub-Regional Concise Land Use Plan.

D. Review of Planning Goals and Objectives

Following the identification and analysis of problems, a review of the planning goals and objectives was undertaken and they were deemed to be robust.

1.6.3.3. Analysis of Potentials and Conflicts

This step involved an appraisal of the opportunities for closing the gap between the present situation and the planning objectives. Following an assessment of the problems, the next step was to see what could be done to ameliorate them. In general, opportunities to solve problems are presented by the presence of unused, under-used or sub-optimally used land, new technology (e.g. improved crop varieties), or a change in the socio-economic or political scene, such as land tenure reform, tax regime changes or subsidy reform.

Following the production of the thematic maps indicating the actual situation on the ground, this part of the methodology essentially amalgamated all the different data variables, such as:

- **physical variables** (soil, topography, etc.)
- **environmental variables** (climate, vegetation, land cover, etc.)
- **socio-economic variables** (D&I status, land tenure, land use, infrastructure, population, etc.)

and created areas of similar land use and land management systems. These then became the land use planning zones, areas which are relatively homogeneous in terms of their physical, environmental and socio-economic characteristics and which have their own problems, constraints, potentials and solutions.

As outlined in section 1.6., in the EEZ methodology, this would involve the creation of ITUs using physical variables. This was not found to be practical for the current planning area since there is very little topographic relief and many of the soils that would have formed the basis for the ITUs are very similar or at least show little difference in their characteristics and management.

The assessment of land use potential was therefore undertaken using soil drainability and capability as the basis for delineating areas of similar physical characteristics. Soil drainability was chosen since this integrates soil characteristics and topographic considerations and will (or at least should) be the primary consideration for development. This is based on the premise that only gravity drainage is economically viable (MottMacdonald *pers. comm*. 2003) and that there is no point in trying to develop a particular area before another if it will be much more difficult to drain. Land capability was chosen since this is an expression of soil characteristics such as fertility, drainage, texture, salinity and toxicity.

The final land use planning zones are therefore based on an amalgamation of socio-economic, physical and environmental variables. In some areas, broad socio-economic factors such as land tenure, D&I status and land use, were considered (reinforced by stakeholder interviews) to be of greater importance than physical or environmental variables, whilst in other areas the reverse was true.

An example of the former, is the fact that Albion sugar estate and the frontland villages to the east of Port Mourant have broadly similar saline soils with a land capability rating of IIs. However, differences in the availability of water and management skills have resulted in the estate continuing to produce sugar, whilst in the villages the land is abandoned due to salinity and poor workability. An example of the latter comes from East Bank Berbice where the boundary between the riverain agricultural land and the swampy backlands was initially drawn according to land tenure (the plots' eastern boundary), but was later revised westward when it was noted that the potentially toxic acid-sulphate soils extended well into the demarcated areas.

It should be noted that depending on the type and quality of data available, different criteria would be used in different Regions of the country for assessing a Region's potentials and constraints. For instance, in the NRMP pilot land use planning area, the forestry and mining sectors were very important, whereas in Berbice, where agriculture is the dominant sector, they are relatively unimportant.

A. Assessment of Land Use Potentials

The assessment of land use potential was undertaken as just described, using land drainability and capability as the criteria. The rationale for this is that each land unit presents similar problems and opportunities and will respond in similar ways to management.

The base data for this stage were the soil and topographic maps. Maps of specific land characteristics such as drainability, drainage, fertility, soil acidity and toxicity were also created and used in the planning process.

The potential for agricultural development and for aquaculture, housing and industrial development was considered. The potential for fishing, forestry and mining development was briefly considered. This process is discussed in greater detail in Appendix 3.

B. Analysis of Stakeholder Interests

Stakeholder interests were taken into account through a series of public meetings, by focused discussions with stakeholder representatives and by talking to farmers during the course of fieldwork. This is discussed further in Appendix 3.

C. Identification of Constraints and Conflicts

Following on from the assessment of the land use systems' potential, and taking the stakeholders' interests into account, any constraints to development were identified. These could be related to physical issues, land tenure issues, lack of inputs, infrastructure issues or political issues. Any potential conflicts were also highlighted.

D. Feedback to Stakeholders and Communities

The feedback to stakeholders and communities was supposed to have been undertaken in November 2003 through a series of public meetings in the same communities as the initial public meetings in May 2003. This was done in January 2004. The Plan and the different scenarios have been presented to the Planning Team, the Steering Committee and the GLSC Board and comments noted.

1.6.3.4. Identification of Land Use Options

This stage of the process comprised the identification of a range of land use options that were considered suitable in achieving the defined planning objectives given the potentials and constraints already described.

These options were then presented for public discussion to the Planning Team, to the Steering Committee and to the stakeholders at public meetings.

A. Identification of Land Use Areas Requiring Change

In the FAO methodology, the identification of areas requiring change highlights those areas either with potential, or showing conflict under the present land use system, for which alternative scenarios of land use options are developed. Within the Planning Area, this was largely based on the identification of areas of underutilised land with potential. Areas where conflict occurs were also noted and the development scenarios took this into account.

B. Development of Scenarios

Three scenarios were developed:

- The No Plan Scenario
- The Medium-Term, Agriculture Led Scenario
- The Full Development Scenario

Appendix 2

The Current Situation

1. The Current Situation

The assessment of the actual situation on the ground involved data collection through fieldwork, reports and maps, and interviews and discussions with stakeholders. All this information was collated and that which could be mapped was digitised and mapped onto the base map of the Planning Area. It is important to note that this Region 6 LUP was done at 50,000 scale.

This information forms the basis for the LUP.

1.1. General Description

The Land Use Planning Area shown in Map 2 is the northern part of Region 6 – East Berbice-Corentyne. It is bounded by the Atlantic Ocean to the north, the Berbice River to the west, the Corentyne River to the East and the Torani Canal to the south and covers a total of 2,882 km^2.

The area is flat with little relief and forms part of the Coastal Plain of Guyana. It is drained by the Berbice and Corentyne Rivers and the Canje Creek, which runs down the centre of the area. The soils are primarily formed from recent alluvial deposits and have very poor natural drainage. Much of the coastal area is below sea level and is saline. Drainage and irrigation are required for agriculture over most of the area.

The area has a climate typical of coastal Guyana, characterised by a high but variable rainfall (mean c.1700-2200mm/a), high humidity and a relatively small temperature range (mean min and max 24-30^oC), (Bureau of Statistics, 2001). There are two wet and two dry seasons a year with the dry seasons normally lasting from February-April and August-November. December-January and May-August are the wet seasons, although the yearly rainfall is subject to marked variability.

The area has a population of about 155,000 (1999 estimate, Thomas, 2000) of which 75% are of Indo-Guyanese ethnic origin (Rawana, 1999). The Region is unique within Guyana in having three municipalities: New Amsterdam in the west on the Berbice River (1991 pop. 20,000), Rose Hall (pop. 8,000) in the north and Corriverton (pop. 17,000) on the Corentyne River in the east.

The primary infrastructure feature of the area is the main road that runs between New Amsterdam and Corriverton and continues to the ferry stelling for Suriname at Moleson Creek. Most of the Region's population is located along the road. Most agriculture is

carried out south of the main road with sugar and rice as the main crops. Coconuts are grown on higher sandy reefs.
The land cover is dominated by agriculture in the north and natural vegetation in the 'backlands'- the central and southern area, surrounding the Canje Creek. The agricultural land use is dominated by four large sugar estates (from west to east, Providence, Rose Hall, Albion and Skeldon) and areas of intensive rice production in BBP and Villages 52-74. The sugar estates and the rice areas are irrigated from the Canje Creek by means of canals. Apart from these areas, much former agricultural land is now abandoned due to poor soils and a lack of irrigation water and/or salinity. The backlands are used for grazing cattle in the dry season.

1.2. Topography

The topography of an area can usually be easily assessed with reference to 1:50,000 scale topographic maps. However, the topographic maps that cover Region 6 East Berbice-Corentyne only show occasional spot-heights, not contours. Nevertheless, there are some data available for descriptive purposes.

The Greater Canje Scheme (Sir M Macdonald & Partners, 1965a), involved a great deal of survey work which produced a series of contour maps at 0.31 m (1 foot) intervals, covering nearly 2,590 km^2 (1,000 $miles^2$), from the coast inland for some 130 km (80 miles). Unfortunately, the original maps were not located but text maps in the report do show contours. These show that the area has remarkably little relief with the vast majority of the area ranging from 52-55 feet (Canje datum is 48.53 feet below sea level), a relief of only 0.9 m (3 feet). Along the Torani Canal, the height rises to 64 feet but this still shows a total relief over the whole area of 3.65 m (12 feet). Depressions are indicated and they include the Pegasse area between the Canje Creek and the Berbice River, an area to the east of Baracara, the land behind BBP and the frontlands of what is now Villages 52-74 rice land.

The soil mapping can also be used as an indication of relief since generally the poorer drained soils will tend to occupy the lowest topographic positions. The natural soil drainage indicates that the lowest areas (very poor to poorly drained soils) occur between the Canje Creek and Berbice River, and in a wide swathe to the east of the Canje, from New Forest through BBP and including much of the Villages 52-74 rice lands and most of Skeldon sugar estate.

1.3. Hydrology

The main rivers are the Berbice River in the west, the Corentyne River in the east and the Canje Creek in the centre. The only other river of any note is the Potoco River which joins the Canje on its west bank some 17 km upstream.

The Berbice and Corentyne Rivers are big rivers with widths of 1-2 km for much of their lengths within the Planning Area, though the Corentyne widens considerably at its mouth so that it is about 9 km wide opposite Corriverton. The Canje Creek on the other hand is much narrower but is relatively deep for a narrow river (12 m deep and 62 m wide at the Black Bush pump station) and has almost no sediment load.
Discharge data are very few and far between. Data from within and just outside the Planning Area came from three gauging stations (5540 on the Berbice River just upstream of the Torani Canal, 5810 on the Canje Creek at the opposite end of the Torani Canal and 5884 just downstream of the Manarabisi Canal) but only gauge height is recorded. There is no rating table and the data appears to end in 1971.

The rivers are all tidal for some considerable distance upstream, the Canje to the Torani Canal (c.50 km) and the Berbice for some 160 km. They are both also subject to saline water intrusion which can reach as far upstream as 35-50 km on the Berbice River at high tide in the dry season. Euroconsult (1981) quote FAO in stating that salinity levels are often greater than 1000ppm TDS (parts per million Total Dissolved Salts), an often recommended maximum value for irrigation water.

Dry season flows in the Berbice River are in the order of 1,800 cusecs (cubic feet per second) or 51 cumecs (cubic metres per second) (MacDonald, 1965), at Hoffwerk some 60 km upstream of New Amsterdam where the catchment area is 10,900 km^2. Similar spot discharge gauging at Matawai (c.140 km upstream) on the Corentyne showed a dry season discharge of 4,000-5,000 cusecs (113-142 cumecs) from a catchment area of 53,000 km^2.

MacDonalds (1965a) quote a flow rate for the Canje of 650,000 acres-feet a year (1,780 acres-feet/day or 897 cusecs or 25 cumecs but caution that this could fall to about 400,000 acres-feet/year (1,096 acres-feet/day, 553 cusecs or 16 cumecs) in a dry year. Euroconsult (1981) present data that show a mean dry season flow of 550 cusecs in the Canje supplemented by a mean 340 cusecs from the Torani Canal, a total mean flow of 890 cusecs.

MacDonalds also stated that this base flow was barely sufficient to irrigate the (then) 83,000 acres (33,590 hectares) of irrigated rice and sugar. Current indications however, following the rehabilitation of the Torani Canal, indicate that the Canje can irrigate 120,000-130,000 acres (48,500-52,500 hectares).

There are five pump stations on the Canje supplying the Guysuco sugar estates, BBP and Villages 52-74 with irrigation water. Their pump capacities (in 1981) are shown in Table 2.1. and indicate a total pump capacity of 1,210 cusecs which is greater than the river's flow but there are no data to indicate exactly how much water is pumped when. Agrodev (1996) however, quote figures of 375 cusecs for BBP and 250 cusecs for Manarabisi (Villages 52-74) though also state that Manarabisi was only operating at 50 cusecs.

Table 2.1. Canje Pump Stations		
Irrigated Area	**Location**	**Pump Capacity (cusecs)**
Skeldon	Sandaka Creek	120
Albion, Rose Hall	Brotherson	400
Providence	Calabash Creek	50
BBP	Black Bush	400(375)
Villages 52-74	Manarabisi	240(250)

1.4. Land Cover/Land Use

Map 3 shows the present land uses and land cover (natural vegetation) within the Planning Area. Table 2.2. and Table 2.3. shows the same data for the major land classes and all land cover/land uses categories, respectively.

In terms of major land cover/land uses classes, it is notable that the main land use type is that of Natural Vegetation which occupies some 60% of the total area and is located in the central-southern part of the area – occupying most of the land between the Berbice River and the Canje Creek and also an appreciable area on the east bank of the Canje.

Cropped Land is the next most extensive cover at 18% and this is located in a broad arc in the north-east of the area. It is interesting to note that the gross area of cropped land is just over 130,000 acres – the limit of land irrigable from the Canje.

Table 2.2. Present Land Uses & Land Cover – Major Classes			
	Acres	**Hectares**	**Percentage**
Primarily Natural Vegetation	435,865	176,395	61.20
Cropped Land	130,656	52,874	18.34
Pasture Land	17,726	7,174	2.49
Abandoned Land	109,167	44,180	15.33
Other Land	18,809	7,612	2.64
TOTAL	**712,223**	**288,237**	**100.00**

Abandoned Land is the next most extensive, covering some 15% of the total area or just over 109,000 acres. Other Land, mainly urban areas and pasture land make up the remainder, though it must be noted that large areas of natural vegetation, abandoned land and cropped land are used for pasture at certain times of the year.

In looking at the distribution of land cover/land uses in greater detail, certain patterns emerge which will form an integral part of the LUP.

Table 2.3. Present Land Uses & Land Cover – All Classes				
Primarily Natural Vegetation	**Acres**	**Hectares**	**% Of Class**	**% Of Total Area**
Dense bush	197,733	80,023	45.37	27.76
Bush with patches of grassland	17,723	7,173	4.07	2.49
Bush with patches of grassland/Intensive cattle pasture	11,542	4,671	2.65	1.62
Open grassland/savannah (extensive grazing)	159,925	64,722	36.69	22.45
Marshland	31,827	12,880	7.30	4.47
Coastal bush	10,668	4,318	2.45	1.50
Salt bush	4,878	1,974	1.12	0.68
Dense bush with scattered cultivation	953	386	0.22	0.13
Bush with scattered coconuts	616	249	0.14	0.09
Cropped Land				
Sugar	69,381	28,079	53.10	9.74
Rice	47,928	19,396	36.68	6.73
Cash Crops	2,527	1,023	1.93	0.35
Coconuts	9,144	3,701	7.00	1.28
Cleared land - proposed crop unknown, grazing	1,675	678	1.28	0.24
Pasture Land				
Intensive cattle pasture	17,726	7,174	100.00	2.49
Abandoned Land				
Recently abandoned rice land, may be brought back into cultivation soon	1,416	573	1.30	0.20
Abandoned rice land over 5 years, now used for extensive grazing	48,548	19,647	44.47	6.82
Abandoned rice land over 5 years, now used for extensive grazing/Rice	1,775	718	1.63	0.25
Abandoned rice land over 5 years, now used for intensive grazing	9,186	3,717	8.41	1.29
Long abandoned rice land due to salinity	3,798	1,537	3.48	0.53
Long abandoned rice land due to salinity - salt bush present	4,204	1,701	3.85	0.59
Long abandoned rice land due to salinity - salt bush present/Fishponds, aquaculture	1,600	648	1.47	0.22
Abandoned former rice land with dense bush regrowth	17,762	7,188	16.27	2.49
Abandoned sugar over 5 years, now used for extensive grazing	990	401	0.91	0.14
Abandoned sugar over 5 years, now used for intensive grazing	284	115	0.26	0.04
Abandoned formerly cleared land. Dense bush regrowth with scattered cultivation	19,605	7,934	17.96	2.75
Other Land				
Fishponds, aquaculture	117	48	0.62	0.02
Fishponds, aquaculture/Salt bush	1,449	586	7.70	0.20
Urban and Industrial area	12,719	5,148	67.62	1.79
Urban area with cash crops (BBP villages)	4,494	1,819	23.89	0.63
Beach and mudflats	30	12	0.16	0.00
TOTAL	**712,223**	**288,237**		**100.00**

As shown in Table 2.3., the majority of the area is still under **Primarily Natural Vegetation** with the majority of this land cover type being Dense bush (N-db) with nearly 200,000 acres or 28% of the total area. This cover tends to occur on the riverain fringes of the Berbice River and the Canje Creek and is also extensive in the Moleson-Jackson Creek area.

This Dense bush occurs on slightly higher and better drained ground than the next most extensive vegetation cover – Open grassland/savannah (N-gs), which covers some 160,000 acres or 22% of the whole area. This land is also used for extensive grazing in the dry season and occurs primarily between the Berbice River and the Canje Creek and forms much of the backlands of the Canje East Bank.

Other areas used for grazing include Bush with patches of grassland (N-bg) which occupies just less than 18,000 acres or 4% of the land use class and occurs between BBP and the Canje. The western part of the MCP has also been mapped as primarily natural vegetation to distinguish it from the eastern part which is almost entirely devoid of any tree or bush cover. This N-bg/P-c unit covers some 11,500 acres.

Other areas of primarily natural vegetation of note are the marshlands (N-m) (32,000 acres or 4.5% of the total area), which occupy the lowest topographical positions and are most extensive between the Berbice River and the Canje Creek and the Coastal bush (including mangrove) and Salt bush (N-cb, N-sb) (10,700 – 1.5%, 4,900 – 0.7%, respectively), which occupy a narrow strip on the coastal frontlands.

Other areas of primarily natural vegetation are extremely small and have a scattered distribution.

The areas of agricultural land or **Cropped Land** are dominated by sugar and rice which occupy nearly 90% of land in this class. Sugar covers an area of just over 69,000 acres, (53% of cropped land, just under 10% of the total area) in three contiguous blocks, corresponding to the Guysuco sugar estates.

Rice occupies an area of 48,000 acres (37% of cropped land, just under 7% of the total area), a figure which compares well with the figure of 40,000 acres from the Rice Producers Association since the 48,000 acres figure is a gross figure which includes dams, canals and drains. Areas cropped to rice are centred on BBP and Villages 52-74, although it is also grown between Rose Hall sugar estate and the main road, at Volkerts Lust and Batchelors Adventure on the Canje East Bank and in a couple of places on the Berbice East Bank.

Cash crops occupy a small area with only 2,500 acres mapped (2% of cropped land, <1% of the total area), although many small cash crop areas were too small to be mapped and the cash cropping areas around BBP villages have been mapped as urban areas. Nevertheless, cash cropping does not occupy a large area within the Region.

Coconuts occur associated with the sandy reefs in the frontlands of BBP and Villages 52-74. They occupy some 9,000 acres or 7% of cropped land, 1% in total.

It is interesting to note that the Greater Canje Scheme report (MacDonalds, 1965b) estimated acreages for sugar and rice at 36,000 and 81,200 acres, respectively indicating that the area under sugar has almost doubled but that rice has nearly halved in area in 40 years.

Pasture Land (P-c) describes land used only for the intensive rearing of cattle and includes the MCP and a couple of other areas in Jackson-Moleson Creek. It occupies some 17,700 acres or 2.5% of the total area. The MCP itself covers an area of nearly 30,000 acres but the western portion has been mapped as a combination of bush with patches of grassland as described before.
Other areas are also used for grazing but these have been mapped either as primarily natural vegetation since the grazing is seasonal or as abandoned land since it was felt that it was more important to highlight the areas of abandoned land.

The area of **Abandoned Land** is appreciable and is only just less that the area of currently cropped land at 109,200 acres, just over 15% of the total area. There are however, important differences in the reasons why land has been abandoned and these can be seen on the map and will influence planning decisions.

Areas of recently abandoned rice land (A-rr) may be brought back into cultivation soon. These are individual fields or areas that were not able to be planted the previous season, often due to inaccessibility of the dam at the time of planting. These areas cover some 1,400 acres and make up only 1% of all abandoned land.

The most extensive category of abandoned land is that of former rice land abandoned over five years and now used for extensive grazing. These areas cover 48,500 acres and make up 44% of abandoned land or just fewer than 7% of the total area.

They occur mainly in two areas; in the frontlands of intensive rice and sugar producing areas such as Villages 52-74 and BBP and in the backlands on former Co-op land. The land is not saline but they have been abandoned due either simply to a lack of irrigation water or due to a failure of the D&I system to supply the lands with water and drainage. The greatest extent of these lands is in front of BBP between Port Mourant and Village 51. Here they are bounded by saline land to seaward, intensive rice cultivation towards the Canje and are cut by sandy reefs with coconuts.

The greatest extent of abandoned backlands lies between the Canje and the MCP. These lands are currently used for dry season grazing and some parts have been earmarked for sugar under the planned Skeldon Expansion.

Other areas include Crabwood Creek where again D&I problems are given as the main reason for abandonment, a large area between Albion sugar estate and the Canje Creek and other smaller scattered areas around New Amsterdam.

The small area (1,700 acres) mapped as A-re/C-r occurs in Crabwood Creek and is mapped thus due to problems of access. Only about 20% of the former rice land at Crabwood Creek is currently planted to rice – the rest is abandoned.

A smaller area of similar former rice land but now used for intensive (rather than extensive) grazing has been mapped and covers some 9,200 acres, 8% of abandoned land and just over 1% of the whole area. These areas occur in Jackson-Moleson Creek, Crabwood Creek, the Canje East Bank and Berbice East Bank but are most apparent to the north of the main road in front of Rose Hall sugar estate. Again lack of water and/or poor D&I are given as the main reasons for the land use change.

Land abandoned due to salinity occurs all along the coast and is usually confined to the north of the main road except around Fyrish/Kilcoy, in front of BBP and at Village 66. This saline land has generally been abandoned for 40 years or so. The land has been sub-divided on the presence (A-rsb) or absence (A-rs) of saltbush and the presence or absence of fishponds (Arsb/F) which were not able to be mapped separately. The total area abandoned due to salinity is about 9,600 acres which is nearly 9% of all abandoned land or just over 1% of the whole area.

All the categories of abandoned land mentioned before, do not have a dense bush regrowth. The category mapped as ArBr however, has a characteristic dense bush regrowth which will make rehabilitation more difficult and costly. These areas occur mainly to the west of Providence sugar estate on the Berbice East Bank, and on the Canje West and East Banks. They cover an area of 17,800 acres making up 16% of abandoned land or 2.5% of the whole area.

Another category characterised by a dense bush regrowth describes areas of formerly cleared land (not necessarily rice land) that now have a dense bush regrowth and small scattered patches of mainly cash crop cultivation. These areas are most common along the Berbice East Bank and at Jackson-Moleson Creek. They cover an area of 19,600 acres making up 18% of abandoned land or just fewer than 3% of all land. Lack of irrigation water and the fact that the land is transported are the most common reasons given for abandonment and subsequent neglect.

Very small areas of abandoned former sugar cane land totalling 1,275 acres were mapped in Berbice East Bank.

Other Land is dominated by urban and industrial areas (U) which cover a total of 12,700 acres, just over two thirds of the category or just under 2% of the total area. This includes the Municipalities of New Amsterdam, Rose Hall and Corriverton as well as the villages fringing the main road. The planned villages of BBP have been mapped separately as Urban areas with cash crops (U-cc) since they are much more spread out. Other Land categories include Fishponds/aquaculture which account for just over 1,500 acres and beach/mudflats.

1.5. Land Use History

This brief description of the land use history is by no means authoritative but aims to provide some background information.

Sugar has been grown in Guyana since 1630 and in Berbice since the early 18th Century and the sugar estates of Providence, Rose Hall, Albion and Skeldon have long histories. The only historical land use map that permits a comparison with the present land use is that of the Greater Canje Scheme study (MacDonalds, 1965), which shows the land use in the early 1960s. From then to today, the area under sugar has increased from 36,000 acres to 69,000 acres (an increase of 92%) though it is possible that the 1960s figure is the net area whereas the current figure is a gross one. However, in comparing the two maps, it is noticeable that the western sugar estates have increased their area slightly whilst Skeldon has almost doubled in area. The sugar sector experienced a decline in the 1980s but recovered rapidly in the 1990s with a doubling of production. The three Berbice estates (Providence is considered to be a part of Rose Hall), produce just over half of the country's sugar with higher yields and greater profitability than other estates in the country.

The area under rice however, has decreased by about 41% from 81,200 acres in the early 1960s to about 48,000 acres today. The MacDonalds report states that much of the rice land was a result of rapid expansion in the 1950s and early 1960s and that before the rice boom most agriculture (apart from sugar) concentrated on coffee and cocoa grown on estates in riverain areas. During the 1980s, poor pricing policy led to a significant fall in rice production and also led to the consolidation of smaller farms as small-scale farmers rented out land and went into cattle rearing or migrated (NDS, 1996). Much of the former rice land has now been abandoned, such as behind the MCP, the frontlands of BBP, behind Albion estate and on Berbice East Bank but some has been converted to sugar as at Port Mourant.

The greatest change however, is probably in the frontlands from Gibraltar in the west to Village 51 in the east where land mapped as 'Paddy and mixed farming' in 1965 is now practically all abandoned land and salt bush. Similarly, land on the Berbice East Bank mapped as 'Mixed farming' is now mostly abandoned, often with dense bush regrowth.

Interestingly, land mapped as 'Rough grazing for cattle' in 1965 is generally still that although some has been mapped as savannah and some as abandoned land with intensive grazing.

