chapter 2

project description

FINAL SCOPING REPORT

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2. OVERVIEW OF THE PROPOSED PROJECT

This chapter is based on information provided by PhytoAmandla. Please note that the information pertaining to the details of the project description is relatively conceptual at this stage as the design process is at a preliminary phase. Therefore, it is likely that the project details may change as the project design progresses.

As explained in Chapter 1, the EIA focuses on the processing facility within the Coega IDZ, as this component of the project triggers the need for environmental authorisation and certain environmental licenses. In this chapter, on the project description, an overview of the wider project (including growing and transportation of feedstock) is presented, although this component does not form part of the EIA process.

2.1 INTRODUCTION

The PhytoAmandla Biofuel Processing Plant will be the end of an integrated feedstock production value chain aimed at not only producing canola for feedstock, but also increasing the production of food crops in the growing areas through a crop rotation system. The processing facility will be located in Zone 5 of the Coega IDZ near Port Elizabeth and consist of two biofuel plant trains each with a 200 000 ton annual output capacity. The project will procure and convert about one million tons of canola per annum to produce 400 000 tons of biofuel. Approximately 600 000 tons of oilcake (pelletized meal) will be produced as a by-product and will be sold to the local market as animal feed. South Africa is currently a net importer of sunflower oilcake (150 000 tons in 2010) and soybean oilcake (1 million tons in 2010)[1] for animal feed, which indicates the market opportunity for locally produced oilcake. The local production will see oilcake become more affordable to local farmers.

2.2 PROJECT DESCRIPTION

2.2.1 Processing Plant

The processing plant will be located in the Coega IDZ near Port Elizabeth. A site of approximately 25 ha in zone 5 (high intensity industrial zone) of the IDZ has been allocated for the construction of the processing plant (see Figure 2-1).

The allocated site in the IDZ has all the necessary services installed (e.g. water, electricity, stormwater, etc.). It is assumed that sufficient water and electricity is available and will be allocated to the plant by the Coega Development Corporation (CDC).

[1] Bureau for food and agricultural policy. 2010. The South African agricultural baseline. Available online at: http://www.bfap.co.za/FINAL%20Agricultural%20Outlook.pdf Assessed 23 January 2012