1.6. Soils

The soils of the Planning Area are shown in Map 4. The soil information and mapping is derived from FAO mapping in the mid-1960s which not only produced a soil and land capability map for the whole of Guyana (FAO, 1966a) but also undertook semi-detailed

fieldwork for the Canje area and produced maps at 1:60,000 scale that cover the present Planning Area (FAO, 1966b). These maps have been digitised at GLSC and form the basis for the soil data within the area.

In all, 35 SMUs have been recognised and are described briefly. Figure 2.4. shows each soil unit's physical and chemical characteristics grouped together based on the soil unit's drainability (Map 5), since this is considered to be the most important driver to development. Practically, all the soils (98% of the total area) within the Planning Area require drainage and (to a lesser extent) irrigation to be brought into production.

Each soil unit was also assigned a Land Capability Class by FAO. This is a method of grouping soils together to show their relative agricultural suitability and is based on each soil unit's limitations for crop production.

Table 2.4. Soil Mapping Units	Area		Drainage	Drainability	Flooding	Salinity	Acid-sulphates	Fertility	FAO Land Capability		
Soil Types	**Acres**	**%**							**Class**	**Limitation**	
Ithaca sandy loam	16,304	2.3	Well to moderately well	Unnecessary		present		Low	1	f	1f
Yesi silt loam	900	0.1	Well to moderately well	Unnecessary				Very low	2	f	2f
Plegt Anker clay	9,967	1.4	Poor	Easy				Moderate	1	f	1f
Everton silty clay	178,143	25.0	Poor	Easy				Moderate	1	f	1f
De Velde silt loam	11,411	1.6	Poor	Easy	present			Low	1	f	1f
Cola silt loam	1,681	0.2	Poor	Easy				Very low	2	f	2f
Bartica silt loam	8,576	1.2	Poor	Easy				Very low	2	f	2f
Putkin silt loam	818	0.1	Poor	Easy				Very low	2	f	2f
Potoco silt loam	14,044	2.0	Somewhat poorly to poorly	Easy				Very low	2	f	2f
Moleson silt loam	622	0.1	Somewhat poor	Relatively easy	present			Low	1	f	1f
De Velde clay	15,248	2.1	Poor	Relatively easy	present			Moderate	1	f	1f
Skeldon clay	33,255	4.7	Poor	Relatively easy				High	1	m	1m
Bath silty clay	12,816	1.8	Poor	Relatively easy				Moderate	1	f	1f
Corentyne clay	25,831	3.6	Very Poor	Relatively easy				High	1	m	1m
Corentyne clay-drained phase	70,310	9.9	Very Poor	Relatively easy				High	1	m	1m
Corentyne clay-peaty phase	22,426	3.1	Very Poor	Relatively easy				High	1	m	1m
De Velde clay-saline phase	1,406	0.2	Poor	Relatively easy	present	present		Moderate	2	s	2s
Whim silty clay loam	2,890	0.4	Somewhat poor	Relatively easy		present		Moderate	2	s	2s
Haswell clay	5,146	0.7	Poor	Relatively easy		present	present	Moderate	2	s	2s
Whittaker clay	45,794	6.4	Poor	Relatively easy		present		Moderate	2	s	2s
Tain clay	8,817	1.2	Poor	Relatively difficult		present		Moderate	2	s	2s
Macouba clay	2,659	0.4	Very Poor	Relatively difficult		present	present	Moderate	2	s	2s
Brandwagt clay	56,097	7.9	Very Poor	Relatively difficult				Moderate	1	f	1f
Vigilante silty clay	15,024	2.1	Very Poor	Relatively difficult				Low	2	f	2f
Fairfield clay	4,219	0.6	Very Poor	Relatively difficult			present	Low	2	s	2s
Manarabisi clay	3,821	0.5	Very Poor	Relatively difficult				Low	2	f	2f
Mara clay	15,483	2.2	Very Poor	Difficult			present	Very low	3	t	3t
Mara clay-peaty phase	5,292	0.7	Very Poor	Difficult			present	Very low	3	t	3t
Canje clay	24,298	3.4	Poor	Difficult				Low	2	m	2m
Kerkenama clay	14,973	2.1	Very Poor	Difficult				Low	2	m	2m
Vryberg clay	49,011	6.9	Poor	Difficult				Low	2	m	2m
Anira peat	13,855	1.9	Very Poor	Very difficult				Very low	3	m	3m
Kamani silt	164	0.0	Poor	Very difficult				Very low	3	m	3m
Lama muck	457	0.1	Very Poor	Very difficult		present	present	Low	3	m	3m
Tidal Flat	8,245	1.2	Very Poor	Very difficult	present	present			4	s	4s
No Data	12,221	1.9									
TOTAL	**712,223**	**100%**									

1.6.1. Soil Mapping Units

1.6.1.1. A. Soils not requiring drainage.
Well to moderately well drained loams with low to very low fertility.

Area 17,204 acres
2.5% of the total area

1.6.1.1.1. Ithaca sandy loam

This well to moderately well drained, dark brown over yellowish brown sandy loam describes the soils developed on sand reefs (probably old beach lines) which parallel the coast and extend up to 8 km inland. The reefs are about 0.1-1.3 m higher than the surrounding land and are from 100-500 m wide. The soils are low in fertility and have a very strongly acid topsoil over a slightly acid subsoil.

The soils have been assigned Land Capability Subclass If due to their low fertility and droughtiness.

This soil unit covers some 16,000 acres and comprises 2% of the total area.

The soil unit stretches from Albion estate in the west to Village 67 in the east.

1.6.1.1.2. Yesi silt loam

This well to moderately well drained silty loam describes soils developed from Cornopia deposits. The soils are very low in fertility and are extremely acid throughout the profile but show favourable physical properties.

The soils have been assigned Land Capability Subclass IIf due to their very low fertility.

This soil unit only covers some 900 acres in the west Canje backlands.

1.6.1.2. B1 Easily drainable soils.
Poorly drained clays with moderate fertility.

Area 188,110 acres
27% of the total area

1.6.1.2.1. Plegt Anker clay

These poorly drained clays are developed from recent riverain deposits and often overlie marine sediments. They occur at low elevations and are characterised by a thin, grey to dark grey clay surface layer over a grey to greenish grey subsoil. The soil has a very strongly acid topsoil but a neutral subsoil, has moderate fertility status but is deficient in Phosphorus (P).

The soils have been assigned Land Capability Subclass If due to their low fertility.

The soil covers some 10,000 acres (nearly 1.5% of the total area) and is most extensive near the Corentyne River from Crabwood Creek past Moleson Creek and in the lower Canje West Bank area from Caracas to Anna Clementina.

1.6.1.2.2. ***<u>Everton silty clay</u>***

These poorly drained clays are developed from recent riverain deposits and are similar to Canje clays but have much more permeable subsoils. They occur at low elevations and are characterised by a greyish brown topsoil over a grey clay subsoil with yellowish brown mottles. The soil has a very strongly acid topsoil but a neutral subsoil and has a moderate fertility status but is deficient in Calcium (Ca), P and also Potassium (K) in places.

The soils have been assigned Land Capability Subclass If due to their low fertility.

The soil is very extensive covering some 178,000 acres (25% of the total area) and is most extensive in the East Bank Berbice, the lower Canje, the East Canje backlands and Jackson and Moleson Creeks.

1.6.1.3. B2 Easily drainable soils.
Poorly drained silt loams with low to very low fertility.

Area 36,531 acres
5.2% of the total area

1.6.1.3.1. ***<u>De Velde silt loam</u>***

These poorly drained soils are developed from recent riverain deposits on slight elevations. They are characterised by a greyish brown to brown silty loam topsoil over a grey but very strongly mottled silty subsoil. The soil has a very strongly acid topsoil, a slightly less acid subsoil and low fertility. It is also prone to flooding at spring tide.

The soils have been assigned Land Capability Subclass If due to their low fertility.

The soil covers some 11,410 acres (1.6% of the total area) and is most extensive south of Mara on the East Bank Berbice.

1.6.1.3.2. ***<u>Cola silt loam</u>***

These poorly drained silty soils are developed from Coropina deposits and occur under forest. They are characterised by a greyish brown silty loam topsoil over a strongly mottled grey silty clay subsoil. The soil is extremely acid and has very low fertility.

The soils have been assigned Land Capability Subclass IIf due to their very low fertility.

The soil only covers some 1,680 acres (0.2% of the total area) and occurs just to the north of the Torani Canal.

1.6.1.3.3. ***Bartica silt loam***

These soils are very similar to those of the Cola silt loams but have a slightly more clay textured subsoil. They are characterised by a greyish brown silty loam topsoil over a strongly mottled grey silty clay to clay subsoil. The soil is extremely acid and has very low fertility.

The soils have been assigned Land Capability Subclass IIf due to their very low fertility.

The soil covers some 8,575 acres (1.2% of the total area) and occurs in association with the Cola silt loams just to the north of the Torani Canal.

1.6.1.3.4. ***Putkin silt loam***

These soils were not described in detail in the FAO report but can be assumed to be similar to the Cola and Bartica silt loams.

The soils have been assigned Land Capability Subclass IIf due to their very low fertility.

The soil only covers some 820 acres (0.1% of the total area) and occurs in association with the Cola and Bartica silt loams just to the north of the Torani Canal.

1.6.1.3.5. ***Potoco silt loam***

These soils are very similar to those of the Cola and Bartica silt loams as mentioned before, but are slightly better drained occurring on slightly higher ground than the other soils. They are characterised by a greyish brown to grey silty loam topsoil over grey friable mottled silty clay loam subsoil. The soil is very strongly acid and has very low fertility.

The soils have been assigned Land Capability Subclass IIf due to their very low fertility.

The soil covers just over 14,000 acres (2% of the total area) and occupies both the slightly higher ‘islands’ and the fringes of the very poorly drained marshy pegasse area between the Berbice River and the Canje Creek.

1.6.1.4. C1 Relatively easily drainable soils. Poorly drained silt loams to clays with low to moderate fertility.

Area 49,124 acres
7.0% of the total area

1.6.1.4.1. ***Moleson silt loam***

This somewhat poorly drained soil is developed from recent silty alluvium and occurs on slightly elevated positions along stream banks. It is characterised by a brown silt loam topsoil over a grey silty subsoil with yellowish brown mottles. The soil has low fertility and is not acid but is prone to flooding at spring tide.

The soils have been assigned Land Capability Subclass If due to their low fertility.

The soil is not extensive covering only 620 acres (<1% of the total area) and occurs at Moleson Creek.

1.6.1.4.2. ***De Velde clay***

This soil is similar to the De Velde silt loam in appearance but has a finer texture, a very strongly acid topsoil but neutral subsoil and has moderate rather than low fertility. It is also prone to flooding at spring tide.

The soils have been assigned Land Capability Subclass If due to their low fertility.

The soil covers some 15,250 acres (2% of the total area) and occurs along rivers throughout the area. It is most extensive on the lower Corentyne coast, Moleson/Jackson Creek and on the East Bank Berbice.

1.6.1.4.3. ***Bath silty clay***

This poorly drained soil is developed from riverain deposits and is similar in appearance to Vryberg clay but differs in that it usually has a silty subsoil. It is characterised by a thin grey to greyish brown clay topsoil over a grey silty subsoil with red to yellowish brown mottles. The soil has a very strongly acid topsoil over a neutral subsoil and is more fertile than the Vryberg clay.

The soils have been assigned Land Capability Subclass If due to their low fertility.

The soil is moderately extensive covering some 33,200 acres (4.7% of the total area) mainly between the Canje Creek and Skeldon sugar estate although it also occurs fringing the middle Canje.

1.6.1.5. **C2 Relatively easily drainable soils.**
Poorly to very poorly drained clays with high fertility.

Area 131,382 acres
18.8% of the total area

1.6.1.5.1. ***Skeldon clay***

This poorly drained soil is developed from marine sediments known as ‘frontland clays’ and occurs in flat areas close to the coast. It is characterised by a dark grey to mottled greenish grey clay topsoil over a greenish grey mottled clay subsoil. The soil is strongly acid in the topsoil over a neutral subsoil and has a high nutrient status.

The soils have been assigned Land Capability Subclass Im due to their poor workability and the fact that they are likely to be waterlogged for some days after heavy rain.

The soil is moderately extensive covering some 12,800 acres (1.8% of the total area) mainly between Crabwood Creek and Village 64 though it is most extensive in Villages 68-71.

1.6.1.5.2. ***Corentyne clay***

This poorly drained soil is also developed from marine sediments known as 'frontland clays' and is a swampland soil with 15-30 cm of peat overlying a thin dark topsoil and a greenish grey clay subsoil mottled with olive brown. The soil is strongly acid in the topsoil over a neutral to slightly alkaline subsoil and has a high nutrient status.

The soils have been assigned Land Capability Subclass Im due to their poor workability and the fact that they are likely to be waterlogged for some days after heavy rain.

The soil is moderately extensive covering some 25,800 acres (3.6% of the total area) mainly on and north of Skeldon sugar estate and also to the south of Providence sugar estate.

1.6.1.5.3. ***Corentyne clay-drained phase***

As its name suggests, this is the same soil as the Corentyne clay but which has been drained and cultivated and has lost the peat surface layer in the process. The soil also differs from the Corentyne clay in having a mottled topsoil and a firmer subsoil.

The soils have been assigned Land Capability Subclass Im due to their poor workability and the fact that they are likely to be waterlogged for some days after heavy rain.

The soil is extensive covering some 70,300 acres (10% of the total area) and extends from Crabwood Creek in the south, through Skeldon sugar estate, the rice lands of Villages 52-74, BBP and peters out around New Forest on the lower Canje East Bank. Smaller areas also occur on Providence sugar estate and East Bank Berbice.

1.6.1.5.4. ***Corentyne clay-peaty phase***

This soil unit describes soils that are similar to the Corentyne clays but which have a thicker peat layer of 30-60 cm over the mineral soil.

The soils have been assigned Land Capability Subclass Im due to their poor workability and the fact that they are likely to be waterlogged for some days after heavy rain.

The soil is moderately extensive covering some 22,400 acres (3.1% of the total area) mainly in the Moleson/Jackson Creek area but is also present as an 'inlier' surrounded by Manarabisi clay in the West Canje backlands.

1.6.1.6. C3 Relatively easily drainable soils.

Poorly drained silt loams to clays with low to moderate fertility. Salinity and/or acid-sulphates present.

Area 55,235 acres
8% of the total area

1.6.1.6.1. ***De Velde clay-saline phase***

These soils are similar to the De Velde clays in category C1 but are flooded at high tides and therefore contain appreciable amounts of soluble salts. Any reclamation and improvement of these soils would involve protection from high tides and the leaching of soluble salts from the soil which would be relatively difficult given their poor natural internal drainage.

The soils have been assigned Land Capability Subclass If due to their low fertility.

The soil is localised covering only 1,400 acres (0.2% of the total area) and occurs mainly in the frontlands of Villages 52-74.

1.6.1.6.2. ***Whim silty clay loam***

This somewhat poorly drained soil is developed from marine sediments and occurs as a narrow reef parallel to the coast. It is characterised by a very dark greyish brown silty clay loam topsoil over a mottled grey clay to silty clay loam subsoil. The soil has a relatively high salt content which would be relatively difficult to remove.

The soils have been assigned Land Capability Subclass IIs due to their high salt levels which would be relatively difficult to remove.

The soil is localised covering only 2,890 acres (0.4% of the total area) and occurs mainly just to the east of Port Mourant estate and on Albion sugar estate.

1.6.1.6.3. ***Haswell clay***

This poorly drained soil is developed from marine sediments known as ‘frontland clays’. It is characterised by a grey to dark grey clay topsoil over a firm, grey, mottled clay subsoil with some concretions. The soil is extremely acid in the topsoil over a very strongly acid subsoil. The soil has a moderately high concentration of soluble salts (salinity) and also shows traces of toxic acid-sulphate salts. The soil would be moderately difficult to leach of salts.

There is a high correlation between this soil unit and the ‘Abandoned Land’ land use class, the only exception being on Albion sugar estate where greater water availability and a high level of management mean that the soil can be cultivated.

The soils have been assigned Land Capability Subclass IIs due to their high salt levels which would be relatively difficult to remove.

The soil is relatively extensive covering only some 5,150 acres (0.7% of the total area) and is confined to patches in the frontlands of BBP, the backlands of Bloomfield to Ulveston and on Albion sugar estate.

1.6.1.6.4. ***Whittaker clay***

This poorly drained soil is also developed from marine sediments known as 'frontland clays' and has similar characteristics to the Haswell clay as before, but is not an acid-sulphate soil. It is characterised by a dark grey clay topsoil over a grey, mottled clay subsoil with some concretions. The soil has a high salt content and is difficult to cultivate due to a poor surface structure which makes it prone to waterlogging.

There is a high correlation between this soil unit and the 'Abandoned Land' land use class, the only exception being on Rose Hall and Albion sugar estates where greater water availability and a high level of management mean that the soil can be cultivated.

The soils have been assigned Land Capability Subclass IIs due to their high salt levels which would be relatively difficult to remove.

The soil is moderately extensive covering some 45,800 acres (6.4% of the total area) and occurs in the coastal frontlands from Rose Hall sugar estate in the north-west to Village 51, Leeds, in the south-east.

1.6.1.7. **D1 Soils which are relatively difficult to drain. Very poorly drained silt loams to clays with low to moderate fertility.**

Area 67,573 acres
9.7% of the total area

1.6.1.7.1. ***Brandwagt clay***

This poorly drained soil is developed from riverain deposits. It is characterised by a thick very dark grey topsoil over a grey subsoil with yellowish brown to red mottles. The soil is strongly acid in the topsoil but has a neutral subsoil and a moderate fertility status but is deficient in Ca and P.

The soils have been assigned Land Capability Subclass If due to their low fertility.

The soil is moderately extensive covering some 8,800 acres (1.2% of the total area) and occurs mainly in Villages 52-74 and in the East Canje backlands behind BBP.

1.6.1.7.2. ***Vigilante silty clay***

This very poorly drained soil is developed from Coropina sediments and occurs in depressions. It is characterised by a very dark grey silty clay topsoil over a grey silty clay loam subsoil with yellowish brown mottles. The soil is extremely acid and low in fertility.

The soils have been assigned Land Capability Subclass IIf due to their very low fertility.

The soil covers only 2,660 acres (0.4% of the total area) and occurs in the West Canje backlands.

1.6.1.7.3. ***Manarabisi clay***

This very poorly drained soil is developed from marine sediments and is characterised by a thin peat layer over a very dark grey to black clay topsoil over a grey to greenish grey clay subsoil with yellowish brown mottles. The soil is extremely acid and low in fertility.

The soils have been assigned Land Capability Subclass IIf due to their very low fertility.

The soil is extensive covering some 56,100 acres (7.9% of the total area) and occurs mainly in the West Canje backlands immediately south of Providence sugar estate, behind BBP and underlies part of the proposed conservancy for the Skeldon sugar estate Expansion.

1.6.1.8. D2 Soils which are relatively difficult to drain. Poor to very poorly drained clays with low to moderate fertility. Salinity and/or acid-sulphates present.

Area 22,064 acres
3.3% of the total area

1.6.1.8.1. ***Tain clay***

This poorly drained soil is developed from recent fine-textured sediments and occurs in flat areas close to the coast. It is characterised by a mottled grey clay topsoil over a firm mottled grey clay subsoil. The soil has a high salt content throughout which would be relatively difficult to remove.

There is a high correlation between this soil unit and the 'Abandoned Land' land use class, the only exception being on Albion sugar estate where greater water availability and a high level of management mean that the soil can be cultivated.

The soils have been assigned Land Capability Subclass IIs due to their high salt levels which would be relatively difficult to remove.

The soil is moderately extensive covering an area of some 15,000 acres (2.1% of the total area) and occurs in the frontlands of BBP and also on Albion sugar estate.

1.6.1.8.2. ***Macouba clay***

This very poorly drained soil is developed from marine sediments over older riverain or Coropina sediments. It is a swamp soil characterised by a 7-30 cm layer of peat over a soft dark grey clay topsoil over a firm to very firm, red mottled, grey, clay subsoil. The soil is extremely acid throughout and shows traces of toxic acid-sulphate salts.

The soils have been assigned Land Capability Subclass IIs due to their high levels of acid-sulphates which would be relatively difficult to remove.

The soil is moderately extensive covering an area of some 4,200 acres (0.6% of the total area) in a strip to the west of the middle Canje Creek

1.6.1.8.3. ***Fairfield clay***

This very poorly drained soil is developed from fluvio-marine sediments in association with the Canje and Mara clays. It is a swamp soil with a thin peaty surface layer over a dark grey clay topsoil over a greenish grey soft clay subsoil. The soil is very strongly acid throughout and shows traces of toxic acid-sulphate salts.

The soils have been assigned Land Capability Subclass IIs due to their high levels of acid-sulphates which would be relatively difficult to remove.

The soil is moderately extensive covering an area of some 3,800 acres (0.5% of the total area) and occurs on the Berbice East Bank in the backlands from Essandam to Union and south of Mara between L'Esperance and Bloemhof.

1.6.1.9. **E1 Soils which are difficult to drain.**
Poor to very poorly drained clays with low fertility.

Area 45,074 acres
6.4% of the total area

1.6.1.9.1. ***Canje clay***

This very poorly drained soil is developed from riverain sediments and occurs at slightly higher elevations. It is characterised by a grey to greyish brown clay topsoil over a very firm grey clay subsoil with yellowish brown and red mottling. The soil is very strongly acid throughout and low in nutrients.

The soils have been assigned Land Capability Subclass IIm due to their impermeable subsoils and low fertility.

The soil is extensive covering an area of some 15,500 acres (2.2% of the total area) and occurs at slightly higher elevations on the Berbice East Bank, between the Berbice and the Canje and also in small patches in the Upper Corentyne backlands.

1.6.1.9.2. ***Kerkenama clay***

This very poorly drained soil occurs in slight depressions within old riverain deposits. It is characterised by a black to very dark grey clay topsoil (some areas have a peat layer) over a grey, very firm, mottled subsoil. The soil is extremely acid and low in fertility.

The soils have been assigned Land Capability Subclass IIm due to their impermeable subsoils and low fertility.

The soil is moderately extensive covering some 5,300 acres (0.7% of the total area) and occurs in thin strips in the West and East Canje backlands.

1.6.1.9.3. ***Vryberg clay***

This very poorly drained soil occurs at slightly higher elevations within old riverain deposits. It is characterised by a grey to greyish brown clay topsoil over a very firm grey clay subsoil with yellowish brown and red mottling. The soil is very strongly acid throughout and low in nutrients.

The soils have been assigned Land Capability Subclass IIm due to their impermeable subsoils and low fertility.

The soil is relatively extensive covering an area of some 24,300 acres (3.4% of the total area) and occurs at slightly higher elevations just north of the Torani Canal, within the poorly drained pegasse area between the Berbice and the Canje, a large proportion of Providence sugar estate and also in smaller patches in the East Canje backlands and the Upper Corentyne backlands.

1.6.1.10. **E2 Soils which are difficult to drain.**
Very poorly drained clays with very low fertility. Toxic acid-sulphates present.

Area 63,984 acres
9.1% of the total area

1.6.1.10.1. ***Mara clay***

This very poorly drained soil is developed from fluvio-marine sediments in association with the Canje and Fairfield clays. It occurs at low elevations and is characterised by a thin (<30 cm) peaty surface layer over a dark grey clay topsoil over a grey to greenish grey soft clay subsoil. The soil is extremely acid throughout and usually contains toxic acid-sulphate salts.

The soils have been assigned Land Capability Subclass IIIt due to their high amounts of toxic acid-sulphate salts.

The soil is moderately extensive covering an area of some 15,000 acres (2.1% of the total area) and occurs in the backlands on the Berbice East Bank and between there and the Canje.

1.6.1.10.2. ***Mara clay-peaty phase***

This soil is very similar to the Mara clay but occurs at slightly lower elevations and has a thicker (>30 cm) peat covering.

The soils have been assigned Land Capability Subclass IIIt due to their high amounts of toxic acid-sulphate salts.
The soil is extensive, covering an area of some 49,000 acres (7% of the total area) and occupies much of the area between the Berbice River and the Canje Creek.

1.6.1.11. F Soils which are very difficult to drain.

Poor to very poorly drained organic soils to clays with low to very low fertility.

Area 22,721 acres
3.2% of the total area

1.6.1.11.1. Anira peat

This is a very poorly drained organic soil with a peat layer >30 cm thick. It is characterised by a very dark brown to reddish brown, partly decomposed peat surface over a dark reddish brown peat subsoil. The soil is extremely acid, very difficult to drain and would shrink by 50% on draining.

The soils have been assigned Land Capability Subclass IIIm due to their low fertility and physical limitations which require very special management.

The soil covers some 13,850 acres (2% of the total area) and occurs in the West Canje backlands between the Torani Canal and the Berbice River.

1.6.1.11.2. Kamani silt

This very poorly drained soil is developed from Coropina sediments and occurs in association with savannah vegetation. It is characterised by a grey to dark grey silt topsoil over a thick, dense silty pan which impedes vertical drainage. The subsoil is grey with strong brown to red mottles. The soil is extremely acid, very low in fertility status and has poor permeability and aeration rendering it very difficult to rehabilitate and manage.

The soils have been assigned Land Capability Subclass IIIm due to their low fertility and physical limitations which require very special management.

The soil covers only 160 acres (<0.1% of the total area) and occurs in the West Canje backlands.

1.6.1.11.3. Lama muck

This is a very poorly drained organic soil occurring in depressions. It is characterised by a thin layer of recent roots and leaves over 10-40 cm of well decomposed muck over dark reddish brown peat over peat, sand or greenish clay at a depth of about 90 cm. The soil is extremely acid, very difficult to drain and the underlying clay often contains toxic acid-sulphate salts.

The soils have been assigned Land Capability Subclass IIIm due to their low fertility, presence of toxic salts and physical limitations which require very special management.