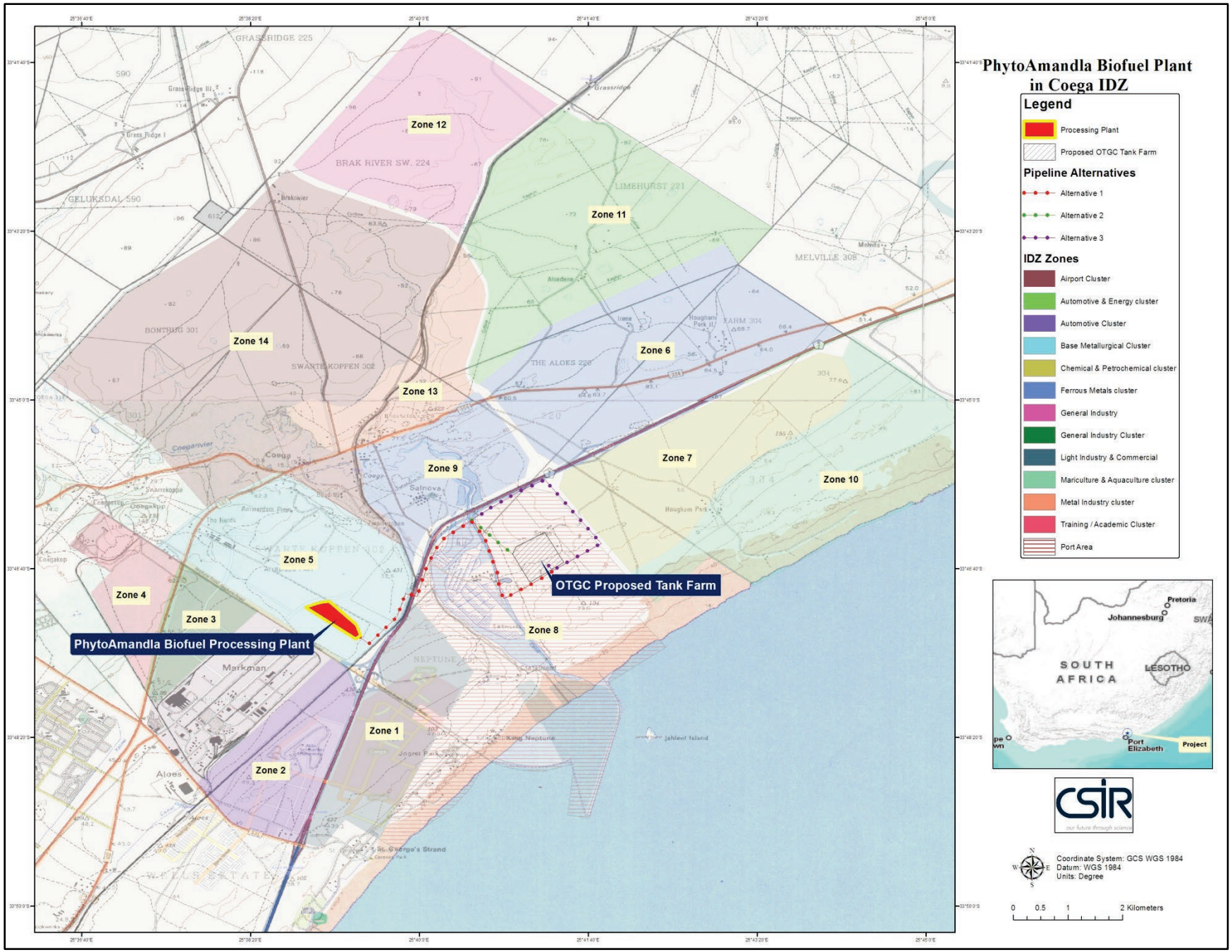

Figure 2-1 Map of site allocated for the construction of the processing plant and pipeline route alternatives to the OTGG tank farm.

The processing plant will consist of the following key components:

a) Rail and road feedstock receiving and oilcake dispatch area

This area will be equipped with weigh bridges for both trucks and trains. Feedstock transported from the storage facilities in the growing areas will be weighed, graded and then offloaded into pits in the ground. From here the feedstock will be cleaned of impurities and metal before being stored in the planned 8 onsite silos with an approximate combined storage capacity of 100 000 tons. Two pelletized meal storage facilities with a combined storage capacity of about 30 000 t will also be constructed in this area.

Other raw materials and chemicals needed for processing (e.g. methanol, hexane, etc.) from either rail or road delivery will be received in this area.

By-products from the processing plant (e.g. oilcake in the form of pelletized meal, sludge from biogas plant, salt, etc.) as well as biofuel to local fuel blending facilities will be dispatched by rail and road from this area.

Onsite rail and road infrastructure will be constructed by PhytoAmandla, while offsite connections to existing road and rail infrastructure in the Coega IDZ will be constructed by the CDC. Due to the fact that the IDZ is an industrial complex, the construction of rail infrastructure does not trigger any NEMA Listed Activities.

b) Two pre-pressing units

In this facility the canola feedstock will once more be cleaned of impurities and metal before being flaked, conditioned and eventually pressed. From this facility the crude oil pressed from the canola will be cooled and stored, while the cake (remainder of the canola seeds) will be fed into a further extraction process.

c) Two solvent extraction units

In this facility any remaining crude oil will be extracted from the cake originating from the pre-pressing facility by a process of hexane solvent extraction, filtration and evaporation. After all oil has been extracted, the remaining meal (oilcake) will be toasted and pelletized. The pelletized meal is a by-product of the process that will be sold as animal feed.

This facility will also include an exhaust gas cleaning system. The purpose of this system is to extract and reuse the evaporated hexane from exhaust gas.

d) Two degumming units

In this facility the crude oil extracted from the canola feedstock will be degummed using phosphoric acid, caustic soda and citric acid. Adding phosphoric acid and caustic soda to the crude oil agglomerates gums, allowing the removal thereof by solid separation. Citric acid is then used to clean the oil of the remaining additives (e.g. caustic soda and soaps). Extracted gums will either be added to the oilcake before pelletization or fed into a biogas plant for power production.

e) Two transesterfication units

Transesterfication is the process of reducing the viscosity of the degummed oil and involves the chemical conversion of the oil into its corresponding fatty ester. Chemically, transesterification means taking a triglyceride molecule or a complex fatty acid (crude oil), neutralizing the free fatty acids, removing the glycerine and creating a methyl ester (biofuel). This is accomplished by mixing methanol

with sodium or potassium hydroxide to make sodium or potassium methoxide. This mixture is then added together with an excess of methanol into the degummed crude oil to which methyl ester from the esterification unit has also been added. The entire mixture then settles and glycerine separates to the bottom while the methyl esters (biofuel) settle on the top. Soaps will be extracted from crude glycerine with an acid and the excess methanol will be further utilised. The treated glycerine from the process will be fed into the biogas unit and the biofuel washed and filtered before storing. From this storage the biofuel will either be exported or, if possible, be used locally.