The soil only covers some 460 acres (<0.1% of the total area) and occurs associated with the Anira peat in the West Canje backlands between the Torani Canal and the Berbice River.

1.6.1.12. Tidal Flat

This category is not a soil but a land type and consists of a soft, grey clay, with high levels of soluble salts and subject to regular flooding with brackish water.

The soils have been assigned Land Capability Subclass IVs due to their high salt content and frequent flooding.

Tidal flats cover an area of some 8,245 acres (1.2% of the total area) and occur in the coastal frontlands.

1.6.2. Soil Characteristics

Soil fertility rated from high to very low and dependent on the relative amounts of available soil nutrients such as Nitrogen (N), P and K and also on the soil's ability to retain those nutrients as indicated by the soil's cation exchange capacity (CEC).

Soil drainage rated from well to very poor. This is the natural soil drainage largely dependent on the texture and structure of the soils and should not be confused with the soil's drainability which also takes the topography into account.

Soil acidity rated from not acid to extremely acid. Some soils have only acid topsoils which are indicated. A soil's acidity affects the ability of plants to obtain nutrients and can also influence toxic elements such as aluminium.

Soil salinity, **toxicity and flooding** (Map 6) have also indicated those areas where these characteristics will influence the land capability.

1.7. Land Capability

The Land Capability classification used by the FAO has been reproduced here. This is a method of grouping soils together to show their relative agricultural suitability and is based on each soil unit's limitations for crop production. It is essentially the same as that used by the United States Bureau of Reclamation (USBR) but modified for local conditions in that it assumes the provision of adequate drainage. The classification therefore differs from the USBR in that Class I and II soils possess limitations that greatly limit the range of crops that can be grown, due mainly to the soils' poor to very poor internal drainage. The Class I and Class II soils in Berbice would correspond to Class III under the USBR classification.

The classification system as used is split into two levels; the Class and Subclass. Class levels I-IV show the range of limitations to agricultural development in that Class I Land has the least limitations and the widest range of agricultural use whilst Class IV Land is not fit for agricultural use. The Subclasses are notated by a suffix (Im, IIs, IIIt, etc.) which relate to specific limitations:

f	low fertility
t	soil toxicity
m	physical limitations (heavy clay texture, poor structure, poor drainage, etc.)
s	excess soluble salts
w	poor drainage

1.7.1. Class I Good Agricultural Land

Soils that have no to slight limitations and the widest range of agricultural use. These soils are level, are relatively easy to manage, can be cultivated intensively and will remain moderately productive. For high yields, fertilizer will be needed for most crops and lime for some.

Im Clay soils with relatively high fertility. Relatively difficult to work and tend to be waterlogged for several days after heavy rain. Frontland clays.

If Permeable sandy, silty or clayey soils. Relatively easy to drain and work but are less fertile than Im and require more fertilizer. Riverain soils.

1.7.2. Class II Moderate Agricultural Land

Soils that have moderate limitations for general agricultural use. The soils in this class are between the Class I soils which have above average potential and those of Class III which are distinctly marginal.

Soils in this class have low fertility or relatively poor physical characteristics and/or have moderate salinity or toxicity limitations. These soils can produce moderately well given above average management and heavy applications of fertilizer and lime.

IIm Clay soils with impermeable subsoils and low fertility. They are relatively difficult to drain and also require relatively heavy fertilizer applications.

IIf Silty, sandy and clay soils with low fertility. These soils need regular, heavy applications of fertilizer and lime to perform moderately well.

IIs Clay soils with salinity as the main limitation but also with acid-sulphate salts in some areas. This limits the choice of crops and requires special treatment.

1.7.3. Class III Poor Agricultural Land

Marginal soils for agriculture with severe limitations. They can be cultivated with difficulty but generally should be left in their natural condition.

These soils have low fertility combined with poor physical properties and/or high levels of toxic salts. These limit the choice of crops and require very special management.

IIIs Mainly deep organic soils but also include soils with impermeable very silty surface layers which cap and become very hard when dry. All soils are low in fertility and the organic soils are difficult to work with machinery and shrink badly when drained. Drainage would also be very difficult.

IIIt Clay soils with relatively high concentrations of toxic acid-sulphates. They have low fertility and would require very special practices for agricultural development.

1.7.4. Class IV Non-Agricultural Land

These are soils that cannot be cultivated at present due to their very severe limitations.

IVs Clayey sediments with very high soluble salt content and frequently flooded with brackish water. Tidal flats.

Table 2.5. shows the areas of the different land capability classes within the Planning Area. This shows that nearly 57% of the Planning Area has been classified as Class I Good Agricultural Land, with a further 29% classified as Class II Moderate Agricultural Land and 11% as Class III Poor Agricultural Land.

Map 7 shows the location of the different Land Capability Classes and again it is apparent that the majority of the Class I and II Land lies to the east of the Canje Creek and that the more marginal Class III Land is concentrated in the west of the area between the Canje Creek and the Berbice River. An analysis of drainability and land capability has been carried out to highlight areas of potential development. This is reported on in Appendix 3.

Table 2.5. Land Capability Classification (LCC)				
LCC Class	**LCC Subclass**	**Area (acres)**	**% Of Class**	**% Of Total Area**
Class I	1m	131,382	32.4	18.4
Good Agricultural Land	1f	273,767	67.6	38.4
Total Class I		**405,149**	**100.0**	**56.9**
Class II	2m	45,074	21.7	6.3
Moderate Agricultural Land	2f	84,775	40.7	11.9
	2s	78,299	37.6	11.0
Total Class II		**208,148**	**100.0**	**29.2**
Class III	3m	14,476	18.5	2.0
Poor Agricultural Land	3t	63,984	81.5	9.0
Total Class III		**78,460**	**100.0**	**11.0**
Class IV	4s	8,245		1.2
Non-Agricultural Land				
Total Class IV		**8,245**		**1.2**
Sub-Total		700,002		
No Data		12,221		1.7
TOTAL		**712,223**		

1.8. Land Tenure

Map 8 shows the land tenure within the Planning Area and Table 2.6. also shows this information.

Table 2.6. Land Tenure Areas		
Land Tenure Class	**Area (acres)**	**Percentage**
Private (Transported)	118,496	16.6
Private (Guysuco)	7,879	1.1
Public	465,879	65.4
Public Co-operative	23,421	3.3
Public (Guysuco)	52,388	7.4
Public Land Development Scheme	26,166	3.7
Public Neighbourhood Democratic Council Estate-Public NDC	17,994	2.5
TOTAL	**712,223**	**100.0**

Table 2.6. shows that the vast majority (82.3%) of land within the Planning Area is public land with private land confined to the coastal frontlands, generally first and second depth land, the northern part of the Berbice East Bank, lower Canje both East and West and scattered plots along the Canje Creek.

Privately owned Guysuco land is confined to the frontal part of the Skeldon sugar estate since Providence, Rose Hall, Albion and the back of Skeldon are actually on public land. Other smaller areas of land tenure classes include public co-operative land most of which is located between Skeldon sugar estate and the Canje Creek and falls under the Skeldon Expansion scheme.

BBP is public land and a land development scheme, whilst public NDC administered land occurs in the third and fourth depth of Villages 52-74 and Crabwood Creek.

Table 2.7. shows the present land uses and land cover on all Public Land whilst Table 2.8. shows the present land uses and land cover for all Private Land.

Table 2.7. Land Use On Public Land	Area (acres)	Percentage
Abandoned Land	58,532	10.0
Cropped Land	102,949	17.6
Pasture Land	17,557	3.0
Primarily Natural Vegetation	402,115	68.6
Other Land	4,695	0.8
TOTAL	**585,848**	**100.0**

Table 2.8. Land Use On Private Land	Area (acres)	Percentage
Abandoned Land	50,636	40.1
Cropped Land	27,706	21.9
Pasture Land	169	0.1
Primarily Natural Vegetation	33,750	26.8
Other Land	14,114	11.2
TOTAL	**126,375**	**100.1**

The most interesting feature of these tables is the fact that private land is four times more likely to be abandoned than public land. The total acreages of abandoned land are about the same but abandoned land makes up only 10% of all public land whilst it comprises 40% of private land.

1.9. Land Occupation

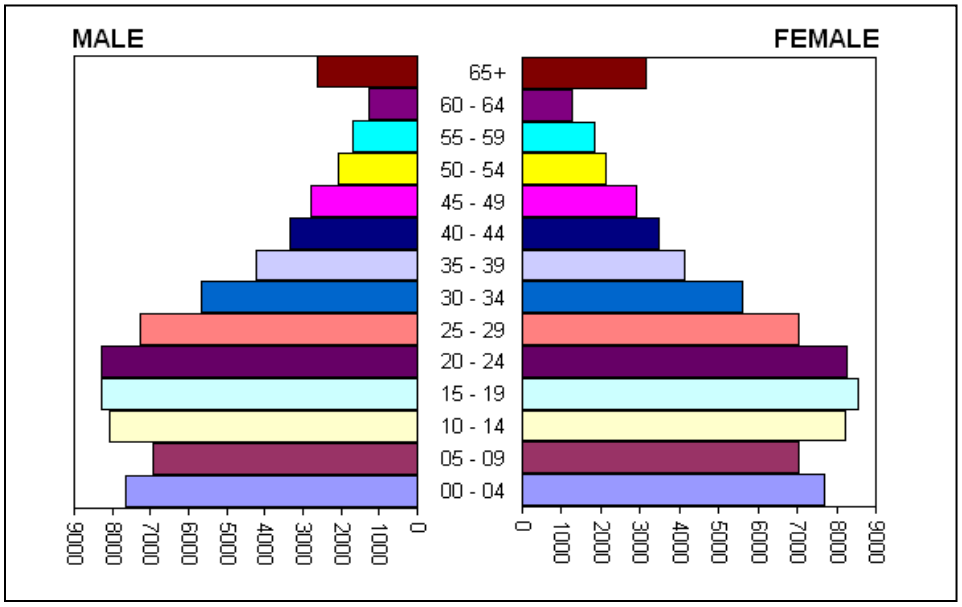
Land Occupation refers to whether an area of land is actually currently occupied or not and serves to highlight areas of land that may not be used to their full potential. This is shown on Map 9 and in Table 2.9.

Table 2.9. Land Occupation	Area (acres)	Percentage
Occupied	220,723	31.0
Scattered Occupation	187,565	26.3
Unoccupied	303,935	42.7
TOTAL	**712,223**	**100.0**

The map highlights those areas that are currently unoccupied and correlates well with areas of abandoned land. These areas include parts of Moleson/Jackson Creek, former Co-op lands behind Skeldon sugar estate and the MCP, the frontlands of BBP, the lower Canje West Bank between Providence sugar estate and the Canje Creek and all but the land along the road in East Bank Berbice from Light-town to Christinas Lust and Zorg-en-Vlygt to Mara.

1.10. Population and Demography

The population data for Region 6 East Berbice-Corentyne were derived from the 1991 population and housing census. Unfortunately, the 2001 census data was not yet available at the time of writing (January 2004). Figure 2.1. shows the population data and derived population pyramid for the Planning Area.



AGE	MALE	FEMALE	TOTAL
00 - 04	7,648	7,695	15,343
05 - 09	6,940	7,039	13,979
10 - 14	8,075	8,203	16,278
15 - 19	8,302	8,537	16,839
20 - 24	8,290	8,251	16,541
25 - 29	7,287	7,020	14,307
30 - 34	5,669	5,589	11,258
35 - 39	4,235	4,135	8,370
40 - 44	3,320	3,469	6,789
45 - 49	2,786	2,888	5,674
50 - 54	2,089	2,128	4,217
55 - 59	1,688	1,844	3,532
60 - 64	1,276	1,286	2,562

65+	2,626	3,135	5,761
TOTAL	**70,231**	**71,219**	**141,450**

Source: Statistical Bureau (Guyana) - 1991 Population & Housing Census

Figure 2.1. Region 6 Population Pyramid

The total population for the Planning Area is given as 141,450 in 1991. Thomas (2001) estimated a population of 155,000 in 1999 based on the 1991 census data. The population demographics are skewed towards the young as would be expected for a developing country with 21% (29,322) of the total population aged under 10 and 66% (93,287) of the population aged under 30. The numbers of children aged under 10, and especially between 5 and 9 are significantly fewer than those aged between 10 and 24. This may be as a result of the economic progress of the country since 1982, the success of family planning programmes or an improvement in the status of women.

In terms of sex ratios, females outnumber males by a ratio of 1.01-1.09:1 for most age groups with the exception of 65+ where the ratio is much greater at 1.19:1 and for the ages 20-39 where surprisingly males outnumber females by a ratio of 1.01-1.04:1. Overall the ratio of females to males is 1.01:1.

1.11. The Urban Landscape

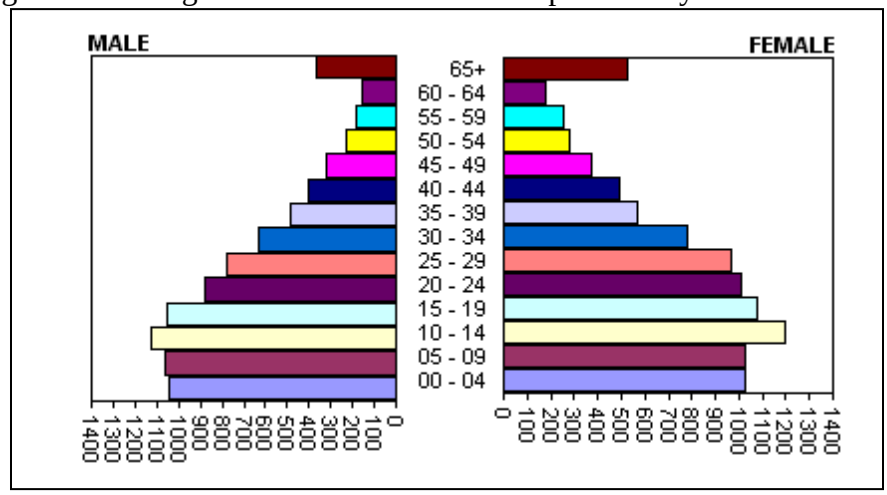
Region 6, East Berbice-Corentyne is unique in Guyana in having three municipalities within the Region. A breakdown of the population for the three municipalities is as follow:

The municipalities are:

	Population
New Amsterdam	18,479
Corriverton	13,429
Rose Hall	6,796
Total	**38,704**

Out of a total population of 141,450, 38,704 people or 27.4% live in the three municipalities. The age structures of the population pyramids for the three municipalities broadly correspond with the Region as a whole with the exception of Rose Hall which shows a much narrower base i.e. proportionally fewer children.

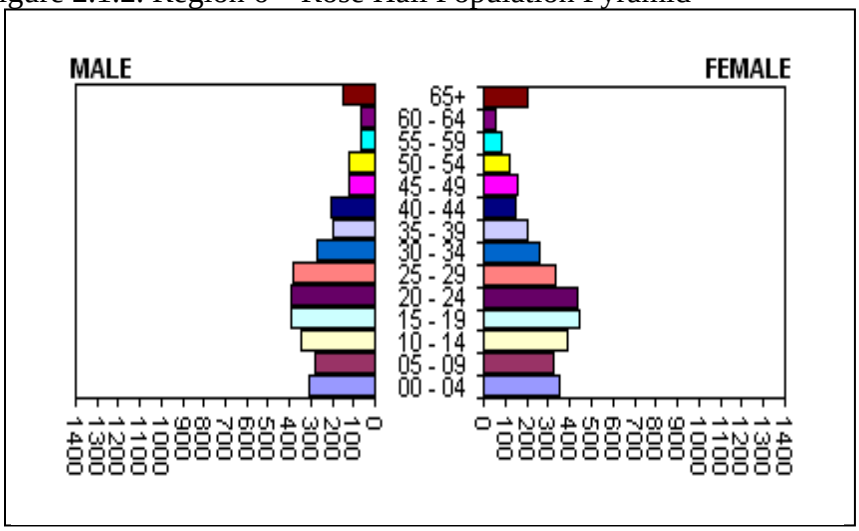
Figure 2.1.1. Region 6 - New Amsterdam Population Pyramid



AGE	MALE	FEMALE	TOTAL
00 - 04	1,047	1,024	2,071
05 - 09	1,057	1,027	2,084
10 - 14	1,127	1,197	2,324
15 - 19	1,055	1,079	2,134
20 - 24	883	1,006	1,889
25 - 29	781	964	1,745
30 - 34	630	777	1,407
35 - 39	482	572	1,054

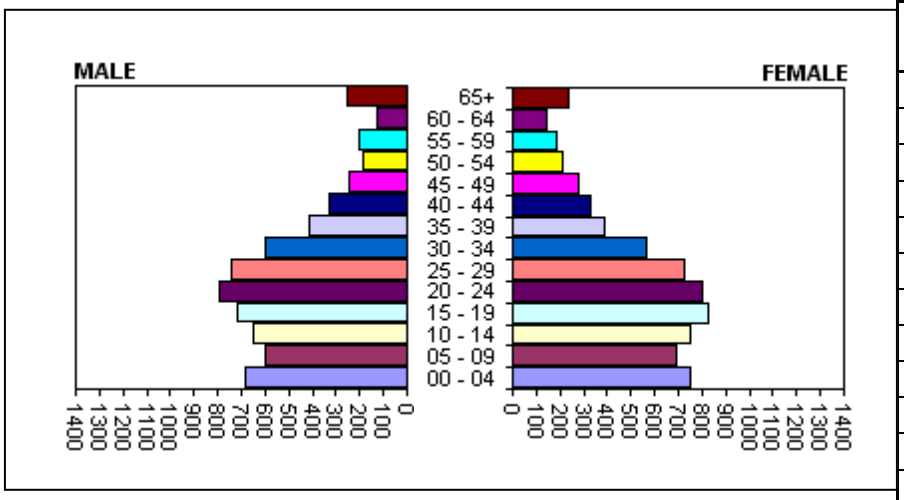
40 - 44	403	489	892
45 - 49	319	377	696
50 - 54	232	283	515
55 - 59	185	257	442
60 - 64	157	176	333
65+	367	526	893
TOTAL	**8,725**	**9,754**	**18,479**

Figure 2.1.2. Region 6 – Rose Hall Population Pyramid



AGE	MALE	FEMALE	TOTAL
00 - 04	311	352	663
05 - 09	279	322	601
10 - 14	345	385	730
15 - 19	395	445	840
20 - 24	396	440	836
25 - 29	380	332	712
30 - 34	271	260	531
35 - 39	200	200	400
40 - 44	202	150	352
45 - 49	120	154	274
50 - 54	121	117	238
55 - 59	70	81	151
60 - 64	61	57	118
65+	149	201	350
TOTAL	**3,300**	**3,496**	**6,796**

Figure 2.1.3. Region 6 – Corriverton Population Pyramid



AGE	MALE	FEMALE	TOTAL
00 - 04	683	750	1433
05 - 09	601	693	1294
10 - 14	649	752	1401
15 - 19	718	830	1548
20 - 24	792	798	1590
25 - 29	743	724	1467
30 - 34	599	568	1167
35 - 39	414	389	803
40 - 44	326	330	656
45 - 49	246	282	528
50 - 54	188	211	399
55 - 59	201	189	390
60 - 64	127	141	268
65+	249	236	485
TOTAL	**6536**	**6893**	**13429**

In terms of sex ratio, New Amsterdam is unusual in that it shows an overall female to male ratio of 1.12:1 with a ratio of 1.24:1 for the ages 20-65+. Given that the younger age groups show, on average, a 1:1 ratio, one can conclude that many men emigrate from New Amsterdam in their late teens and early twenties. The sex ratio data for Corriverton and Rose Hall are broadly in line with the Region as a whole.

It should be noted that the current GLASP Regional Land Use Plan has no jurisdiction over town planning within the municipalities, this coming under the Town and Country Planning Department (TCPD) of the CHPA. The TCPD however, now largely concentrates on reactive planning relating to the review and processing of building permit regulations and the sub-division of land, whilst CHPA concentrates on planning new housing development and squatter regularisation. None of the municipalities within the Planning Area has a town plan, although New Amsterdam is currently in negotiation with an American city concerning their collaboration in a town plan.

The Regional Plan therefore recognizes the fact that it does not have the mandate to plan *within* the municipalities but aims to provide the regional framework to guide any subsequent town planning.

The three municipalities differ from one another in a number of ways.

New Amsterdam is the largest municipality within the Region and is the second city of Guyana. It is bounded to the west by the Berbice River, to the north and east by the Canje Creek and by Providence sugar estate to the south. Being the regional capital, the town is a focal point for many government agencies as well as being a centre for private sector operations mainly in the light industry and service sectors. Major employers and industries associated with the town include Guysuco and the Providence sugar estate; shipping and especially the trans-shipment of bauxite mined upstream to ocean-going vessels moored in the Berbice River mouth; sand and gravel trans-shipment located on the Canje Creek and a variety of oil depots, timber processing works and saw-mills.

New Amsterdam is characterised by its relative independence of Guysuco as a major employer, although Guysuco is still a large employer, it is not an important part of the town's economy as it is in Corriverton and Rose Hall. The town is growing rapidly (personal observation and local consultation in the absence of the 2001 census data) but is constrained by its physical boundaries. This situation is leading to the conversion of former agricultural land to housing and to land speculation by developers (GLASP Land Market Study, 2002).

Corriverton is the second largest municipality in the Region and is located in a narrow strip on the banks of the Corentyne River between the river and the Skeldon sugar estate. The municipality itself is bounded to the north by the villages of the Lower Corentyne coast and to the south by Crabwood Creek. The town is dominated by the Skeldon sugar estate, although it is also an important service centre in its own right, particularly for the relatively affluent, rice-growing Villages 52-74. The town also supports a number of saw mills and is a key trading centre with Suriname. Unlike New Amsterdam, there are no areas of former agricultural land available for conversion to housing which has led to very high land prices. Any expansion of the municipality will either have to be into privately owned Guysuco land or in the villages to the north of the town or in the Moleson/Jackson Creek area.

Rose Hall is by far the smallest of the three municipalities in terms of population and, like Corriverton, is dominated by the local sugar estate, in this case Albion. The town acts as a service centre for the local area but differs from New Amsterdam (and to a lesser extent, Corriverton), in that there are very few other employment opportunities other than the sugar industry or private sector service industries. The town is not constrained by any physical features, although it is fronted by the coast and has the Albion sugar estate to the south. There are large areas of saline, abandoned, former agricultural land close to the municipality which are gradually being converted to housing. The areas immediately to the east and west of Rose Hall are considered to have the greatest housing demand in the Region. Albion sugar estate has made some land available for housing but there have not been any major housing developments as yet.

1.12. Poverty Status

The household poverty status was determined by Thomas (2000) in 1999 according to the following definitions:

Absolute poverty is defined as "being unable to meet both essential food and non-food needs". In monetary terms, the absolute poverty line was set at G$7,639 per month (US$1.40/day).

Critical poverty is defined as "unable to purchase/consume food essential for survival" and the critical poverty line was set at G$5,463 per month (US$1/day).

In 1999, the percentage of households in East Berbice-Corentyne in absolute poverty was 24.7% and amount in critical poverty was 7.5%. These figures for the Region are lower than those for Guyana as a whole (26.7 and 12.7%, respectively) and for the rural coastal zone (30.7 and 12.3%), and show that the Region has the second lowest incidence of households in critical poverty (after Region 10, Upper Demerara-Berbice – 5.1%) and the fourth lowest in absolute poverty (after Regions 10, 5 & 7).

1.13. Socio-Economic Infrastructure

Maps 10 and 11 show the socio-economic infrastructure of the Planning Area in terms of location of facilities for:

Education	Nursery Schools
	Primary Schools
	Secondary Schools
	Tertiary Colleges and Universities
Health	Health Centres
	Hospitals

Law	Police Stations Magistrate's Courts
Other Services	Post Offices Fire Stations Rice Mills

Other private businesses and services such as shops and gas stations have not been shown. The maps show that the majority of facilities are strung out along the coast road and concentrated in the three municipalities with the exception of BBP and the occasional primary school or police station in such places as Moleson/Jackson Creek, Mara, East Bank Berbice and Baracara.

1.14. Transport Infrastructure

The main features for each transport infrastructure type for the Planning Area are:

Road

The main tar roads are:

- From New Amsterdam to the Suriname stelling at Jackson Creek.
- From New Amsterdam to Mara on East Bank Berbice.
- From New Amsterdam to Sandvoort/Rising Sun, West Bank Canje.
- From the Rose Hall turnoff to Vrede en Vriendshap, East Bank Canje.
- From Adventure through BBP to Village 44, Good Hope.

The only other all weather tracks are those that follow the supply canals to pump stations on the Canje for the Guysuco sugar estates namely:

- Calabash Creek for Providence sugar estate.
- Port Mourant Water Path for Albion sugar estate.
- Skeldon Water Path for Skeldon sugar estate.

There are also tracks that follow canals to the pump stations for Black Bush Main Canal and the Manarabisi Canal but they are not all weather. There is no passable track alongside the Yakusari Canal. The only other motorable track, apart from dams, is to the new school at Moleson Creek.

Most dams are motorable in the dry season but many are impassable in the wet season.

Canals

The main canals have been mentioned under roads. On the Canje they are:

- Port Mourant Water Path
- Black Bush Main Canal
- Yakusari Canal
- Manarabisi Canal

- Skeldon Water Path

and between the Berbice River and the Canje Creek:

- Torani Canal

Airstrips

There is only one airstrip in the Planning Area at Skeldon serving the sugar estate.

Stellings

There are two main stellings in the Planning Area.

- At New Amsterdam crossing the Berbice River to Rosignol in West Berbice.
- At Jackson Creek crossing the Corentyne River to Suriname.