This facility will also include a gas collection and cleaning system that will extract methanol from exhaust gasses.

f) Two esterfication units

This facility will produce methyl ester that will be added to the transesterfication process. Esters will be produced by adding methanol and sulphuric acid as catalyst to fatty acids.

g) Liquid Storage Facilities

In Table 2-1 below the estimated storage volumes, storage times and other information is provided for each liquid that will be stored onsite.

Table 2-1 The estimated storage volumes, storage times and other information is provided for each liquid that will be stored onsite

buffer and storage tanks	material	kind of tank	number	volume in m³	storage time in d	connection	notes
tankfarm	crude oil	storage tank	1	3 000	2.5	road +rail	feed pressed +external oil in all tanks must be possible
(placed in a pan)		storage tank	1	2 000	1.5	road +rail	steady circulation in each tank, bottom stirrer necessary
		storage tank	1	2 000	1.5	road +rail	crude oil feed in all tanks, from all tanks feed in degumming train a+b
							in all output lines of each tanks regulation valves and mass flow meter necessary, in central pipe to degumming unit installation of static mixer
	degummed oil	buffer tank	1	1 500	1		from degumming train a+b into transesterification train a+b
		buffer tank	1	1 500	1		from degumming train a+b into transesterification train a+b
	crude glycerol	buffer tank	1	500	2.5		from transesterification train a+b to glycerol preparation train a+b, in pan, contain methanol, nitrogen in vent
		buffer tank	1	500	2.5		from transesterification train a+b to glycerol preparation train a+b, in pan, contain methanol, nitrogen in vent
	FFA	buffer tank	2	250	8	truck	from glycerol preparation train a+b into esterification train a+b, in pan, contained methanol
	technical glycerol	buffer tank	1	500	4		from evaporation train a+b, in pan (in Phase2 into glycerol distillation)
		buffer tank	1	500	4		from evaporation train a+b, in pan (in Phase2 into glycerol distillation)
		storage tank	1	500	4	truck	in pan
		storage tank	1	500	4	truck	in pan
	biodiesel	daily tank	1	1 500	1		from transesterification train a+b and back, circulation pipe, in pan
		daily tank	1	1 500	1		from transesterification train a+b and back, circulation pipe, in pan
		daily tank	1	1 500	1		from transesterification train a+b and back, circulation pipe, in pan
		loading tank	1	5 000	3.5	truck + rail	from loading tank, to offshore tanks, in pan
		loading tank	1	5 000	3.5	truck + rail	from loading tank, to offshore tanks, in pan

buffer and storage tanks	material	kind of tank	number	volume in m³	storage time in d	connection	notes
	gums		2	200	6		with bottom stirrer and circulation
	antioxi additive	storage tank	1	100	17	truck	train a+b, biodiesel feed in tank must be possible, in pan
methanol storage	methanol	storage tank	1	3 000	17	rail	train a+b, in pan, separate place, into transesterification+ esterification train a+b, from methanol recovery train a+b, circulation pipe, nitrogen in vent
(separate place)	methanol	storage tank	1	3 000	17	rail	train a+b, in pan, separate place, into transesterification+ esterification train a+b, from methanol recovery train a+b, circulation pipe, nitrogen in vent
	Namethylat	storage tank	2	100		truck	train a+b, in pan, separate place, into transesterification train a+b, nitrogen in vent
chemicals and fuels storage	caustic soda	storage tank	2	50	21	truck	double walled, plastic material, train a+b, can placed near the degumming unit,
(placed in the near of production	phosphoric acid	storage tank	1	50	35	truck	double walled, plastic material, train a+b, can placed near the degumming unit,
buildings)	sulphuric acid	storage tank	2	50	10	truck	double walled, plastic material, train a+b, can placed near the biodiesel building,
	hydrochloric acid	storage tank	2	50	10	truck	double walled, plastic material, train a+b, can placed near the biodiesel building,
	citric acid	storage tank	1	50	83	truck	double walled, plastic material, train a+b, can placed near the degumming unit,
	caustic pottash	storage tank	1	50	20	truck	double walled, plastic material, train a+b, can placed near the glycerol distillation,
	hexane	storage tank	6	100	37	truck	earth tanks, 3 tanks for each train, placed in neighbourhood of extraction, train a+b, design with truck offloading place, space for emergency emptying extraction
notes	top loading station with loading arms for rail and truck in the near of tankfarm						in all sucking and pressure sides of tankfarm pumps must be a possibility to connect hoses DN 50
	bottom offloading station for trucks and rail in the near of tankfarm						pumps can placed in the near of each tank
	all loading places are equipped with loading bridges, coated pans and protection against overfill						every tank is equipped with filling and circulation pipes