1.15. Industry

Most industrial sites are located along the Berbice River south of New Amsterdam, at the mouth of the Canje Creek and on the Corentyne River between Skeldon and Crabwood Creek. Most industrial activities are either light industry (construction, engineering, etc.); depots for oil and petrol imports and small scale wood processing plants and saw mills. The Canje Creek mouth is an important area for sand and gravel shipment. Sugar mills are located at Rose Hall, Albion and Skeldon and all processed sugar is exported by sea. There is no deep water harbour within the Planning Area so all bauxite mined upstream in the Berbice River is transferred to bulk carriers at the river mouth.

1.16. Housing

The current demand for housing is somewhat difficult to ascertain but CHPA has, in the past few years, planned housing developments at the following locations within the Planning Area:

- Glasgow, Smithstown, Toghirg Park (New Amsterdam)
- No 2 Cumberland, Smithsons Place, Adelphi (Rose Hall)
- Chesney, Kilcoy, Belvidere, Hampshire, Williamsburg, Ankersville (Albion)
- Resource, Tain, Bloomfield (Port Mourant)
- Bush Lot (BBP frontlands)
- No. 74, No 77 (Corriverton)

There are current plans for lots at:

- Ordnance Fort Lands 1000 lots
- Chesney/Kilcoy 120 lots
- Block 4 Tain 185 lots
- Area R Anchorville 220 lots
- Section D Bloomfield 120 lots
- Scottsburgh 48 lots
- No. 77 Village 400 lots

The CHPA squatter regularisation unit aims to regularise squatters on site but if this is not possible the people are moved to already identified and demarcated areas for new housing development. The unit has identified squatter areas within the Planning Area concentrated around Albion, specifically Belvidere, Hampshire, Nigg, Kilcoy, Chesney and Williamsburg and indicates that it will be able to regularise any squatters on-site without the need for translocation. The unit issued 373 titles to squatter households in these areas in 2002 out of a total of 457 houselot titles issued in Region 6 as shown in Table 2.10.

Table 2.10. Titles Issued By CHPA In Squatting Areas In Region 6 In 2002

Identified Squatting Area	No. Houselots
Block X Belvidere	70
Block X Hampshire	27
Doctor Bush[1]	10
Belvidere/Nigg	74
Kilcoy South	14
Chesney South	45
Kilcoy/Chesney-North	50
High Reef[1]	8
Hampshire-South East	35
Portuguese Quarters-N[1]	2
Portuguese Quarters-S[1]	8
Williamsburg S - Section H	58
Sand Reef[1]	15
Guava Bush[1]	28
Grass Field[1]	4
East Side Of Line Dam[1]	3
Bound Yard[1]	6
TOTAL	**457**

[1] Area's location unclear – name not in Guyana Gazetteer

1.17. Livestock

Data on livestock numbers are scarce. The NDDP estimates a cattle population of 65,000 heads for Region 6, most of which would be within the Planning Area. This is 27% of the total cattle population for Guyana and shows that the Region has the second highest cattle population after Region 5.

Agrodev (1996) give a figure of approximately 15,000 heads of livestock for the MCP but field enquiries in 2003 revealed that fewer than 50 people owned cattle there and of those, only 5 to10 people had greater than 100 heads. Unless six or seven people own a thousand heads each (considered unlikely), then the current cattle population of the MCP is more likely to be 4,000-6,000.

The NDS in 1996 estimated a total cattle population for Guyana of 270,000 heads and also quoted figures of 300,000 sheep and 150,000 goats. If the distribution is the same as for cattle, then this would give sheep and goat populations in the order of 72,000 and 36,000 within the Planning Area. Again, these figures are only a crude estimate and should be treated with caution but serve to indicate the pressing need for a national agricultural audit.

1.18. Tourism

At present, there is very little tourism within the Planning Area with the exception of primarily intra-regional tourism to the coast at Village 63 and international traffic passing through the Region from Georgetown to Suriname and French Guiana. The potential for tourism is discussed in Appendix 3.

Appendix 3

Analysis of the Potentials, Constraints and Conflicts

1. Analysis of the Potentials, Constraints and Conflicts

1.1. Land Use Potentials

The main emphasis of the analysis of land use potential has been in the agricultural sector although forestry, fishing, tourism, mineral exploitation and infrastructure have also been considered. However, since the Planning Area is overwhelmingly dominated by agriculture, the Plan has focused on that sector.

The present land use is a good starting point for an indication of an area's natural resources potential. However, degradation processes resulting from present land use or misuse reduce this potential. Therefore, a brief analysis of the ecological and socio-economic vulnerabilities has been undertaken.

1.2. Vulnerability

1.2.1. Ecological Vulnerability

In evaluating the ecological vulnerability of the area, the following factors were considered:

- Soil salinity
- Soil erosion
- Soil toxicity
- Susceptibility to inundation
- Natural vegetation

Areas of soil salinity are vulnerable since the presence of salinity tends to lead to land abandonment and environmental degradation over time. These areas are often more vulnerable to soil erosion as well since the surface layer forms an impenetrable cap and rainwater runs off or stays as puddles on the soil rather than soaking into it. Large areas of saline frontlands have been abandoned for some 40 years and only in places has the soil been colonised by salt bush, the rest is bare ground.

Areas of soils with toxic acid-sulphate salts are mostly still under natural vegetation in the west of the area. In general, these soils will be very difficult to drain and bring into production, especially since the act of draining the land will cause the oxidation of the pyrite (iron sulphide) in the soil which releases sulphuric acid and can cause a catastrophic fall in the pH level. In areas where these soils also contain a layer of peat over the mineral soil, the 'pegasse' soils, drainage could lead to a shrinkage of soil

volume by 50% and would also render them vulnerable to fire. It is therefore recommended that these areas of acid sulphate soils are kept under natural vegetation.

Areas prone to flooding are also indicated since they may also be prone to erosion although they are just as likely to be subject to deposition. Areas simply waterlogged during the wet season have not been included since this would include much of the area. Soil erosion from runoff such as sheet and rill erosion is not a major factor due to the extremely low relief and the high clay content of most soils as evidenced by the almost total lack of any suspended sediment in the Canje Creek.

Areas of natural vegetation are considered to be ecologically vulnerable given the thrust for the development of agricultural land. There are only two small areas of forestry concessions but there are appreciable amounts of natural bush, savannah and marshland which are vulnerable to agricultural expansion. Areas of mangrove along the coast are particularly vulnerable given their high bio-diversity and role in coastal protection. They are not currently given protected area status but this should be considered, especially given the potential for conversion of abandoned coastal land for aquaculture.

1.2.2. Socio-Economic Vulnerability

In assessing the socio-economic vulnerability, the following factors were taken into account:

- Population (growth, structure, distribution, migration, future expectations)
- Transport infrastructure
- Education
- Poverty indices
- Accessibility to market and credit
- Land tenure
- Energy and water supply
- Comparative advantage (local/regional/global)

The main employment centres in the Planning Area are the three municipalities of New Amsterdam, Rose Hall and Corriverton, although Guysuco is the largest single employer providing employment for 26% of those aged between 15 and 57 (Rawana, 1999). Underemployment is extremely high with 34% of the potential workforce indicating that they were available for work for 5 or more days a week, if it were available. This is perhaps unsurprising given the seasonal nature of work opportunities in an area dominated by sugar and rice production. Many households have secondary occupations with 54% engaged in farming and 20% in fishing.

Labour mobility within the Region is very low but external migration rates are high with the majority of households (62%) having relatives abroad and a further 16% reporting that they expected to migrate in the next 3-5 years. (Rawana, 1999). It is therefore to be expected that remittances form a substantial amount of local income. The same survey cautions that although there is an overall surplus labour force at present, this can be expected to fall due to emigration and that beyond 2005 the labour force may not be able to sustain the manpower demands of an expanded Skeldon. This projection however

assumes a constant emigration rate and does not take into account any dropping off in emigration with an improvement in local economic conditions.

The Region's population is thought to be about 155,000 or 19.8% of the country, based on a 1999 estimate from the 1991 census. Anecdotal evidence indicates that the population is stagnating as emigration equals or exceeds the rate of natural increase.

In terms of educational attainment, 43% of the population did not complete primary school (9% had no formal education at all), 28% completed primary school, 13% completed secondary school (14% attended but did not complete) and 1% received further technical or vocational training. Less than 1% of the population do not have any tertiary education. These figures are broadly comparable with figures for the whole of the country (Thomas, 2000). Increased education provision however, does not appear to be leading to lower unemployment rates within the Region and there are calls for more job creation and on-the-job training. Also, 86% of household heads believed that their children should be educated in order to be able to avoid the tedious job of cane cutting.

However, according to GEAP (GEAP, 2002), secondary school enrolment is very low with only 56% of eligible 12-17 year olds attending school compared with figures of 76% for nursery school and 94% for primary school. This high drop-out rate is explained by socio-economic and educational pressures where either a family cannot afford to keep children in school, does not see the need for secondary schooling or, (especially in the case of girls) wishes to control their activities by keeping them at home. GEAP has calculated (assuming a 75% enrolment), that there will be a steady increase in demand for secondary school places to 2010 and that by then, there will be a shortfall of 931 places for 12-16 year olds and 3,331 for 12-17 year olds. However, they do note that in the absence of any regional data on migration, these data should be treated with caution.

According to Thomas (2000) in 1999, the percentage of households in East Berbice-Corentyne in absolute poverty was 24.7% and amount in critical poverty was 7.5%. Absolute poverty is defined as "being unable to meet both essential food and non-food needs" and critical poverty as "unable to purchase/consume food essential for survival". In monetary terms, the absolute poverty line was set at G$7,639 per month (US$1.40/day) and the critical poverty line at G$5,463 per month (US$1/day). These figures for the Region are lower than those for Guyana as a whole (26.7 and 12.7%, respectively) and for the rural coastal zone (30.7 and 12.3%) and show that the Region has the second lowest incidence of households in critical poverty (after Region 10, Upper Demerara-Berbice – 5.1%) and the fourth lowest in absolute poverty (after Regions 10, 5 & 7). It must be noted that the incidence of poverty had declined from 1992/1993 to 1999.

Within the rice farming areas, there is a feeling that small farmers will be squeezed out and that there will be a consolidation of land holdings. This has been fostered by the previously inadequate land tenure situation where bigger farmers could easily rent land off to smaller farmers but with LTR, smaller farmers may find it easier to obtain loans and make capital investments to make their holdings more profitable. A socio-economic

study in 1998 (GLASP, 1998), calculated that an average family needed 47 acres of rice land to be above the (critical) poverty line, or 23 acres if the family also worked as hired manual labour. 23 acres is the mean farm size for the coastal plain but the median is 15 acres, indicating that well over 50% of farmers have holdings that area too small to offer an adequate income from rice farming alone.

The main area of concern voiced by farmers in the field which relates directly to their socio-economic vulnerability concerns the state of the D&I system. Where it is functioning relatively well, as in BBP or Villages 52-74, then farmers are more or less happy (even though only about 50% pay their D&I rates) but where it is not, such as Crabwood Creek, much of the frontlands and East Bank Berbice, then land is abandoned (farmers do not pay their D&I rates) and farmers either emigrate, move to other activities or graze animals on their own and other land. The most common complaints are; lack of irrigation water, flooding or waterlogging, saltwater intrusion in specific areas and poor maintenance of dam roads.

A further cause of vulnerability which impacts on the D&I system is that farmers often do not get paid by the rice millers in time to plant the next crop when it should be planted. This leads to late planting or not planting at all which in turn means that the D&I is running at a lower efficiency level. Again, LTR and the possession of a longer lease should lead to easier access to credit and therefore should improve the efficiency of the D&I system by enabling farmers to coordinate their planting and harvesting.

The main infrastructural vulnerability after D&I concerns marketing of fresh produce and especially the performance of the Berbice River crossing between New Amsterdam and Rosignol. The ferries are old, frequently break down or are out of order and are not roll-on roll-off ferries but require manoeuvring on-board which takes time. The provision of true roll-on roll-off ferries or a bridge across the river would markedly improve the situation.

The socio-economic survey of the coastal areas of Guyana (IICA, 1994), identified a comparative advantage in paddy production although it also noted that this was almost completely offset by low productivity. GLASP 1998 noted that the fact that yields are lower than international levels (mean 21.7 bags/acre or 3.4t/hectare), offered considerable scope for improvement but recent data for 2001 indicate yields per crop from Berbice of 23-27 bags/acre or 3.6-4.2t/hectare (MoA, 2001), which compares favourably with quoted yields for Suriname (3.5t/hectare), Venezuela (4.0t/hectare) or the USA (5.0t/hectare). However, off-farm cost reductions could still be made by improving farm and main roads, by using more efficient milling techniques and with a deep water harbour.

1.2.3. Ecological Value

Whilst some 65% of the Planning Area is covered by primarily natural vegetation, much of it is grassland and bush with only two small areas in the south of the Planning Area demarcated as forestry concessions. These are the northernmost extensions of much

larger forest reserves on the white sands to the south. To all intents and purposes, forestry and forest conservation is not an issue within the Planning Area.

In terms of vegetation mapping, the GFC vegetation map (GFC, 2001) identifies only four classes within the area, mangrove forest on the coast, cultivated land, open swamp and coastal swamp forest.

The only area of any real ecological value is that of the mangrove woodland that forms a barrier between the sea and the land in places along the coast. This woodland has not been declared a priority area for protection by the National Bio-diversity Action Plan but given its role in coastal protection and the potential pressure from aquaculture perhaps this should be rethought.

1.2.4. Recreational Value

The recreational value of the Planning Area is limited by the fact that much of the land area is occupied and has been or is being used for agriculture. Whilst there is some recreational value in a visit to a sugar estate to international visitors, it seems unlikely that there is much recreational value in agricultural land for local and regional visitors. Much of the rest of the land is grassland, bush and swamp; again with little recreational value especially when compared to other parts of the country.

There is however, some recreational value in the coastal area especially around Village 63 where the land is above sea level and there is a beach. This value is already being exploited by the local population and to a lesser extent, by the national population.

The town of New Amsterdam has very limited recreational value but Corriverton has some value due to its proximity to the Suriname ferry crossing at Moleson Creek and its position on the Corentyne River mouth.

There is little recreational value in terms of eco-tourism actually within the Planning Area but the upper reaches of the Berbice and Corentyne Rivers have considerable recreational value and eco-tourism potential.

1.3. Potentials

1.3.1. Potential for Forestry

The potential for forestry is very small due to the fact that the area is underlain in the main by poorly drained coastal clays and is therefore at a comparative disadvantage compared to the inland areas of the country. The only areas of forestry concessions are two blocks totalling 11,665 acres to the south of the Torani Canal.

In the long term, the swampy, toxic acid-sulphate, pegasse soils in the west of the area could be developed as plantations for pole-wood using certain eucalyptus species as has been done on similar soils in the Mekong Delta in Vietnam.

1.3.2. Potential for Agriculture

The potential for agriculture has been identified using the following criteria:

- Land Capability (a function of soil parameters such as drainage, texture, salinity, toxicity, fertility, acidity)
- Drainability (a function of natural soil drainage and topographic position)
- Land Tenure
- Accessibility Of Farmland
- Drainage & Irrigation System Status
- Water Availability
- Present Land Use and Land Use History
- Access To Markets

A total of 35 SMUs have been recognised and mapped. These have then been grouped together based on the soil unit's drainability since this is considered to be the most important driver to development. Practically, all the soils (98% of the total area) within the Planning Area require drainage and (to a lesser extent) irrigation to be brought into production.

Each soil unit was also assigned a Land Capability Class by the FAO. This is a method of grouping soils together to show their relative agricultural suitability and is based on each soil unit's limitations for crop production. It is very important to note that the land capability classification system ***assumes the provision of adequate drainage***. Whilst this was done with the best intentions in order to emphasise the land's quality after drainage works have been carried out, it does tend to give a false impression of the potential for development.

The assessment of agricultural potential was therefore undertaken using soil drainability and capability as the basis for delineating areas of similar physical characteristics. Soil drainability was chosen since this integrates soil characteristics with topography and is based on the premise that only gravity drainage is economically viable (MottMacdonald *pers. comm*. 2003) and that there is no point in trying to develop a particular area before another if it will be much more difficult to drain. The soils have therefore been grouped first by ease of drainability and then by capability.

Map 5 shows the soil drainability classes and Tables 3.1. and 3.2. indicate the areas of different drainability. Soil drainability is a function of each soil unit's physical characteristics and its topographic position. Essentially, this shows that the vast majority of land to the east of the Canje Creek would be relatively easy to drain and similarly that the majority of land to the west of the Canje Creek would be relatively difficult to drain.

Table 3.1. Soil Drainability

	Area (acres)	Percentage
Soils not requiring drainage	17,204	2.4
Easily drainable soils	224,641	31.5
Relatively easily drainable soils.	235,741	33.1

Soils which are relatively difficult to drain	90,638	12.7
Soils which are difficult to drain	109,058	15.3
Soils which are very difficult to drain	22,721	3.2
No Data	12,221	1.7
TOTAL	**712,224**	**100.0**

Table 3.1a. Summary Soil Drainability	**Area (acres)**	**Percentage**
Relatively easily drainable (RED) soils	477,586	67.1
Soils that are relatively difficult to drain	222,417	31.2
No Data	12,221	1.7
TOTAL	**712,224**	**100.0**

Table 3.2. Soil Drainability Classes and Characteristics

		Area (acres)	**%**
A	Soils not requiring drainage. Well to moderately well drained loams with low to very low fertility.	17,204	2.4
B1	Easily drainable soils. Poorly drained clays with moderate fertility.	188,110	26.4
B2	Easily drainable soils. Poorly drained silt loams with low to very low fertility.	36,531	5.1
C1	Relatively easily drainable soils. Poorly drained silt loams to clays with low to moderate fertility.	49,124	6.9
C2	Relatively easily drainable soils. Poorly to very poorly drained clays with high fertility.	131,382	18.4
C3	Relatively easily drainable soils. Poorly drained silt loams to clays with low to moderate fertility. Salinity and/or acid-sulphates present.	55,235	7.8
D1	Soils which are relatively difficult to drain. Very poorly drained silt loams to clays with low to moderate fertility.	67,573	9.5
D2	Soils which are relatively difficult to drain. Poor to very poorly drained clays with low to moderate fertility. Salinity and/or acid-sulphates present.	23,064	3.2
E1	Soils which are difficult to drain. Poor to very poorly drained clays with low fertility.	45,074	6.3
E2	Soils which are difficult to drain. Very poorly drained clays with low fertility. Toxic acid-sulphates present.	63,984	9.0
F	Soils which are very difficult to drain. Poor to very poorly drained organic soils to clays with low to very low fertility.	22,721	3.2
	No Data	12,221	1.7
	TOTAL	**712,224**	**100.0**

Table 3.3. Soil Drainability By Land Capability								
	Land Capability Sub-class Area (acres)							
Soil Drainability Classification	Good Agricultural Land		Moderate Agricultural Land			Poor Agricultural Land		Non-Agricultural Land
	If	Im	IIf	IIm	IIs	IIIm	IIIt	IVs
A	16,304		900					
B1	188,110							
B2	11,411		25,119					
C1	49,124							
C2		131,382						
C3					55,235			
D1	8,817		58,756					
D2					23,064			
E1				45,074				
E2							63,984	
F						14,476		8,245
TOTAL	**273,767**	**131,382**	**84,775**	**45,074**	**78,299**	**14,476**	**63,984**	**8245**
TOTAL	**405,149**		**208,148**			**78,460**		**8,245**

Map 12 shows soil drainability and capability combined, to highlight areas which would be relatively easy to drain and have good to moderate (Classes I-II) agricultural land. Table 3.3. shows the areas in acres and indicates that there are 477,586 acres (67% of the total area) of land that is relatively easily drainable (Classes A-C) and are classified as good (Class I) or moderate (Class II) agricultural land with physical, fertility or salinity limitations.

Even if one excludes the 55,235 acres of Class II Land with salinity or toxicity limitations (IIs), since they are likely to prove to be difficult to ameliorate, then one is still left with 422,350 acres, or 59% of the total area of relatively easily drainable, good to moderate agricultural land.

Map 13 integrates this information with areas currently cropped, i.e. the Guysuco sugar estates (including the Skeldon Expansion area) and areas with functioning D&I (BBP & Villages 52-74), in order to highlight the remaining areas of *available* land (land that is not currently being used for agriculture, apart from for extensive grazing) with the highest potential. This is also shown in Table 3.4.

Table 3.4. Areas Of Relatively Easily Drainable[1] (RED) and Available[2] Land By Land Capability Class								
Land Capability Classes	**Area (acres)**	**%**	**RED Land (acres)**	**% RED Land**	**% Total**	**RED & Available Land (acres)**	**% RED & Available Land**	**% Total**
Class I	405,149	56.9	396,332	83.0	55.6	260,189	85.8	36.5
Class II	208,148	29.2	81,254	17.0	11.4	43,037	14.2	6.0
Class III	78,460	11.0						
Class IV	8,245	1.2						
No Data	12,221	1.7						
TOTAL AREA (acres)	**712,223**	**100.0**	**477,586**	**100.0**	**67.1**	**303,226**	**100.0**	**42.6**

[1] Relatively easily drainable land according to FAO soil mapping 1965
[2] Available means land currently abandoned or under natural vegetation

This still leaves 303,226 acres of land (43% of the total area) with the potential to be developed for arable agriculture. Of this, the vast majority (86%) is Class I Land and Map 13 shows that the majority of such land occurs to the east of the Canje Creek, although appreciable areas also occur on East Bank Berbice and the lower Canje.

In terms of land tenure, the majority (83%) of this land (both the RED land and the RED and available land) is public land as Table 3.5. shows.

Table 3.5. Available Relatively Easily Drainable Land By Land Tenure						
	All Land		**RED Land**		**RED and Available Land**	
	Acres	**%**	**Acres**	**%**	**Acres**	**%**
Public	585,848	82.3	395,324	82.8	250,936	82.8
Private	126,375	17.7	82,262	17.2	52,291	17.2
TOTAL	**712,224**	**100.0**	**477,586**	**100.0**	**303,226**	**100.0**

The location of this most suitable land for agricultural development, as shown on Map 13, has guided the land use planning exercise and is shown as a backdrop on the scenario maps Figures A, B, C1 and C2.

1.3.3. Potential for Mineral Exploitation

No potential for mining as such has been recognized due to the fact that no minerals have been identified within the Planning Area. Bauxite, kaolin and sand occur to the south of the Planning Area and the Berbice River is an important route for bauxite export.

There is, however, a potential for oil and natural gas. There is a capped (in the 1940s) exploratory oil well near Mara and a Canadian company, CGX, has just completed a preliminary investigation into the area's potential for oil and gas. No results are available as yet.

1.3.4. Potential for Fishing

Most fishing carried out within the Planning Area is relatively small-scale with the only concentrations of offshore fishing co-operatives located at Villages 43 and 66. Other fishing is carried out on an individual basis in the rivers, creeks and canals and is strictly for home consumption. The potential for increasing the amount of offshore fisheries is though to exist but is offset by poor infrastructure and difficulties in getting the produce to market. Improvement in the road infrastructure, a quicker crossing of the Berbice River (whether by bridge or faster transfer ferries) and/or provision of canning/processing/freezing plants to add value to the catch would enable the fisheries sector to realise this potential.

1.3.5. Potential for Aquaculture

The potential for aquaculture, which is being actively promoted by the government, is already being realised in several places along the coast, though the largest areas are in the frontlands of Villages 27 to 39, where 600 acres of fish ponds exist, at Fyrish and at Village 49, Mary's Hope, with a more modest 50 acres. Leases for areas of up to 2,500 acres were sought a few years ago at Mara and Brandwagt Sari on East Bank Berbice but there has been no development as yet.

Areas with the best potential for fish farming/aquaculture are often those which have been long abandoned by rice farmers due to salinity. These areas often also have soils that would make amelioration difficult, so the promotion of conversion to aquaculture is to be encouraged, provided that there is no conflict with the environment. At Fyrish, for instance, cases of environmentally damaging fish farming have been reported with sea defences breached, flooding and an increase in mosquitoes.

The promotion of the conversion to fish farming/aquaculture must also ensure that there is no damage to the existing areas of mangrove. In fact, a case could be made for some of the profits from aquaculture to go towards the rehabilitation of mangrove in degraded areas since the mangrove provides excellent sea defence that protects the fish ponds from erosion.

1.3.6. Potential for Industry

The potential for industrial development is dependent on the development of the Region as a whole and especially on the improvement of transport links with the rest of the country. The PRS states that an industrial estate will be developed in Region 6 to advance the processing of local raw materials for export.

At present, industry within Berbice is located either on the Berbice River just to the south of New Amsterdam or on the Corentyne River between Skeldon and Crabwood Creek. With the potential for improved infrastructural links through the provision of a faster Berbice River crossing (bridge or ferries), a deep water port at New Amsterdam and possibly an airport to the north-east of New Amsterdam, any industrial estate should be located on areas of abandoned land close to these facilities. Figure C1 and Figure C2, the full development scenarios, show the possible location of all these facilities.

The development of any light industry along the Corentyne coast is constrained by the lack of available land. An exception is the frontland area south of Crabwood Creek which is privately owned (transported) but has largely been abandoned and is covered with bush regrowth. Ideally, industrial estates would be located on abandoned public land and whilst there is a lot of such land currently available in the Crabwood Creek, Moleson/Jackson Creek area, the Skeldon Expansion scheme and the rehabilitation of Crabwood Creek D&I will bring a lot of this land back into production.

There are large areas of such abandoned public land available in the second and third depths of the frontlands of BBP but the location of an industrial estate here would involve high transport costs both from the producer and to market. However, the area does correspond to the highest incidence of poverty so this possibility could be investigated further.