h) Air compression and distribution system

This system will consist of compressors to compress and distribute dry air to the plant for operation and regulation purposes.

i) Steam generation and distribution system

Process steam is needed to heat liquids and accelerate chemical reactions as well as for the evaporation/separation of hexane, water and methanol from meal, oil, glycerine and biofuel. Steam will be generated in a high pressure boiler by using biogas, wood pellets and, if necessary, biofuel. The high pressure steam will be fed through back pressure turbines for the production of electrical power. Thereafter, steam will be fed into the processing plant for the heating of chemicals.

j) Water treatment and cooling system

This system will condition and distribute water to the plant.

k) Electrical power system

As much as possible of all electrical energy needed for the plant will be produced from the high pressure steam turbines driven by steam produced in boilers fuelled with biogas, wood pellets and, if necessary, biofuel

l) Biogas generation facility (by-product treatment)

Any suitable organic by-products (e.g. gums and glycerol) will be used to produce biogas by anaerobic fermentation. In a followed aerobic stage rests of organic materials will be oxidised, for further reduction of the COD value.

Biogas and wood pellets will be used to generate electricity and steam to be used in the plant. The preliminary plan is for the plant to have an electricity generation capacity of about 10 MW or more. The ultimate aim is to produce enough electricity with biogas and wood pellets as fuel to operate the processing plant without any additional electricity from the national electrical grid.

Biological sludge as a by-product of the biogas plant and wood ash from the steam boiler could potentially be used by farmers as fertilisers. A suitability assessment of these products for being used as fertilisers and the registration thereof as fertilisers with the Department of Agriculture are currently underway.

Any water from cooling towers, steam generators, rain water collected from roofs, tank pans or any other hard surfaces will be fed through an oil separator and grit chamber before being used to dilute the glycerine and fed into the biogas unit. A preliminary estimation is that the plant will have a wastewater output of about 240 000 m^3/a. All waste water to be fed into the municipal system will be within permissible water quality limits.

m) Pipeline routing between the Processing Plant and the Tank Farm

Biodiesel produced at the site will be stored offsite in the proposed OTGC bulk liquid handling and storage facility in zone 8 of the IDZ. The transport of the biofuel to the loading berth and the loading of ships will be the responsibility of the tank farm operator. Different pipeline routing alternatives from the site to the storage facility will be considered (see Figure 2-1). During the ramping up period offsite

storage of biofuel might not be necessary since the smaller volumes of biofuel can be transported from the plant to the berth by either road or rail.

2.2.2 Feedstock Production

a) Extent and location of growing area

When the project is in full production about one million tons of canola will annually be produced on approximately 500 000 ha of agricultural land. Since canola will be grown as a winter crop in rotation with summer food crops, it will only be grown on the same land every other year. Consequently, to plant 500 000 ha of canola annually, about 1 million ha of production land will be utilised. To reach full production a ramp-up approach will be implemented where only 25 000 tons of canola will be planted in the first year and full production will be reached by the end of 2018.

As part of the democratic process in South Africa, it is vital that land ownership be extended to previously disadvantaged individuals (PDIs). This is especially important in the agricultural sector. As part of this process, the land reform policy has to be carried out in such a manner that it does not negatively impact upon food security. Various government policies and programmes have been implemented to facilitate land reform and agricultural transformation as there are currently limited PDIs with the necessary skills and management experience in farming. The PhytoEnergy Group is committed to support agricultural transformation programmes and the transfer of knowledge and skills to emerging farmers. The aim is for PDIs to ultimately supply the majority of the canola feedstock.