1.3.7. Potential for Housing

The determining factors in relation to the potential for housing are similar to those for industry (essentially abandoned public land), but are more demand driven and less cost driven. According to the CHPA's squatter regularisation unit, the main squatting zone within the Planning Area is around Albion, specifically the villages of Kilcoy, Chesney, Nigg, Belvidere, Hampshire and Williamsburg where 373 households were regularised in 2002. Most of the squatting is on public land leased to Guysuco who has given their most marginal land for housing. Information from CHPA indicates that there is enough land available for squatter regularisation without having to relocate any households to new areas.

Abandoned public land, close to the main road and population centres are areas with the greatest potential for housing development, although private land close to New Amsterdam and Corriverton is currently being targeted by speculators for conversion from (abandoned) rice land to housing.

1.3.8. Potential for Tourism

There are no tourist resorts as such within the Planning Area and only three sites have been identified as having any tourism potential. These are:

- The site of the first landing of Indentured Indian Labour in Guyana in 1838 at Highbury on East Bank Berbice.

- The beach at Village 63. This is one of the few areas in the east of the country where the land is above sea level and the shoreline is a beach. The beach actually stretches for a few miles in either direction from Village 63 and is popular with the local population at weekends. There is some potential for the development of local tourism but none for international tourism. A clean-up programme needs to be put into operation, litter bins provided and emptied regularly and/or users need to be encouraged to take litter home with them.

- Corriverton has some potential for development as an overnight stop before or after taking the ferry to/from Suriname. Better hotel facilities, particularly one which combined the view over the Corentyne River and the breeze off the Atlantic, would need to be developed. A hotel offering those suggestions as mentioned before may also be able to market itself as a weekend escape from Georgetown.

The potential for eco-tourism within the Planning Area is limited given that much of the area is occupied and does not offer a great biodiversity. There is, however, potential for eco-tourism further south of the Planning Area on the Berbice and Corentyne Rivers and therefore a potential for New Amsterdam and Corriverton to develop as setting-off points, overnight stops and service centres.

1.4. Stakeholders' Interests

The identification of stakeholders is provided in section 1.6.3.1. The assessment of stakeholders' interests has been carried out throughout the planning exercise through consultation with farmers during fieldwork, focused consultations with interested parties and by public meetings, the results of which are presented in Tables 3.6. and 3.6.1. The stakeholders' interests are overwhelmingly focused on the agricultural sector so no sectoral breakdown of interests has been undertaken. Instead, they are presented by geographical areas which broadly correspond to the Planning Areas.

Table 3.6. Region 6 Land Use Planning Area – First Public Meetings

Region 6 Land Use Planning Public Meetings

Sunday 25 May, 2003
9am Crabwood Creek
20 Attendees

After being introduced by the Chairman of the NDC, the Commissioner of the GLSC opened the meeting by outlining the ideas behind a Land Use Plan for Berbice. He explained that the GLSC has a mandate to produce regional land use plans and that Berbice had been selected as the pilot. He explained what a land use plan aims to achieve and how it is carried out. He showed the project area; the data already collected in the form of maps of land tenure, land use and occupation and outlined the concept of delineating areas with the potential for development from soils data and putting this information together with current land use to formulate a plan.

He then indicated that the idea of public consultation was to ask the people living in the area what they would like to see in the Plan, what constraints they thought there were to development and opened the floor for ideas and suggestions.

- Comment 1. Concerned the development of the El Dorado Co-op scheme and whether they could give up some land in order for the Skeldon Expansion to take place and apply for land elsewhere. They indicated that there was land suitable for cattle behind the El Dorado Co-op.

- Comment 2. Concerned the development of an all weather road to the new Moleson Creek school and whether a bridge could be built over 'Mary's Canal' (just to the south of the school), to open up that land for development. It was indicated that access was a problem beyond 'Mary's Canal' and that there was land suitable for many uses beyond.
- Comment 3. On the topic of access, it was indicated that if the present road could be extended for 2.3 miles (3.7 km) from its present end point, then it would reach a reef and it would then be relatively easy to extend the road up to Orealla from there. A track runs north from Orealla for 12 miles (19 km).

- Comment 4. On the same topic – extension of the road by 1 mile (1.6 km) would open up 5,000 acres (2,023 hectares) of land for development including 850 acres (345 hectares) of land suitable for cattle.

- Comment 5. Soil type is important since some areas are swampy and some are sandier reefs.

The Commissioner then opened the discussion up to the possibility of building a bridge across the Berbice River at Everton just south of New Amsterdam and linking this by road to the ferry to Suriname i.e. running a new road alignment through the Region, thus opening up the backlands. Comments were invited.

- Comment 6. This would be a good thing. Before BBP was developed, there was a plan to develop the Corentyne coast down to Orealla. Access has always been a problem.

- Comment 7. Access by road and D&I would be needed for the development of the inland area.

1pm No. 53 Village
24 Attendees

The Commissioner opened the meeting with the same outline as in Crabwood Creek and invited comments from the floor.

- Comment 1. Around here, the land use is cattle in the backlands with rice in the front of it – is that how it should be? The better land should be used for rice.

- Comment 2. There is a severe shortage of irrigation water for lands in front of BBP. The Chairman of the Water Users Committee has put a canal through the

back and cut off most of the irrigation water from reaching the front lands. There has been 30 years of neglect in the D&I system.

- Comment 3. With the planned Guysuco expansion at Skeldon, there will be a need to consider the conservation of water more carefully. This last dry season saw salt water being drawn further up the Canje Creek than ever before. Need to look at what happens at Mahaica Mahaicony Abary and also in the future to look at the possibility of the Greater Canje Scheme (a reservoir higher up the Canje).

- Comment 4. Need better access into the backlands for development. Villages 52 and 66 and Port Mourant Water Path run from the Canje to the frontlands. These dams (and canals) should be developed with all weather roads to encourage greater development in the backlands.

The Commissioner then opened the discussion up to the possibility of building a bridge across the Berbice River and running a new road alignment through the Region, thus opening up the backlands. Comments were invited.

- Comment 5. This would be a good thing.

- Comment 6. What land uses would be suitable for the backlands? In pegasse areas, one needs to graze cattle first to break up the soil and then arable cropping can follow.

- Comment 7. In the past, Johannesburg and Babylon Co-op areas were big areas of cash crop production. However, getting the produce to market was often difficult and crops rotted in the field. Better access would improve this constraint but more marketing research and help is needed since there is often a glut, the price falls and the crop becomes uneconomic.

- Comment 8. There is a need to separate cattle and cropped areas and to develop the MCP area – possibly along the lines of zoned farming as outlined in the Greater Canje Scheme report in 1965.

- Comment 9. There is no desire to expand the area of rice production since the price is too low.

- Comment 10. Any land suitable for development should be empoldered first and then roads built to that land – development follows access.

- Comment 11. The backlands have good soils and are suitable for everything including lumber. There could be a 2 stage development with farming following lumber production.

4pm Betsy Ground Village
24 Attendees

After being introduced by the Chairman of the NDC, the Commissioner opened the meeting by outlining the ideas behind a Land Use Plan for Berbice and invited comments from the floor.

- Comment 1. What would the GLSC advise that the land is used for? Answered, by stating that this meeting is looking for suggestions as to what use the land could be put to rather than being prescriptive.

- Comment 2. Major problem is blocked drainage trenches. Urgent need to rehabilitate the D&I. Need to clean all trenches both irrigation and drainage.

- Comment 3. Upstream on the Canje Creek – some 2 miles (3.2 km) past the Torani Canal, there is a large swampy area. This water could be used to irrigate areas downstream by gravity feed.

- Comment 4. There are many abandoned lands along the Canje Creek. There is a need to involve the Sea Defence Board in any development.

- Comment 5. There is a need to clear the Canje Creek from grass growth.

- Comment 6. Returning to D&I problems - speculation is not a D&I Board area therefore there is a need to get the NDCs involved in clearing and rehabilitating the trenches.

- Comment 7. Opinion that land should be developed whilst waiting for lease to be processed. Pointed out that if a lease is not granted then a lot of money could be wasted.

- Comment 8. There is a need for an all-weather road to New Forest to encourage development. This could be extended further upstream – to the Torani Canal if possible.

- Comment 9. Also the road from Sandvoort on the east of Canje Creek should be extended – this would bring areas such as New Forest closer to New Amsterdam.

- Comment 10. Opinion that roads should be developed last after land preparation and drainage.

- Comment 11. There is a need to rehabilitate the sluices on the New Forest road.

- Comment 12. There is also a need to realign the New Forest road since it is underwater when the Canje floods. The Canje Creek has been shifting eastward over time in the vicinity of New Forest.

- Comment 13. There is a constraint in identifying new land for housing since most land in the vicinity is owned by Guysuco. There is a need to identify other land for housing development.

Tuesday 27 May, 2003
4pm Light Town Village
43 Attendees

The Head of the Land Administration of the GLSC opened the meeting by outlining the ideas behind a Land Use Plan for Berbice and invited comments from the floor.

- Comment 1. The main drainage is blocked up on the road to the river - 5½ miles (8.9 km) from Light Town to Plegt Anker. There is not enough drainage, the main road has blocked up the drains.

- Comment 2. Irrigation is also a problem and after irrigating, farmers have to pump water off the lands for drainage.

- Comment 3. Also the main drainage sluices to the Berbice River are too far apart. More are needed as well as more culverts.

- Comment 4. There is a need to upgrade the all weather road to Mara.

- Comment 5. There is a large area of land in East Bank Berbice that could be opened up with the upgrading of 2 dams (roads). There are dams between Brothers and Lonsdale and Kortberaad and Enfield. The provision of a cross road between these two would provide access and promote development. These would act as farm-to-market roads.

- Comment 6. There is a greater need to upgrade and maintain the public road to Mara first – farmers can build their own roads for access to their lands.

- Comment 7. Farmers need title to their lands to be able to apply for loans. Titles first then can look at planning after.

- Comment 8. With cattle in the backlands and with the drainage problems in the frontlands, it is often impossible to reach the cattle and many die.

- Comment 9. There is a conflict between arable farmers (rice and cash crops) and cattle. They need to be separated. Asked whether there was any land particularly suitable for cattle – yes in the back – need to zone for cattle.

- Comment 10. What crops are most suitable, what crops should we plant? Explained that it is not for the GLSC to prescribe what crops to plant but that the

outcome of the Land Use Plan would indicate which range of crops would and would not be suitable for a particular area.

- Comment 11. There is a need for recreational land.

- Comment 12. Returning to the major problems in reiteration. When the public road was built, it did not take drainage adequately into consideration. Therefore, water backs up behind the road in the first depth lands. This is compounded by poor internal field drains, a too long façade drain and too great a distance between sluices.

- Comment 13. There would be a demand for extending the public road (assuming it is to be upgraded) past Mara to Brandwagt Sari.

Wednesday 28 May, 2003
4pm Lochaber Village
58 Attendees

After being introduced by the Head of the GLSC Region 6, the Commissioner of the GLSC opened the meeting by outlining the ideas behind a Land Use Plan for Berbice and invited comments from the floor.

- Comment 1. Adequate titles need to be in place for any development. People need security of title or security of tenure in order to be able to obtain loans.

- Comment 2. There is an urgent need to regularise squatting. Squatting is a problem in the area – highlighting the need for more land for housing.

- Comment 3. In the Rising Sum area, the land is fertile but abandoned. The whole area from where the road ends in Sandvoort through Rising Sun to Wyburg on the west bank of the Canje needs access, drainage and a koker. The land has been left abandoned and unoccupied due to drainage problems.

- Comment 4. There is a trail from the end of the road at Sandvoort that leads into these lands. The road needs improving and extending into the lands mentioned in Comment 3.

- Comment 5. Would it be possible to have more land for gardens when house lots are allocated? Need to make sure that any land adjacent to the house lots was available for this, to be the case.

- Comment 6. In Vryheid and Caracas, drainage is the major constraint to development with the main drainage canal being silted up. The area is unorganised (no NDC), therefore need to get 20 or so people together and apply to the RDC to become organised.

- Comment 7. Going back to a previous point - housing is a problem; therefore people are forced to squat. There is a need for the Plan to take this into account and to provide more land for housing.

- Comment 8. A number of years ago the government promoted the development of the coconut industry but now there is little demand. Will the Plan address this problem? The Plan will show what crops are suitable for which areas but will not prescribe what farmers can and cannot plant. That will still be up to individual farmers.

- Comment 9. What about markets for our crops? There is no point in investing in land preparation, drainage, etc. if there is no market. For example, rice and sugar are having problems marketing as well as bauxite.

The Commissioner took this point and then opened the discussion up to the possibility of building a bridge across the Berbice River with links to Suriname and Brazil via new roads thus opening up new markets. Comments were invited.

- Comment 9. This would be an excellent idea and have the full approval of the people.

- Comment 10. What about feedback? The Plan will be prepared and the first draft should be ready in late September 2003, so the GLSC will bring the Plan back to the people for consultations in October 2003, before sending the Plan on to the Steering Committee, the RDC and Cabinet for their approval.
- Comment 11. Where will the Plan be available? Apart from the public consultations outlined as before, copies of the Plan will be available for inspection at the RDC and selected NDCs.

Table 3.6.1. Region 6 Land Use Planning Area – Second Public Meetings

Region 6 Land Use Planning Public Meetings

Sunday 13 December, 2003
9am Light Town Village
6 Attendees

The meeting was opened by Trevor John of the GLSC for Region 6, where he first introduced Shuwani Devi Singh and Malini Ross and began explaining that this is the presentation of the Region 6 Land Use Plan, after all the necessary data had been collected to formulate the Plan.

He furthered explained that this meeting is a follow up from the previous Public Consultations that were held in May 2003 and noted that this would be the final Public

Meeting to present the Plan and therefore the importance of anymore ideas and suggestions would be necessary to be added to the Land Use Plan.

After the presentation, the floor was opened for comments.

- Comment 1. They indicated the idea of an orange processing factory being necessary for the area since mostly citrus farming is done.

- Comment 2. D&I is a major problem in the area and even the main road is flooded easily.

- Comment 3. Concern is raised that priority is given to some villages over other villages in terms of development, while the other villages are in more need of attention.

Lots of concern was raised about if and when the Plan would be implemented. Everyone agreed it is a good Plan.

1pm Lochaber Village
1 Attendee

The meeting was opened the same as before and the presentation was made. The Plan was accepted as a good Plan by the one attendee. No comment was made.

Sunday 14 December, 2003
9am Crabwood Creek
15 Attendees

The meeting was opened as the other meetings and the presentation was made.

- Comment 1. The idea of a new road should be placed on the south dam of Crabwood Creek to the C10 Canal and then extending towards Orealla where a reef is present. This road is a continuation from the existing main road and is considered more feasible since persons confirm that the previous road alignment to Orealla is not a good idea because this gets flooded easily from the Corentyne River. In addition, they confirmed that the new road would open up all the available backlands for agriculture.

A note was made of this comment. Everyone agreed that it is a good Land Use Plan but wanted to know when it will be and if it will ever be implemented.

Thursday 15 January, 2004
4pm Betsy Ground Village
25 Attendees

This meeting was opened by Trevor John where he introduced Andrew Bishop, Commissioner of the GLSC and Shuwani Devi Singh. The Commissioner gave a brief overview of the Region 6 Land Use Plan and explained that this is the final Public Meetings of which it is necessary for the people to provide anymore of their ideas and suggestions to be added to the Plan.

The presentation was made and the floor was opened for comments.

- Comment 1. The major problem in the area is D&I and persons also confirmed that some of the canals are within privately owned land. Some canals that are recommended for serious attention are Goed Land Canal, Leser Canal and Miners Canal.

- Comment 2. Marketing of produce for the area. This is very important to consider if more agricultural land are to be made available for farming.

- Comment 3. Access is another important consideration. This is very poor, thus dams, bridges and roads need to be upgraded in order to provide security and protection so as to enhance investment for the future.

Friday 16 January, 2004
4pm No. 54 Village
20 Attendees

This meeting was opened like the other meeting and the presentation was made. The floor was then opened for comments.

- Comment 1. Prefer the idea of the new road leading to the Linden Highway. This would be a shorter route for the Brazilians and also link Suriname for trading. This road can also provide branches of secondary roads to other areas.

- Comment 2. The idea that a road should be placed from the existing main road to the Deep Water Harbour.

- Comment 3. The point that tourism should be promoted in the Region 6 Land Use Planning Area. The idea that the Canje River should be a possible site for resorts, etc.
- Comment 4. Need to consider that the alternative of machine and equipment for replacing manual labour, since the labour market in the Planning Area is not large enough to support the Plan.

These ideas were all noted.

3.4.1. Lower Corentyne Coast

This is an area of current expansion though still covered mainly by natural vegetation at present. Primary concerns were:

- The need for a road from Moleson Creek south to Orealla to drive development. At present, there are tracks only and river transport is expensive.

- An immediate need for a bridge over 'Mary's Canal' to gain access to land to the south. A small extension would reach a reef from where it would be simple to run a track to Orealla.

- It was felt that there was plenty of land available both for arable agriculture and livestock but that D&I would have to be provided for arable land. Soils are important since some lands are better drained than others.

- The owners of abandoned transported land close to the Corentyne River should be forced to optimise their use of that land or forfeit it.

3.4.2. Moleson/Jackson Creek

This area is currently mainly natural vegetation and abandoned rice land with some pasture but is earmarked for development in the shape of the Skeldon sugar estate expansion. Large areas of land will be used for a conservancy and for private cane out-growers. The main concerns were:

- Lack of D&I provision inhibits development.

- Potential for conflict in the future between sugar cane farmers, cattle farmers and cash croppers on Co-op land.

- New "Halcrow" conservancy will take out large area of good grazing land. But may still be possible to graze in the dry season.

- Poor state of D&I close to Crabwood Creek, water becomes saline in the dry season, poor drainage.

- Poor state of farm to market roads such that crops rot in fields.

- The owners of abandoned transported land close to the Corentyne River should be forced to optimise their use of that land or forfeit it.

3.4.3. Crabwood Creek

The area is a zoned development with rice in the first 2 depths, cash crops in the third and livestock in the backlands. However, now mainly abandoned land due to poor D&I. Main concerns were:

- Poor maintenance of D&I causing people to abandon land and emigrate. Main problems are related to flooding, drainage and intrusion of salt water in the dry season.

- Poor performance of the NDC in maintaining D&I. Need to buy sweet water from Guysuco.

- Explore the possibility of extending Crabwood Creek NDC's jurisdiction to include the Jackson/Moleson Creek frontlands to raise revenue.

3.4.4. Skeldon Sugar Estate and Expansion Areas

The Skeldon sugar estate currently covers 12,355 acres (5,000 hectares) and is scheduled to nearly double in size with an additional 11,615 acres (4,700 hectares) on the estate and 9,885 acres (4,000 hectares) of out-growers in Moleson/Jackson Creek. These additional areas will be irrigated from two new conservancies. The Guysuco conservancy covers an area of 3,460 acres (1,400 hectares) and has a capacity of 11,000 mega litres and the Halcrow Conservancy covers 14,825 acres (6,000 hectares) and has a capacity of 25,000 mega litres ensuring that no more water than is currently used is pumped from the Canje Creek. Primary concerns are:

- The peaceful resolution of any conflict between Guysuco and any farmers that have been farming on hitherto unused Guysuco land.

- To this end, the provision of 4,200 acres (1,700 hectares) of higher ground as compensation pasture to cattle farmers from Villages 67-74. The provision of access roads and drainage for this land.

- The acquisition by Guysuco of the following Co-op land for sugar cane development: Babylon Land Co-op, Leeds & Johannesburg Land Co-op, Johannesburg Land Co-op and Leeds Pioneering Land Co-op.

- The erection of a new sugar mill and processing plant at Skeldon.

- The world price of sugar, export markets and quotas.

- The continuation of efficient operation of the Torani Canal ensuring enough water in the Canje Creek for all Guysuco operation.

3.4.5. Villages 52-74 and Upper Corentyne Coast

This area is the main rice producing area in the Region, although the frontlands are now largely abandoned due to salinity and the MCP is not well managed. Main concerns were:

- Need maintenance of D&I system. Too many side canals and dams have not been cleared for 15 years so fields become difficult to drain. Farmers need ingress and egress. NDC apathy.

- The need to consider the conservation of water more carefully especially with the planned Skeldon Expansion. This last dry season saw salt water being drawn further up Canje Creek than ever before.

- Need to look at the possibility of the Greater Canje Scheme (a reservoir higher up the Canje).

- Need better access into the backlands for development. Villages 52 and 66 dams run from the Canje to the frontlands. These dams (and canals) could be developed with all weather roads from the Seaford cross dam back, to encourage greater development in the backlands, possibly along the lines of zoned farming as outlined in the Greater Canje Scheme report in 1965. Plan out 10 acre plots and resettle landless people along new dams with zoned farming for rice, cash crops, livestock and poultry.

- The current low price of rice makes it more and more difficult for smaller farmers to make a living. There is no desire to expand the area of rice production since the price is too low.

- Need guidance as to what to do with salinised frontlands.

- Need to look at the possibility of poultry production and also in growing maize as feed.

- In the past, Johannesburg and Babylon Co-op areas (now part of Skeldon Expansion) were big areas of cash crop production. However, getting the produce to market was often difficult and crops rotted in the field. Better access would improve this constraint but more marketing research and help is needed since there is often a glut, the price falls and the crop becomes uneconomic.

- There is a need to separate cattle and cropped areas and to develop the MCP area. Has 17,000 acres but fewer than 50 people own cattle there and of those only 5-10 people have >100 heads. Guesstimate 3,000-4,000 heads of cattle (Agrodev 1996 estimate 15,000 though). Assume 1 acre can sustain 1 head of cattle for a year, then plenty of opportunity for expansion.

- There is a lot of squatting and if people do not get land they migrate.

- Potential problem with cattle rustling in backlands, especially from the area of compensation land offered to Villages 67-74 cattle farmers. Rustling from Baracara. Also reckon that small animal population is decreasing due to rustling.

- Any land suitable for development should be empoldered first and then roads built to that land – development follows access.

- Problem with flooding in past years. Loss of 350 heads of cattle in 2000, 75-80 heads in 2002. At times of flooding, cattle make for higher ground, which in the MCP is the empoldering of dams which are then destroyed hindering access. Conflict with Guysuco over land, canals and flooding.

- The backlands have good soils and are suitable for everything including lumber. There could be a 2 stage development with farming following lumber production.

- Need for integrated development of the MCP with drainage into Villages 52 and 66 Creek, provision of access, (at present access is along Manarabisi Canal since Yakusari is being dredged), fencing and fodder crops.

- Market for beef is in Georgetown (and possibly export). Abattoirs are in Georgetown, meaning live animal transport with frequent delays in crossing the Berbice River.

3.4.6. Black Bush Polder

This is a planned land development scheme with relatively well functioning D&I and growing almost exclusively rice. Also cash crops around villages. Main concerns were:

- What should be done about vacant land around Les Beholden?

- The severe shortage of irrigation water in lands in front of BBP. There has been 30 years of neglect in the D&I system.

- Need for maintenance of D&I system within BBP.

- Need for rehabilitation of farms to market roads.

3.4.7. East Canje Backlands

This is the area between the Canje Creek and Albion sugar estate, BBP and the MCP. It is only accessible from the Manarabisi Canal, the BBP Canal, the Port Mourant Water Path and the Canje Creek itself. There is hardly any population living in the area, therefore there were no concerns save for those already expressed by the residents of the frontland areas.

3.4.8. Coastal Frontlands & Ordnance Fort To No. 51 Village

These are the first and second depth lands along the coast from Ordnance Fort in the west to Village 51 in the east and are characterised by the very high acreage of abandoned land, most now used for extensive grazing. Main concerns were:

- The severe shortage of irrigation water in lands in front of BBP. There has been 30 years of neglect in the D&I system.
- Need better access into the backlands for development. Port Mourant Water Path runs from the Canje to the frontlands. This should be developed into an all-weather road to encourage greater development in the backlands.
- What should be done with all the abandoned land in the frontlands? Due to poor D&I, land has been abandoned for 40 years in some places e.g. Fyrish.
- Much of this abandoned saline land becomes waterlogged in the wet season with a huge mosquito problem.
- Need to conserve mangrove where it still exists as a sea defence.
- Need to dredge and improve drainage of main drains out into the sea.
- Land has been abandoned because Guysuco controls the water. Some farmers pay Guysuco for water and can grow rice, sugar and have dairy cattle.
- Big squatting and housing problem in the area. Need to regularise squatters and have more housing areas.
- Guysuco Albion estate indicated that they would not release any more land for housing since land that they have released has not been developed.
- Saline frontlands are good for aquaculture/fish farm development. Main problem is theft of stock.
- Major rustling problem. One farmer quoted losing 15 heads of sheep per week
- Need to look at the potential for feedlots on the frontlands. Possibility of using antelope grass and molasses as feed.

3.4.9. East Berbice Sugar Estates

This includes Providence, to the west of the Canje Creek and Rose Hall and Albion to the east.

- Guysuco Albion estate indicated that they would not release any more land for housing since land that they have released has not been developed.

- Saltwater intrusion up the Canje Creek. Providence had to stop pumping at the Calabash Creek pump station at times in 2003 due to the water being too salty.

3.4.10. Lower Canje

This area includes land both sides of the lower Canje Creek. The area is primarily private, transported land but only about 50% occupied. Main concerns were:

- Major problem in East Canje is blocked drainage trenches. Urgent need to rehabilitate the D&I. Need to clean all trenches both irrigation and drainage.

- Also East Canje not a D&I Board area, therefore there is a need to get the NDC involved in clearing and rehabilitating the trenches.

- There are many abandoned lands along the Canje Creek. There is a need to involve the Sea Defence Board in any development. Also there is a need to clear the Canje Creek from grass growth.

- There is a need for an all-weather road to New Forest to encourage development. This could be extended further upstream – to the Torani Canal if possible. There is also a need to realign the New Forest road since it is underwater when the Canje floods. The Canje Creek has been shifting eastward over time in the vicinity of New Forest.

- There is also a need to rehabilitate the sluices on the New Forest road.

- In East Canje, there is a constraint in identifying new land for housing since most land in the vicinity is owned by Guysuco. There is a need to identify other land for housing development.

- Adequate titles need to be in place for any development. People need security of title or security of tenure in order to be able to obtain loans.

- In the Rising Sun area, the land is fertile but abandoned. The whole area from where the road ends in Sandvoort through Rising Sun to Wyburg on the west bank of the Canje needs access, drainage and a koker. The land has been left abandoned and unoccupied due to drainage problems. This road extension would also bring areas such as New Forest on the East Canje closer to New Amsterdam.

- There is a trail from the end of the road at Sandvoort that leads into these lands. The road needs improving and extending into the lands mentioned as before.

- There is an urgent need to regularise squatting in West Canje. Squatting is a problem in the area – highlighting the need for more land for housing. Housing is

a problem; therefore people are forced to squat. There is a need to provide more land for housing.

- In Vryheid and Caracas, drainage is the major constraint to development with the main drainage canal being silted up. The area is unorganised (no NDC) therefore need to get 20 or so people together and apply to the RDC to become organised.

- Marketing. There is no point in investing in land preparation, drainage, etc. if there is no market. For example, rice and sugar are having problems marketing as it is with bauxite.
- Upstream on the Canje Creek – some 2 miles (3.2 km) past the Torani Canal there is a large swampy area. This water could be used to irrigate areas downstream by gravity feed.

3.4.11. East Bank Berbice

This is an area of largely private land in the north and public land in the south, though very little occupation and much of it abandoned. Main concerns were:

- Drainage is the main problem and the reason why much of the land has been abandoned. When the public road was built it did not take drainage adequately into consideration. Therefore, water backs up behind the road in the first depth lands. This is compounded by poor internal field drains, a too long façade drain and too great a distance between sluices.

- Irrigation is also a problem and after irrigating, farmers have to pump water off the lands for drainage.

- Also the main drainage sluices to the Berbice River are too far apart. More are needed as well as more culverts. Also the first depth lands flood from the second depth lands.

- Even if the D&I was upgraded, most farmers want to rear cattle rather than grow cash crops or rice. There are no big cattle farmers, all medium sized herds.

- There is a need to upgrade the all weather road to Mara. There would also be a demand for extending the public road (assuming it is to be upgraded) past Mara to Brandwagt Sari.

- There is a large area of land in East Bank Berbice that could be opened up with the upgrading of 2 dams (roads). There are dams between Brothers and Lonsdale and Kortberaad and Enfield. The provision of a cross road between these two would provide access and promote development. These would act as farm-to-market roads.

- Farmers need title to their lands to be able to apply for loans. But farmers that own land do not want state land.

- With cattle in the backlands and with the drainage problems in the frontlands, it is often impossible to reach the cattle and many die.
- There is a little conflict between arable farmers (rice and cash crops) and cattle. They need to be separated. There is plenty of land suitable for cattle in the backlands. Some farmers are planting fodder crops and antelope grass for cattle.

- There is a need for recreational land.

- Many people in Mara farm on the West Bank Berbice because the soils are lighter (East Bank soils are 'exhausted') and there is no flooding problem.

- Problem with access to one's own land – many have to pay royalty to other people to use their dams to access one's own land.

3.4.12. West Canje Backlands

This is the area between the East Bank Berbice and the Canje Creek. It is accessible only on foot and from the Canje Creek itself. It is not known whether the back dam proposed for the Mara Scheme (Euroconsult *et al* 1981) to run from Mara to the Potoco/Canje confluence was ever built. There is hardly any population living in the area and the concerns come from those people in East Bank Berbice and Baracara who graze cattle in the area.

- There is good pasture but only in the dry season. Very wet in the rainy season, needs drainage. Between Mara and Baracara there is alternating swamp and savannah.

- Fire is a major hazard in the dry season, especially in 2003, a particularly dry year.

- Need access to markets.

- Poor soil for crops. Only good for 2-3 years then have to leave for many years. Bananas failed this year due to drought.

3.5. Constraints

Many of the main constraints to the development of the area have been voiced as before but have been grouped together by sector and for the agricultural sector, by type of constraint.

3.5.1. Constraints for Forestry

The main constraint for forestry is that the land and soils of the Planning Area are not particularly suitable for forestry and the area is therefore at a comparative disadvantage in comparison to the rest of the country. A further constraint for the two areas of Forestry Concessions is their remoteness and lack of access except by river and canal.

3.5.2. Constraints for Agriculture

3.5.2.1. Water Supply

According to the D&I Board and Guysuco, based on flow data from the Greater Canje Scheme report (Macdonalds, 1965) and allowing for an increased amount of flow through the Torani Canal, there is enough water in the Canje Creek to irrigate 120,000 to 130,000 acres. There are no recent flow data for the Canje Creek (apart from Macdonalds in 1965) and there are no data indicating the amount of water that is pumped out of the Canje by Guysuco (at 3 pump stations - Skeldon, Port Mourant, Calabash) or the D&I Board (2 pump stations - Manarabisi, BBP).

The land use mapping undertaken for this project has shown that there is presently a gross cropped area of 130,650 acres of which just less than 120,000 acres (119,836 acres) are irrigated. If one assumes 15% of gross area for infrastructure, then this leaves 101,860 acres net cropped irrigated land.

Basically, the area currently cropped is approaching its capacity and any further development will initially need to look at improving the efficiency of water use in D&I areas and in the longer term at the provision of more water for irrigation from the Greater Canje Scheme.

Any further extraction from the Canje Creek will result in salt water being drawn further up the creek. In 2003 pumping was stopped at Calabash, which supplies Providence sugar estate, due to salt water intrusion. The expansion of Skeldon sugar estate which will bring an additional 21,500 acres of land under sugar should not affect the Canje Creek since the scheme is planning to irrigate from new conservancies rather than by increasing the off-take from the Canje.

With the possible rehabilitation of the D&I systems at BBP, Villages 52-74 and Crabwood Creek though, it is likely that more land will come back into production and/or that more crops per year will be grown. In this case, Water Users Associations should be formed to ensure the optimal use of water.

3.5.2.2. Drainage and Irrigation

This is the main constraint to development that farmers see and is the most frequently cited reason for the abandonment of formerly productive land. The failure and lack of maintenance of the D&I system in Crabwood Creek, most of the frontlands, lower Canje and East Bank Berbice has led to nearly as much land being abandoned as is currently cropped (109,000 acres verses 130,000 acres), a situation that has led, amongst other reasons, to the high rate of emigration.

According to Agrodev (1996) there are 13 declared D&I areas within the Planning Area with a total acreage of 102,609. There are also several undeclared D&I areas such as East Bank Berbice and the Upper Corentyne. Of these, in only two areas (BBP, Villages 52-74) can the D&I be said to be functioning relatively well and even in these areas efficiency is very low. The lack of maintenance is still the main cause for concern among farmers and points to the need to form Water User Groups as stated before.
With investment in D&I and the formation of Water Users Associations, a great deal more land could be brought into cultivation (with the provision that more water is made available) but most of the abandoned frontland areas will probably prove too difficult and costly to rehabilitate.

3.5.2.3. Soils

The soils of the Planning Area are a constraint to agricultural development since they all need drainage and irrigation provision ***before*** they can be brought into production. It is a common fallacy that the area is endowed with a vast acreage of fertile soils. It is true that there are some 415,000 acres of relatively easily drainable good to moderate agricultural land (FAO LCC Class I and II) but it is often forgotten that this classification ***assumes the provision of adequate drainage***. Without this assumption, these lands would be classified as Class III (USBR classification) at best.

These soils then require a relatively high level of management for acceptable yields since most are either relatively infertile (requiring fertilizer), highly acid (requiring lime), poorly drained, have problems with waterlogging, are difficult to work or a combination of some or all of these.

Nevertheless, when drainage and irrigation is provided and maintained these soils can produce well (yields per crop of 23-27 bags/acre or 3.7-4.4 t/hectare for rice [MoA 2001]) but do require a relatively high level of management and the choice of crops that can be grown is very limited.

Soils other than those that are easily drainable and Class I and II have even more severe limitations in that they may be difficult to drain, very infertile, extremely acid, very poorly drained, saline and toxic or a combination of some or all of these. These soils are not suitable for the development of arable agriculture but may be considered for livestock.

3.5.2.4. Access

There are two types of access constraints, access to farmland along dams and access to backlands and underdeveloped land.

Access to farmland as a constraint is in a similar mould to D&I in that the access dams need regular maintenance. The impassability of dams, especially in the wet season, is frequently cited as a constraint by farmers, especially by cattle farmers who have animals in the backlands that cannot be reached in the wet season.

Access to the backlands and underdeveloped land is a constraint to the future development of the area as a whole and was also frequently cited by farmers in the field and at public meetings as a possible driver to development. Areas requiring new or upgraded all weather roads or tracks included:

- New road from Moleson Creek to Orealla.
- All weather dams at Villages 66 and 52 to the Canje.
- Improvement and realignment of the New Forest road – possible extension up the Canje right bank.
- Extension of the Sandvoort road to Wyburg in Canje West Bank.
- Rehabilitation of East Bank Berbice road – possible extension to Brandwagt Sari.

3.5.2.5. Land Tenure

Much has been written and said about insecurity of tenure being a constraint to agriculture since farmers are unable to access credit and may be unwilling to invest in land improvements. This is being addressed by GLASP under its LTR programme. Nevertheless, insecurity of tenure is a constraint to agriculture, especially in an area where costly irrigation and drainage works are a prerequisite to development.

However, security of tenure in the form of transported land is not a guarantee of success either as the 50,600 acres (or 40%) of abandoned private land shows.

3.5.2.6. Infrastructure and Marketing

This constraint relates to the larger picture and the development of the country as well as the Region. The poor state of the roads, river crossings, ferry services and lack of a deep water harbour are hampering agricultural development since farmers do not want to invest in new crops, seeds, varieties or machinery if the crop is going to spoil on the way to market. Investment in infrastructure development will help to alleviate these constraints.

This situation is exacerbated by a very small internal market, meaning that farmers need to grow export crops to justify development costs such as D&I and therefore a good, rapid infrastructure becomes even more important.

In terms of marketing, a major constraint to rice farmers is not getting paid on time by millers so that they do not have enough cash to plant the next crop. This has led to a situation where, to a certain extent, rice has no season anymore in that farmers will only plant when they can, rather than when they should. The LTR and the issuance of longer term leases should help to alleviate this problem since farmers will be able to obtain credit to pay for seed and sowing.

3.5.3. Constraints for Aquaculture

The main constraints for aquaculture are the availability of land, drainage of excess water in the wet season and theft from ponds. The same constraints in terms of infrastructure and marketing for agriculture also apply.

3.5.4. Constraints for Industry

The main constraints for industry are the availability of designated land and poor infrastructure especially in terms of a deep water harbour and the crossing over the Berbice River.

3.5.5. Constraints For Housing

The main constraint for housing is the availability of designated land. There are appreciable areas of abandoned, saline land close to the main area of housing demand, essentially around Albion and Port Mourant. This land will be very difficult to rehabilitate for agriculture and needs to be converted to housing land to satisfy housing demand.

3.5.6. Constraints for Tourism

The main constraint for tourism is that there is little in the way of scenic beauty or heritage sites. It is at least two and a half hours drive from Georgetown and often includes a wait of 90 minutes for the ferry crossing. Hotel accommodation is also limited.

3.6. Analysis of Conflicts

Five main instances of potential conflict have been identified:

3.6.1. The first is between cattle farmers and arable farmers in the potential agricultural development of the backlands. As has been seen, much of the land to the east of the Canje is relatively easily drainable and is good to moderate agricultural land. However, this would need drainage for arable development but not necessarily for pasture development so there is the potential for conflict between cattle farmers who may occupy the land first and be pushed out if the land is developed for arable agriculture. This is what has happened with the Skeldon Expansion, where cattle farmers from Villages 67-74 were using some public land (leased to Guysuco) for grazing and had to move when Guysuco went ahead with the expansion. The matter was only resolved by Guysuco granting the cattle farmers an area of compensation land, with access, drainage and fencing.

3.6.2. The second potential area of conflict concerns the abandoned frontlands, largely private land, abandoned for many years, mainly due to lack of water and salinity. This land, being frontland, close to the main road and close to New Amsterdam is highly suitable for conversion from abandoned arable land to:

- Industry – close to a potential deep water port and airport.
- Housing – close to the road, electricity and water supply, and to the main areas of housing demand.
- Aquaculture – large areas of flat, poorly drained, saline land close to the sea.
- Livestock – possible conversion to feedlots, seeding with salt tolerant fodder crops such as antelope grass, alfalfa.

- Airport – large area of flat land, close to population centres and main road.

3.6.3. The third potential conflict arises with the possibility of oil and/or gas being discovered. However, assuming that any finds would be economically viable, then it is likely that benefits would greatly outweigh disbenefits and that the value of oil would greatly exceed any value derived from agriculture.

3.6.4. The fourth potential conflict arises in relation to the mangrove forest that fringes the coast from New Amsterdam to Rose Hall. Whilst the area of mangrove is not presently under pressure, it may become so in the future, especially with any expansion of the municipalities of New Amsterdam and Rose Hall, and particularly in relation to the development of a deep water harbour and industrial estate.

3.6.5. The final area of potential conflict is between the forestry concessions to the south of the Torani Canal and agricultural development since the areas correspond to potential agricultural land.

Appendix 4

GIS Thematic Maps

1. Compilation Note

Maps for the Region 6 Land Use Planning Area were compiled from a number of sources:

The 1:50,000 Topographic Maps of Guyana 1987 – 1989 (39NE, 39SE, 39SW, 39NW, 30SE, 30SW, 30NW, 29NE, 29SE, 38NE) were used as base maps for the Regional Land Use Plan.

The Present Land Uses & Land Cover Map & all the Socio-Economic Infrastructure Maps were compiled from field work undertaken March – May 2003.

The Land Tenure and the Occupancy Maps were compiled from field work conducted in September 2001 – August 2002.

The Soil Types Map was digitized using Arc Info and compiled from two sources

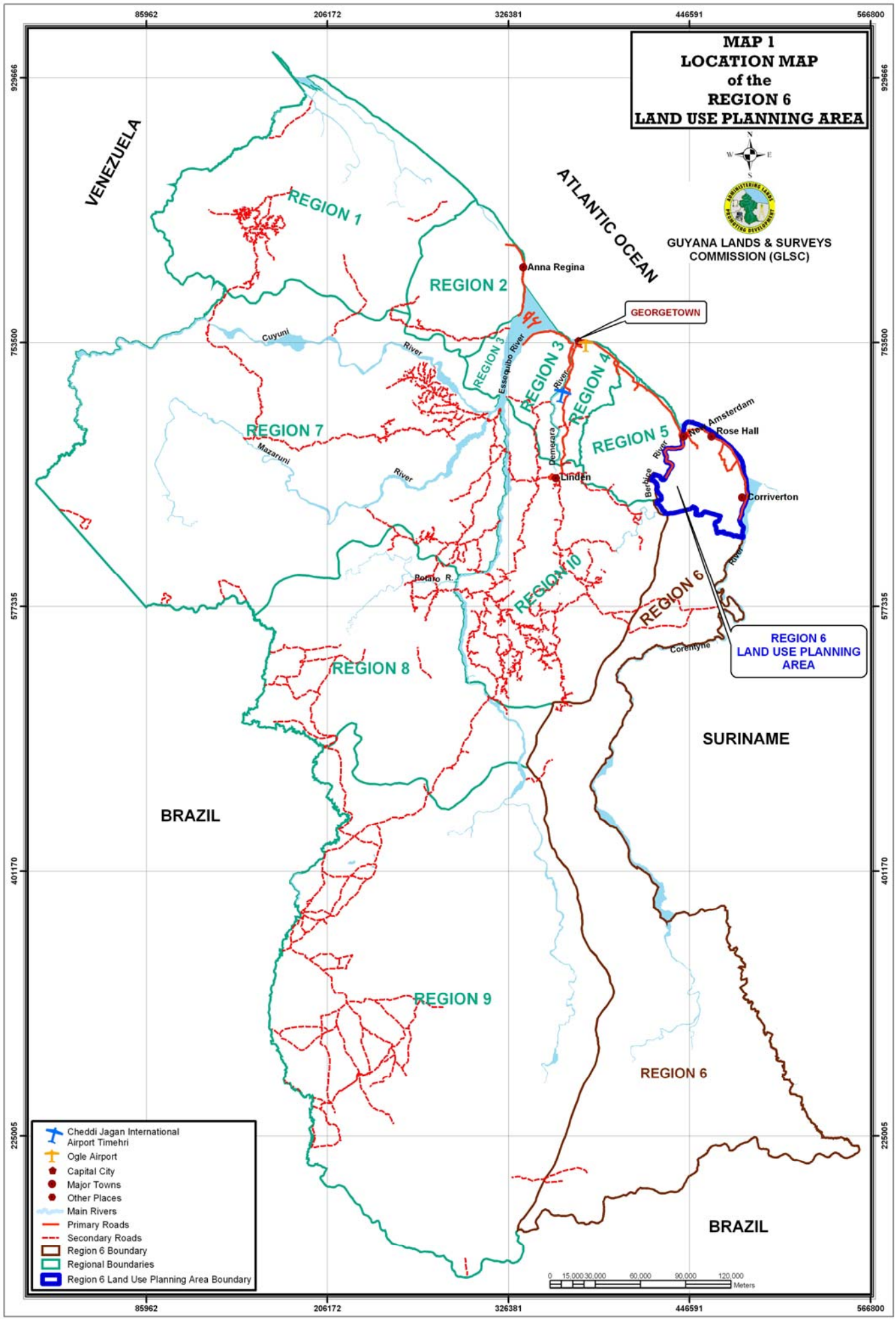
(i) Soil Map of the Canje Area – Food and Agriculture Organisation at scale 1:60,000 that contain 5 sheets dated 20.3.64.

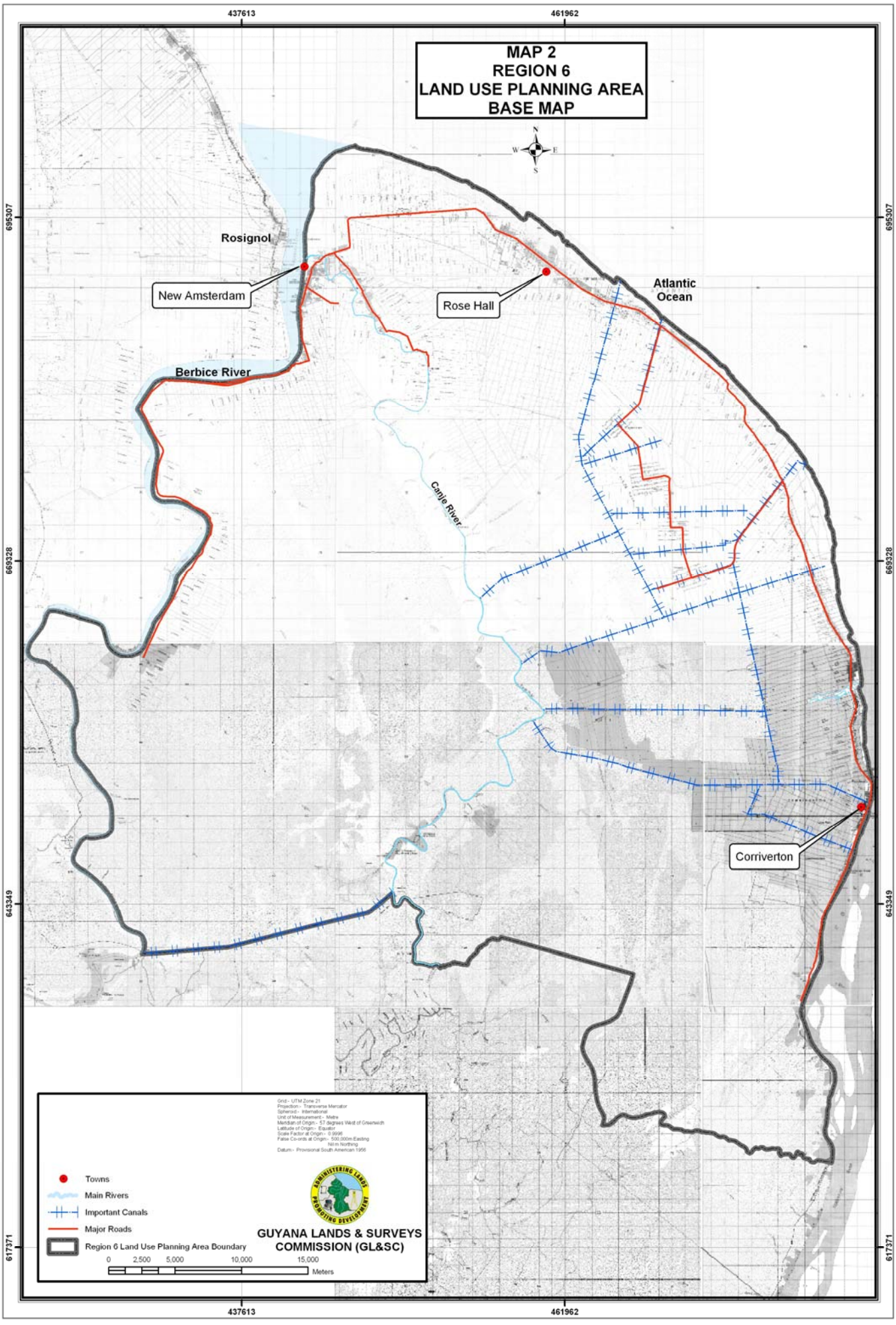
(ii) Land Capability Map of the Lancaster – Joppa Area Corentyne Berbice Guyana – Soil Surveys C.A.S Mon Repos, Ministry Of Agriculture at scale 1:30,000 dated November 1972.

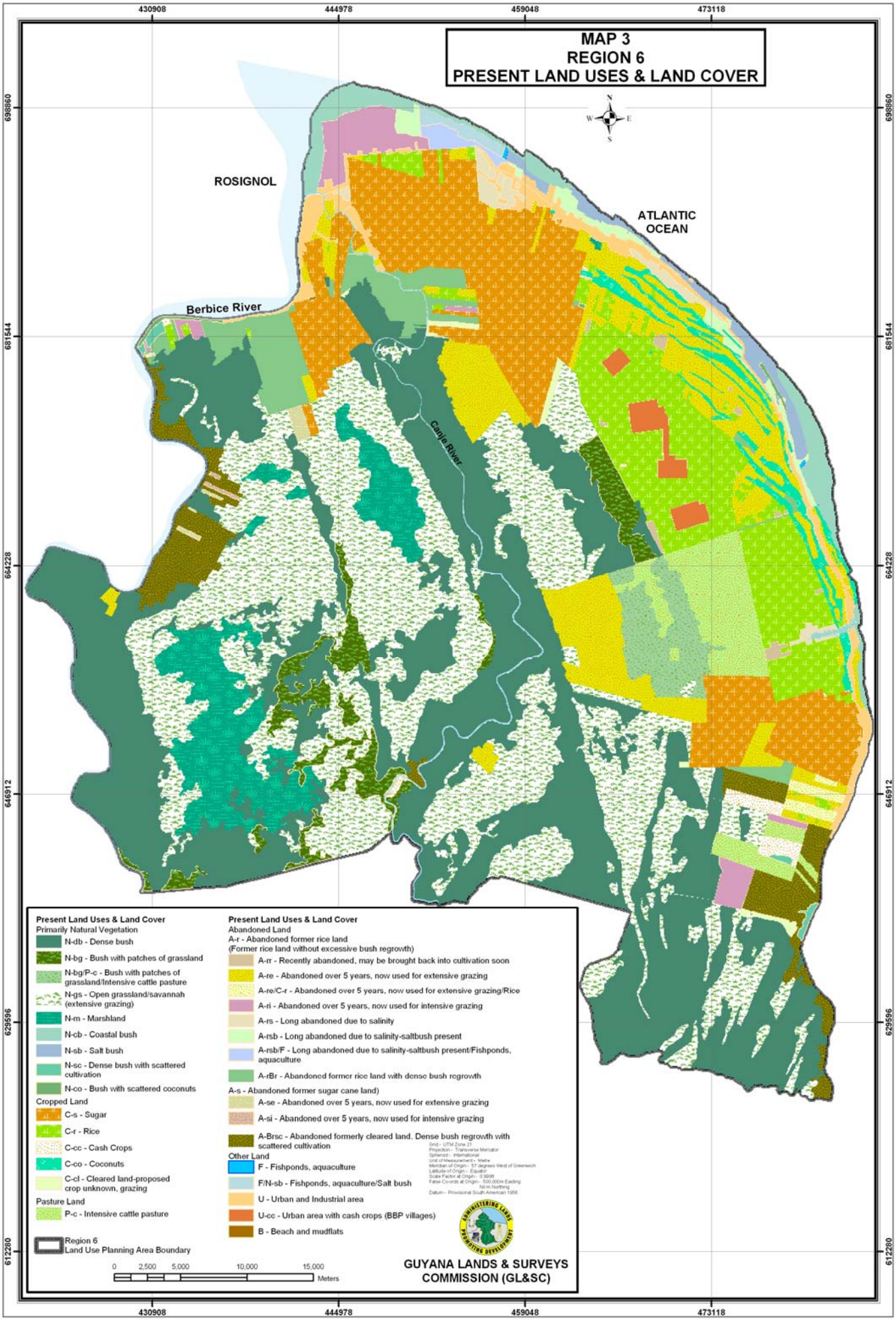
Maps for four themes (Present Land Uses & Land Cover, Soil Types, Land Tenure and Land Occupancy) were made using GIS Arc View 8.2 through spatial analysis.