The economic advisor to the Office of the President has, however, advised the Operational Board of the PhytoEnergy Group to initially make short term use of commercial farmers to secure sufficient feedstock to allow the production plant to operate at full capacity. Feedstock will initially primarily be sourced from the Free State and Eastern Cape, but also the Northern Cape, Mpumalanga and KwaZulu-Natal provinces. Ultimately, by developing communal farmland and educating and funding communal farmers, it is planned to procure most of the feedstock from the Eastern Cape. The production by rural emerging farmers in the Eastern Cape is planned to be gradually ramped up to reach full production in 2018. The purpose of including communal farmland is to alleviate poverty and facilitate community development and upliftment. If no feedstock is locally available it will also be financially viable for the processing plant to make use of imported feedstock.

It is planned to only make use of existing farmland (i.e. land that has been under cultivation during the past 10 years). According to preliminary investigations sufficient existing farmland is available in the Free State and Eastern Cape Provinces to produce the needed feedstock. In the Eastern Cape alone an estimated 600 000 ha of suitable land is available for canola production (see Figure 2-2) Of this, 20 000 ha is currently under cultivation as part of the governmental Massive Food Production Program (MFPP) that falls under the Provincial Growth and Development Programme (PGDP).

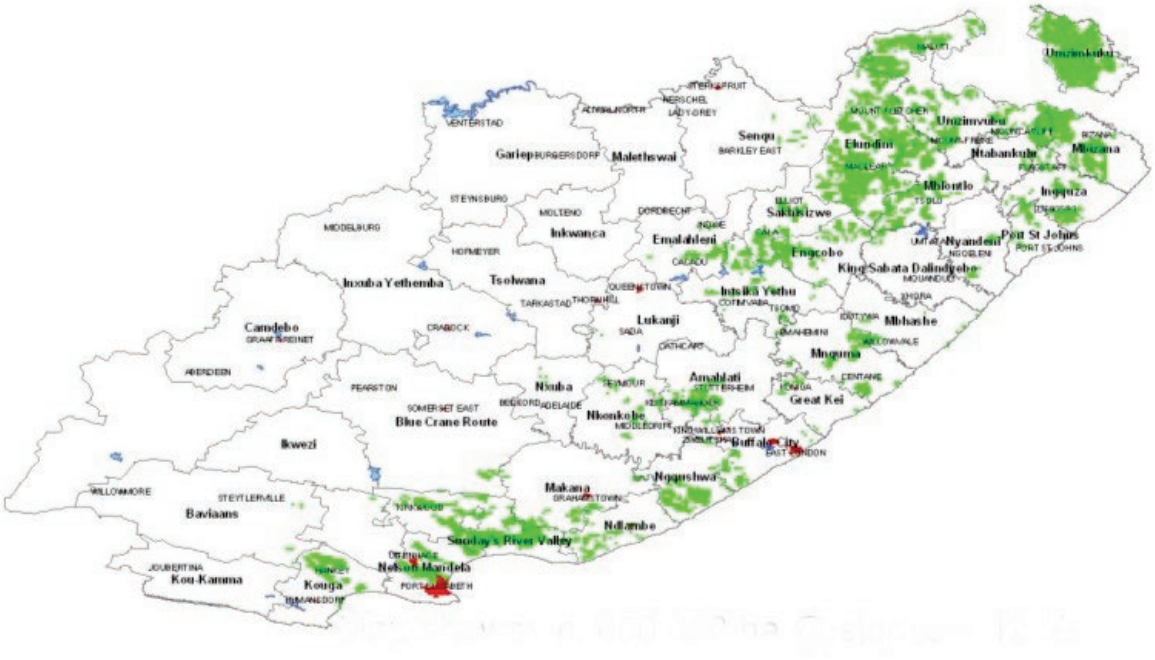

Figure 2-2 Approximately 600 000 ha potential land suitable for cultivation of canola in the Eastern Cape.
Source: PhytoEnergy

b) Agricultural model

An agricultural model with a responsible crop rotation programme has been designed to incorporate canola production during the winter months into traditional summer production of food crops (e.g. maize and sorghum) on both communal and commercialised agricultural land.