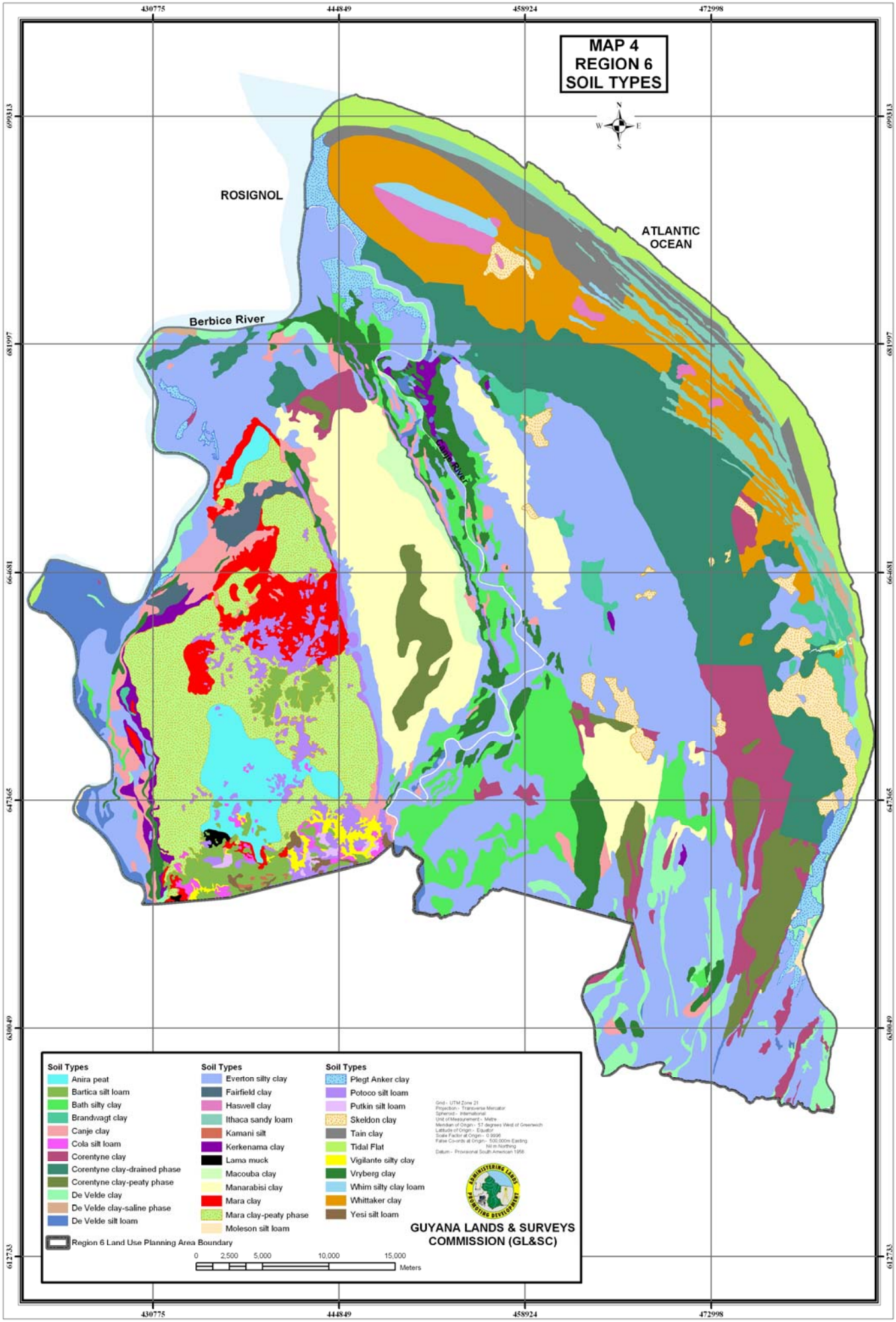
1.1. Maps

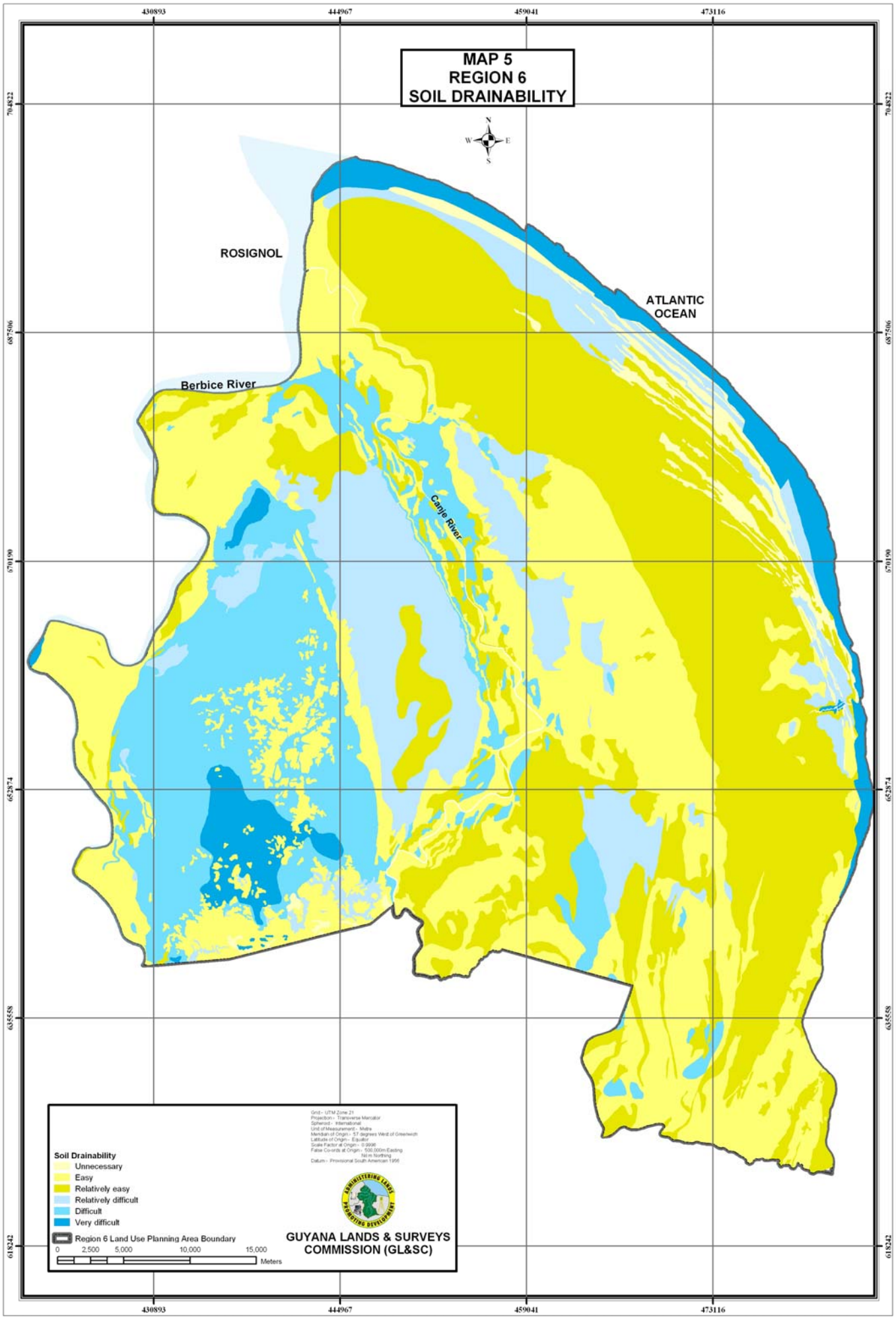
1- Location Map of the Region 6 Land Use Planning Area
2- Region 6 Land Use Planning Area Base Map
3- Region 6 Present Land Uses & Land Cover
4- Region 6 Soil Types
5- Region 6 Soil Drainability
6- Region 6 Areas Prone To Flooding
7- Region 6 Soil Capability and Limitation
8- Region 6 Land Tenure
9- Region 6 Land Occupancy
10- Region 6 Socio-Economic Infrastructure - Schools
11- Region 6 Other Socio-Economic Infrastructure
12- Region 6 Relatively Easily Drainable, Class 1 and 11 Agricultural Land
13- Region 6 Relatively Easily Drainable, Available, Class 1 and 11 Agricultural Land

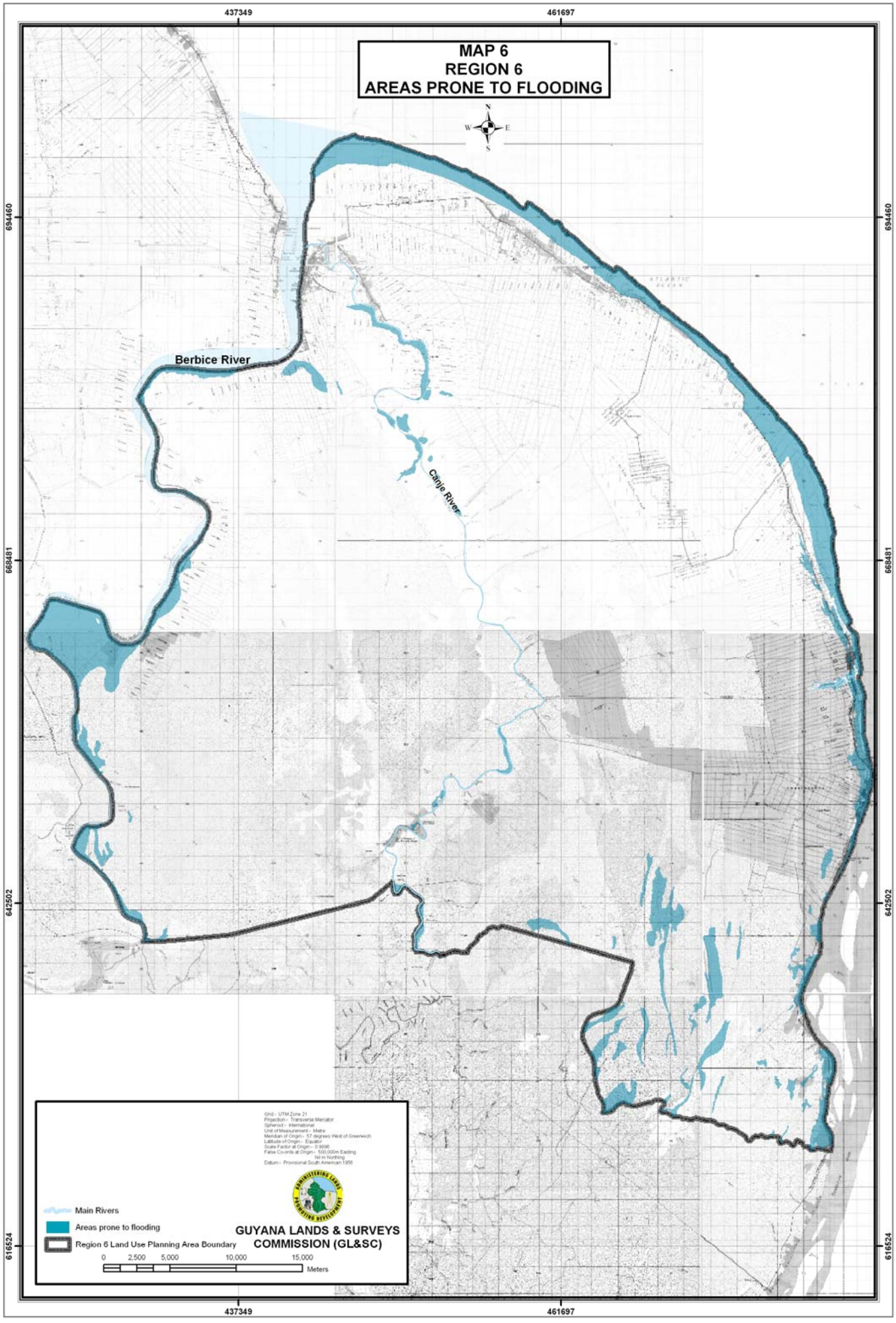

MAP 1
LOCATION MAP
of the
REGION 6
LAND USE PLANNING AREA
GUYANA LANDS & SURVEYS
COMMISSION (GLSC)
VENEZUELA
ATLANTIC OCEAN
BRAZIL
SURINAME
BRAZIL
REGION 1
REGION 2
REGION 3
REGION 4
REGION 5
REGION 6
REGION 7
REGION 8
REGION 9
REGION 10
Anna Regina
GEORGETOWN
Cuyuni River
Mazaruni River
Essequibo River
Demerara River
Berbice River
New Amsterdam
Rose Hall
Linden
Corriverton
Potaro R.
Corentyne River
REGION 6
LAND USE PLANNING
AREA
85962
206172
326381
446591
566800
929666
753500
577335
401170
225005
Cheddi Jagan International Airport Timehri
Ogle Airport
Capital City
Major Towns
Other Places
Main Rivers
Primary Roads
Secondary Roads
Region 6 Boundary
Regional Boundaries
Region 6 Land Use Planning Area Boundary
0 15,000 30,000 60,000 90,000 120,000
Meters


MAP 2
REGION 6
LAND USE PLANNING AREA
BASE MAP
437613
461962
695307
669328
643349
617371
Rosignol
New Amsterdam
Rose Hall
Atlantic Ocean
Berbice River
Canje River
Corriverton
Towns
Main Rivers
Important Canals
Major Roads
Region 6 Land Use Planning Area Boundary
0 2,500 5,000 10,000 15,000
Meters
Grid:- UTM Zone 21
Projection:- Transverse Mercator
Spheroid:- International
Unit of Measurement:- Metre
Meridian of Origin:- 57 degrees West of Greenwich
Latitude of Origin:- Equator
Scale Factor at Origin:- 0.9996
False Co-ords at Origin:- 500,000m Easting
Nil m Northing
Datum:- Provisional South American 1956
ADMINISTERING LANDS PROMOTING DEVELOPMENT
GUYANA LANDS & SURVEYS COMMISSION (GL&SC)

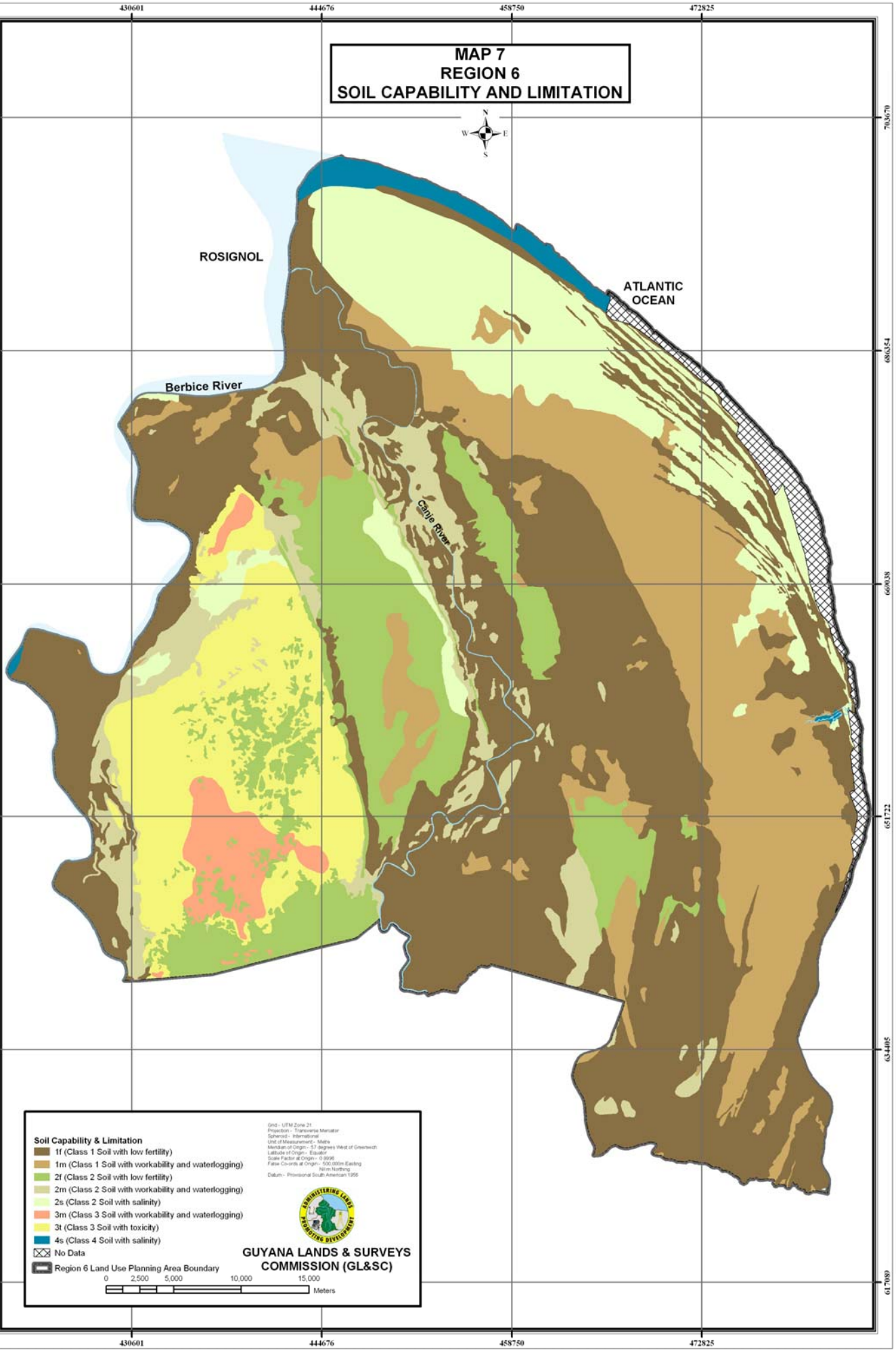

MAP 3
REGION 6
PRESENT LAND USES & LAND COVER
ROSIGNOL
ATLANTIC OCEAN
Berbice River
Canje River
430908
444978
459048
473118
698860
681544
664228
646912
629596
612280
Present Land Uses & Land Cover
Primarily Natural Vegetation
N-db - Dense bush
N-bg - Bush with patches of grassland
N-bg/P-c - Bush with patches of grassland/Intensive cattle pasture
N-gs - Open grassland/savannah (extensive grazing)
N-m - Marshland
N-cb - Coastal bush
N-sb - Salt bush
N-sc - Dense bush with scattered cultivation
N-co - Bush with scattered coconuts
Cropped Land
C-s - Sugar
C-r - Rice
C-cc - Cash Crops
C-co - Coconuts
C-cl - Cleared land-proposed crop unknown, grazing
Pasture Land
P-c - Intensive cattle pasture
Region 6
Land Use Planning Area Boundary
Present Land Uses & Land Cover
Abandoned Land
A-r - Abandoned former rice land
(Former rice land without excessive bush regrowth)
A-rr - Recently abandoned, may be brought back into cultivation soon
A-re - Abandoned over 5 years, now used for extensive grazing
A-re/C-r - Abandoned over 5 years, now used for extensive grazing/Rice
A-ri - Abandoned over 5 years, now used for intensive grazing
A-rs - Long abandoned due to salinity
A-rsb - Long abandoned due to salinity-saltbush present
A-rsb/F - Long abandoned due to salinity-saltbush present/Fishponds, aquaculture
A-rBr - Abandoned former rice land with dense bush regrowth
A-s - Abandoned former sugar cane land)
A-se - Abandoned over 5 years, now used for extensive grazing
A-si - Abandoned over 5 years, now used for intensive grazing
A-Brsc - Abandoned formerly cleared land. Dense bush regrowth with scattered cultivation
Other Land
F - Fishponds, aquaculture
F/N-sb - Fishponds, aquaculture/Salt bush
U - Urban and Industrial area
U-cc - Urban area with cash crops (BBP villages)
B - Beach and mudflats
Grid - UTM Zone 21
Projection - Transverse Mercator
Spheroid - International
Unit of Measurement - Metre
Meridian of Origin - 57 degrees West of Greenwich
Latitude of Origin - Equator
Scale Factor at Origin - 0.9996
False Co-ords at Origin - 500,000m Easting
Nil m Northing
Datum - Provisional South American 1956
0 2,500 5,000 10,000 15,000
Meters
GUYANA LANDS & SURVEYS COMMISSION (GL&SC)

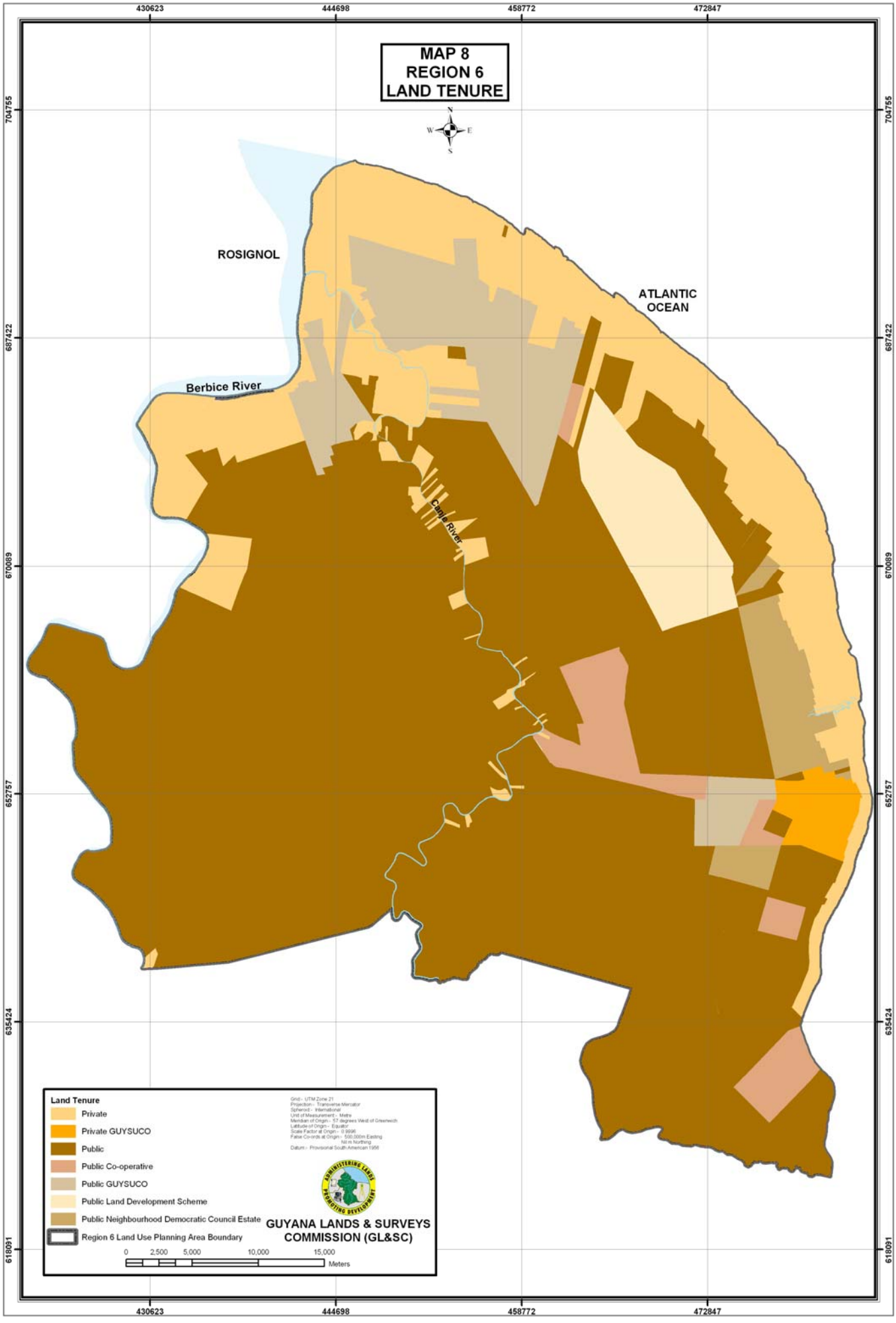

MAP 4
REGION 6
SOIL TYPES
ROSIGNOL
ATLANTIC OCEAN
Berbice River
Canje River
430775
444849
458924
472998
699313
681997
664681
647365
630049
612733
Soil Types
Anira peat
Bartica silt loam
Bath silty clay
Brandwagt clay
Canje clay
Cola silt loam
Corentyne clay
Corentyne clay-drained phase
Corentyne clay-peaty phase
De Velde clay
De Velde clay-saline phase
De Velde silt loam
Soil Types
Everton silty clay
Fairfield clay
Haswell clay
Ithaca sandy loam
Kamani silt
Kerkenama clay
Lama muck
Macouba clay
Manarabisi clay
Mara clay
Mara clay-peaty phase
Moleson silt loam
Soil Types
Plegt Anker clay
Potoco silt loam
Putkin silt loam
Skeldon clay
Tain clay
Tidal Flat
Vigilante silty clay
Vryberg clay
Whim silty clay loam
Whittaker clay
Yesi silt loam
Region 6 Land Use Planning Area Boundary
0 2,500 5,000 10,000 15,000
Meters
Grid:- UTM Zone 21
Projection:- Transverse Mercator
Spheroid:- International
Unit of Measurement:- Metre
Meridian of Origin:- 57 degrees West of Greenwich
Latitude of Origin:- Equator
Scale Factor at Origin:- 0.9996
False Co-ords at Origin:- 500,000m Easting
Nil m Northing
Datum:- Provisional South American 1956
GUYANA LANDS & SURVEYS COMMISSION (GL&SC)

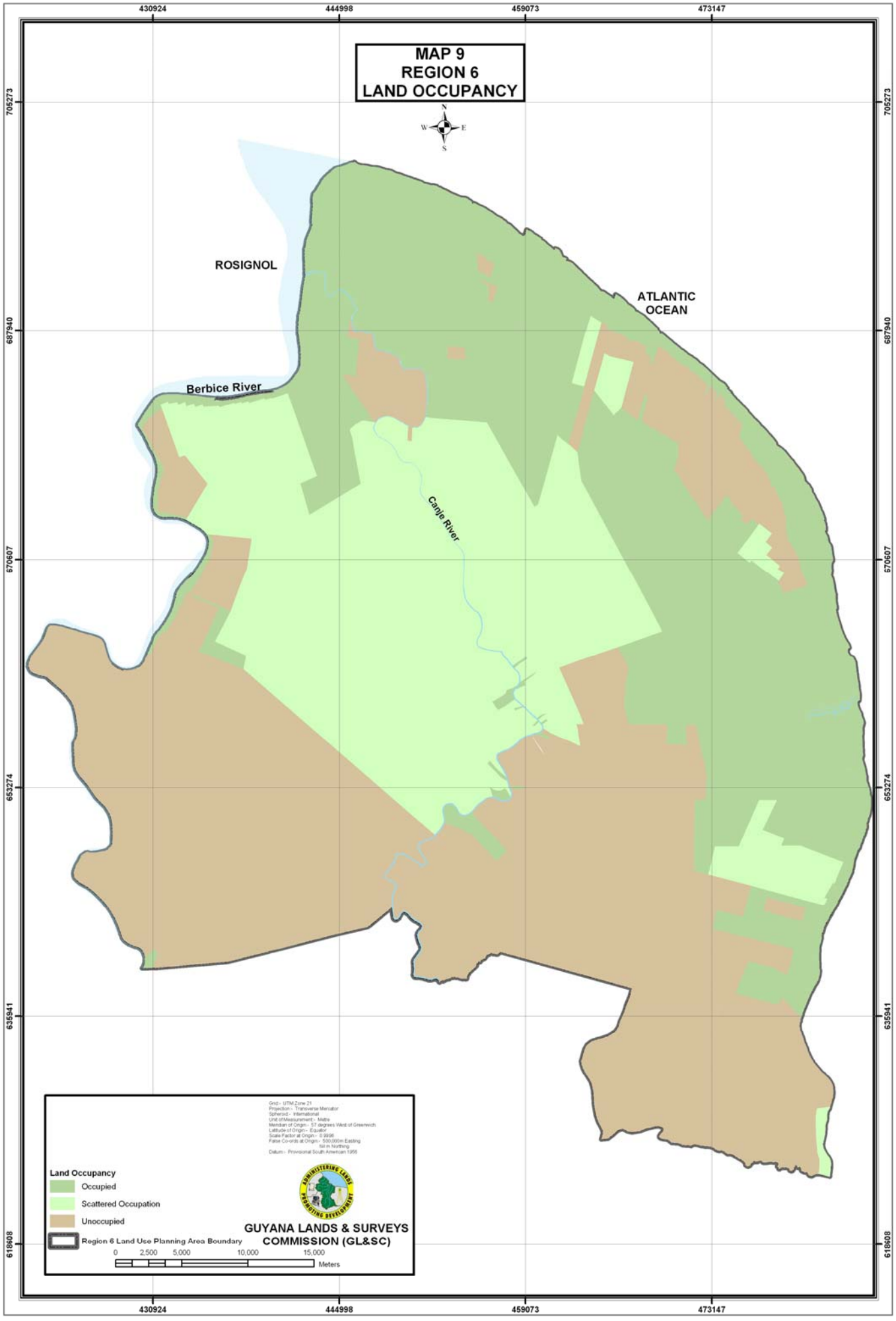

MAP 5
REGION 6
SOIL DRAINABILITY
N
W
E
S
ROSIGNOL
ATLANTIC OCEAN
Berbice River
Canje River
430893
444967
459041
473116
704822
687586
670190
652874
635558
618242
Soil Drainability
Unnecessary
Easy
Relatively easy
Relatively difficult
Difficult
Very difficult
Region 6 Land Use Planning Area Boundary
0 2,500 5,000 10,000 15,000
Meters
Grid - UTM Zone 21
Projection - Transverse Mercator
Spheroid - International
Unit of Measurement - Metre
Meridian of Origin - 57 degrees West of Greenwich
Latitude of Origin - Equator
Scale Factor at Origin - 0.9996
False Co-ords at Origin - 500,000m Easting
Nil m Northing
Datum - Provisional South American 1956
ADMINISTERING LANDS PROMOTING DEVELOPMENT
GUYANA LANDS & SURVEYS
COMMISSION (GL&SC)

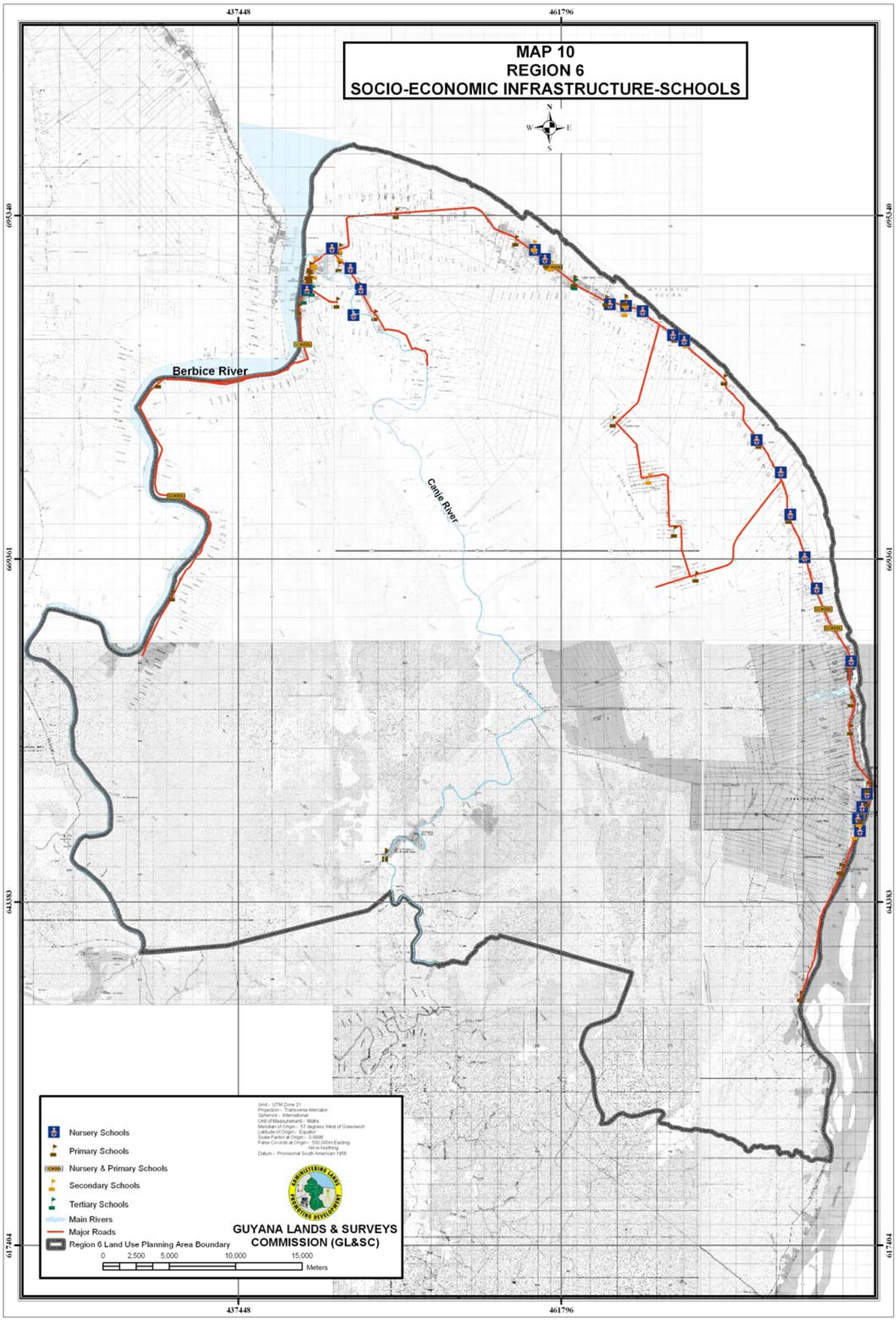

MAP 6
REGION 6
AREAS PRONE TO FLOODING
N
W
E
S
437349
461697
694460
668481
642502
616524
Berbice River
Canje River
Grid - UTM Zone 21
Projection - Transverse Mercator
Spheroid - International
Unit of Measurement - Metre
Meridian of Origin - 57 degrees West of Greenwich
Latitude of Origin - Equator
Scale Factor at Origin - 0.9996
False Co-ords at Origin - 500,000m Easting
No m Northing
Datum - Provisional South American 1956
Main Rivers
Areas prone to flooding
Region 6 Land Use Planning Area Boundary
0 2,500 5,000 10,000 15,000
Meters
GUYANA LANDS & SURVEYS
COMMISSION (GL&SC)

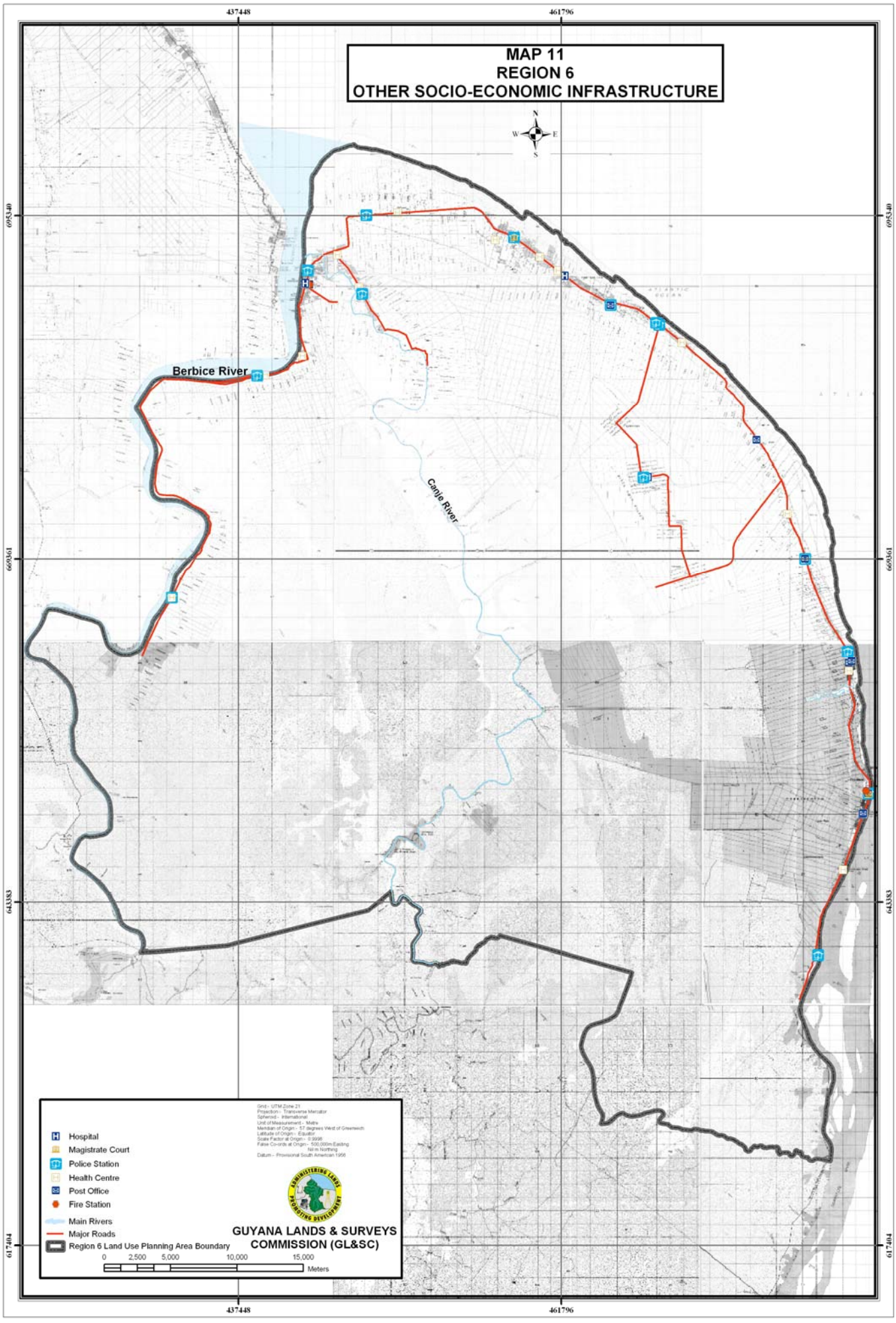
MAP 7
REGION 6
SOIL CAPABILITY AND LIMITATION

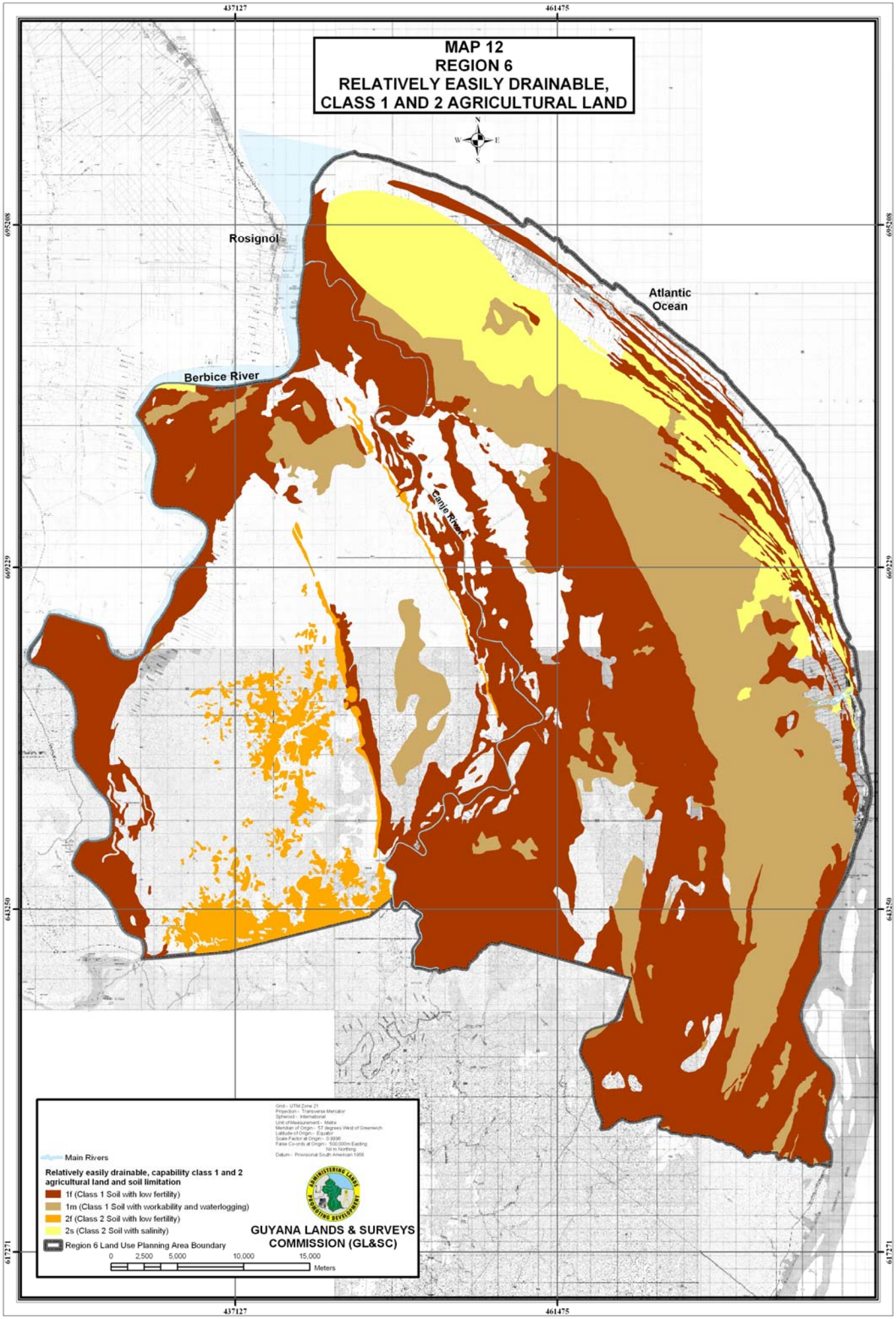


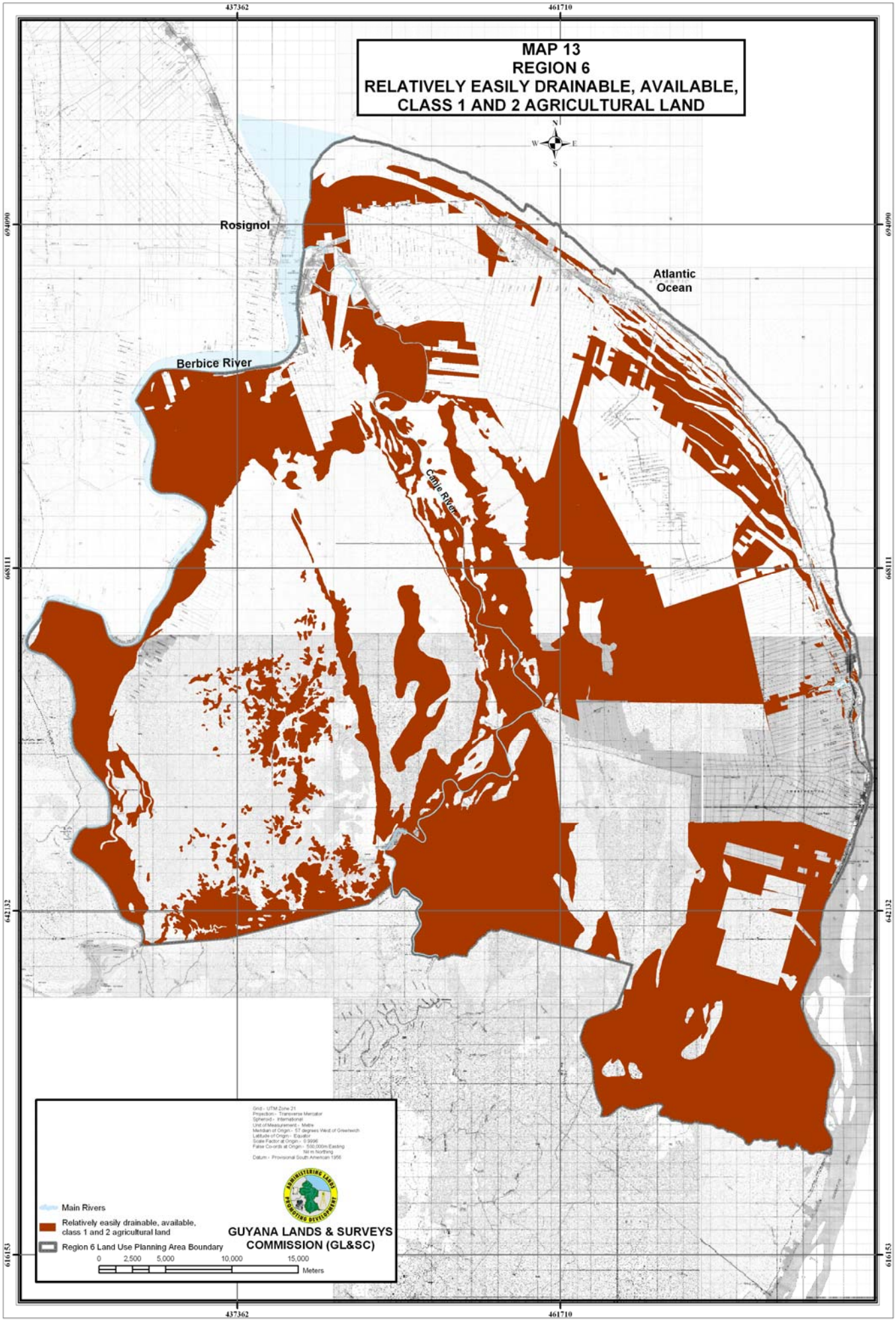

MAP 8
REGION 6
LAND TENURE
N
W
E
S
ROSIGNOL
ATLANTIC OCEAN
Berbice River
Canje River
430623
444698
458772
472847
704755
687422
670089
652757
635424
618091
Land Tenure
Private
Private GUYSUCO
Public
Public Co-operative
Public GUYSUCO
Public Land Development Scheme
Public Neighbourhood Democratic Council Estate
Region 6 Land Use Planning Area Boundary
Grid:- UTM Zone 21
Projection:- Transverse Mercator
Spheroid:- International
Unit of Measurement:- Metre
Meridian of Origin:- 57 degrees West of Greenwich
Latitude of Origin:- Equator
Scale Factor at Origin:- 0.9996
False Co-ords at Origin:- 500,000m Easting
Nil m Northing
Datum:- Provisional South American 1956
ADMINISTERING LANDS PROMOTING DEVELOPMENT
GUYANA LANDS & SURVEYS COMMISSION (GL&SC)
0 2,500 5,000 10,000 15,000
Meters


MAP 9
REGION 6
LAND OCCUPANCY
N
W
E
S
ROSIGNOL
ATLANTIC OCEAN
Berbice River
Canje River
430924
444998
459073
473147
705273
687940
670607
653274
635941
618608
Land Occupancy
Occupied
Scattered Occupation
Unoccupied
Region 6 Land Use Planning Area Boundary
0 2,500 5,000 10,000 15,000
Meters
Grid:- UTM Zone 21
Projection:- Transverse Mercator
Spheroid:- International
Unit of Measurement:- Metre
Meridian of Origin:- 57 degrees West of Greenwich
Latitude of Origin:- Equator
Scale Factor at Origin:- 0.9996
False Co-ords at Origin:- 500,000m Easting
Nil m Northing
Datum:- Provisional South American 1956
ADMINISTERING LANDS PROMOTING DEVELOPMENT
GUYANA LANDS & SURVEYS
COMMISSION (GL&SC)


MAP 10
REGION 6
SOCIO-ECONOMIC INFRASTRUCTURE-SCHOOLS
N
W
E
S
437448
461796
695340
669361
643383
617404
Berbice River
Canje River
SCHOOL
Nursery Schools
Primary Schools
Nursery & Primary Schools
Secondary Schools
Tertiary Schools
Main Rivers
Major Roads
Region 6 Land Use Planning Area Boundary
0 2,500 5,000 10,000 15,000
Meters
Grid :- UTM Zone 21
Projection :- Transverse Mercator
Spheroid :- International
Unit of Measurement :- Metre
Meridian of Origin :- 57 degrees West of Greenwich
Latitude of Origin :- Equator
Scale Factor at Origin :- 0.9996
False Co-ords at Origin :- 500,000m Easting
Nil m Northing
Datum :- Provisional South American 1956
ADMINISTERING LANDS PROMOTING DEVELOPMENT
GUYANA LANDS & SURVEYS
COMMISSION (GL&SC)


MAP 11
REGION 6
OTHER SOCIO-ECONOMIC INFRASTRUCTURE
437448
461796
695340
669361
643383
617404
Berbice River
Canje River
N
W
E
S
Hospital
Magistrate Court
Police Station
Health Centre
Post Office
Fire Station
Main Rivers
Major Roads
Region 6 Land Use Planning Area Boundary
0 2,500 5,000 10,000 15,000
Meters
Grid - UTM Zone 21
Projection - Transverse Mercator
Spheroid - International
Unit of Measurement - Metre
Meridian of Origin - 57 degrees West of Greenwich
Latitude of Origin - Equator
Scale Factor at Origin - 0.9996
False Co-ords at Origin - 500,000m Easting
Nil m Northing
Datum - Provisional South American 1956
GUYANA LANDS & SURVEYS
COMMISSION (GL&SC)


MAP 12
REGION 6
RELATIVELY EASILY DRAINABLE,
CLASS 1 AND 2 AGRICULTURAL LAND
N
W
E
S
437127
461475
695208
609229
643250
617271
Rosignol
Atlantic
Ocean
Berbice River
Canje River
Grid - UTM Zone 21
Projection - Transverse Mercator
Spheroid - International
Unit of Measurement - Metre
Meridian of Origin - 57 degrees West of Greenwich
Latitude of Origin - Equator
Scale Factor at Origin - 0.9996
False Co-ords at Origin - 500,000m Easting
Nil m Northing
Datum - Provisional South American 1956
Main Rivers
Relatively easily drainable, capability class 1 and 2 agricultural land and soil limitation
1f (Class 1 Soil with low fertility)
1m (Class 1 Soil with workability and waterlogging)
2f (Class 2 Soil with low fertility)
2s (Class 2 Soil with salinity)
Region 6 Land Use Planning Area Boundary
ADMINISTERING LANDS PROMOTING DEVELOPMENT
GUYANA LANDS & SURVEYS COMMISSION (GL&SC)
0 2,500 5,000 10,000 15,000
Meters


MAP 13
REGION 6
RELATIVELY EASILY DRAINABLE, AVAILABLE,
CLASS 1 AND 2 AGRICULTURAL LAND
N
W
E
S
Rosignol
Atlantic
Ocean
Berbice River
Canje River
437362
461710
694090
668111
642132
616153
Grid :- UTM Zone 21
Projection :- Transverse Mercator
Spheroid :- International
Unit of Measurement :- Metre
Meridian of Origin :- 57 degrees West of Greenwich
Latitude of Origin :- Equator
Scale Factor at Origin :- 0.9996
False Co-ords at Origin :- 500,000m Easting
Nil m Northing
Datum :- Provisional South American 1956
Main Rivers
Relatively easily drainable, available, class 1 and 2 agricultural land
Region 6 Land Use Planning Area Boundary
0 2,500 5,000 10,000 15,000
Meters
GUYANA LANDS & SURVEYS
COMMISSION (GL&SC)

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