In the Eastern Cape underutilised and degraded land will need to be rehabilitated by adding the necessary nutrients and trace elements to facilitate the cultivation process. Commercial contractors will materially benefit the emerging rural farmers by efficiently utilising their land to yield a second crop during the winter season. The PhytoEnergy Group has agreed to assist farmers and contractors in obtaining production input funding, take-off agreements and technical assistance on a consulting base.

In the short term, existing commercial farmers in the Free State will supply a large proportion of the feedstock. These farmers are currently operating successful commercial farms and have indicated a keen interest in planting canola as a rotational crop because of the added benefit of increased follow-on wheat yields.

Even though the PhytoEnergy Group will not grow the feedstock itself, it will be informed of agricultural practices and crop condition at all times. This will be accomplished through monitoring all contracted growing fields by remote sensing. By using state of the art agricultural satellite monitoring techniques, the need for soil conditioning before planting as well as crop spraying and crop fertilising during the growing period will be determined. The monitoring contracted crops will ensuring that responsible and sustainable growing practices, as contractually prescribed by the PhytoEnergy Group in line with international requirements, are implemented by the contract growers. Crop monitoring is also essential for planning purposes and traceability.

According to prospective contract growers canola can only be grown financially viable if it is done commercially on land portions larger than 200 ha. It is planned to initially enter into agreements and purchase feedstock from commercial farmers. Ultimately, when the majority of feedstock will be

produced in the Eastern Cape, contractors familiar with the areas and communities will be appointed by the PhytoEnergy Group to produce the feedstock on communal land. Communities will be required to structure themselves into legal entities to enter into contracts with funding institutions and contract growers. Communities will be assisted either by the contractor of the PhytoEnergy Group in establishing these legal entities (e.g. cooperatives). If and when a community is able and willing to produce the crops themselves, the PhytoEnergy Group will purchase the feedstock from the community directly.

2.2.3 Transport and Storage of Feedstock

a) Transport to storage facilities

Initially, during the ramping up of production, the PhytoEnergy Group plans to take delivery of feedstock on farms and transport the feedstock to its onsite storage facilities at the processing plant in the Coega IDZ. Only once the production density in certain areas allows for it, will storage facilities (silos) in that areas be constructed, and delivery taken at these facilities.

Where feedstock is produced by commercial farmers, the farmers will transport the feedstock to the nearest storage facility where the PhytoEnergy Group will take delivery. The mode of transport from the farm to the silos will be by road. In these areas of commercial farming roads are in an adequate condition.

In less developed areas of communal land in the Eastern Cape growers might transport the feedstock to the storage facilities by any means available. In many cases they may not have any means of transporting the feedstock. In such cases they will be assisted in either organising for delivery to be taken on the farm or financing to be made available to enable communities to obtain the means of delivering their product to the storage facilities. Local roads in these impoverished areas are not always adequate for transporting heavy loads (see Figure 2-3) and investment might be needed from the government or the growers to improve the roads.

Figure 2-3 Some of the roads in the impoverished areas of the Eastern Cape are in a poor condition and might need upgrading for feedstock transport

b) Storage facilities

Initially, during the ramping up period, feedstock will only be stored in the onsite storage facility in the Coega IDZ. As production increases in certain growing areas, feedstock will be stored in silos at strategically located storage facilities in these areas. This will allow a continuous supply of feedstock to the processing plant throughout the year.

Storage facilities will be constructed at strategic locations over the main cropping areas and close to railway sidings. It is envisaged that about 9 storage locations in the growing areas, with an approximate storage capacity of 100 000 tons each, will be needed. Some of the strategic locations for storage facilities are at Bethlehem, Butterworth, Umtata, Bojotwa, King Williams Town,as well as Clocolan, Wesselsbron or Kroonstad (see concept in Figure 2-4). The locations for the remaining facilities are yet to be identified.

c) Transport to processing plant

Transportation of the feedstock from the storage facilities in the growing areas to the processing plant at Port Elizabeth will eventually be predominantly by rail (see Figure 2-4). Where rail lines are not available, or do not have the necessary load capacity, new lines will have to be built and existing lines upgraded. The upgrading of rail infrastructure outside the Coega IDZ will be the responsibility of the rail operator (i.e. Transnet). The transport feedstock from the growing areas to the processing plant by road will eventually only be used if rail transport is not available. Road transport will thus only serve as a backup to rail transport.

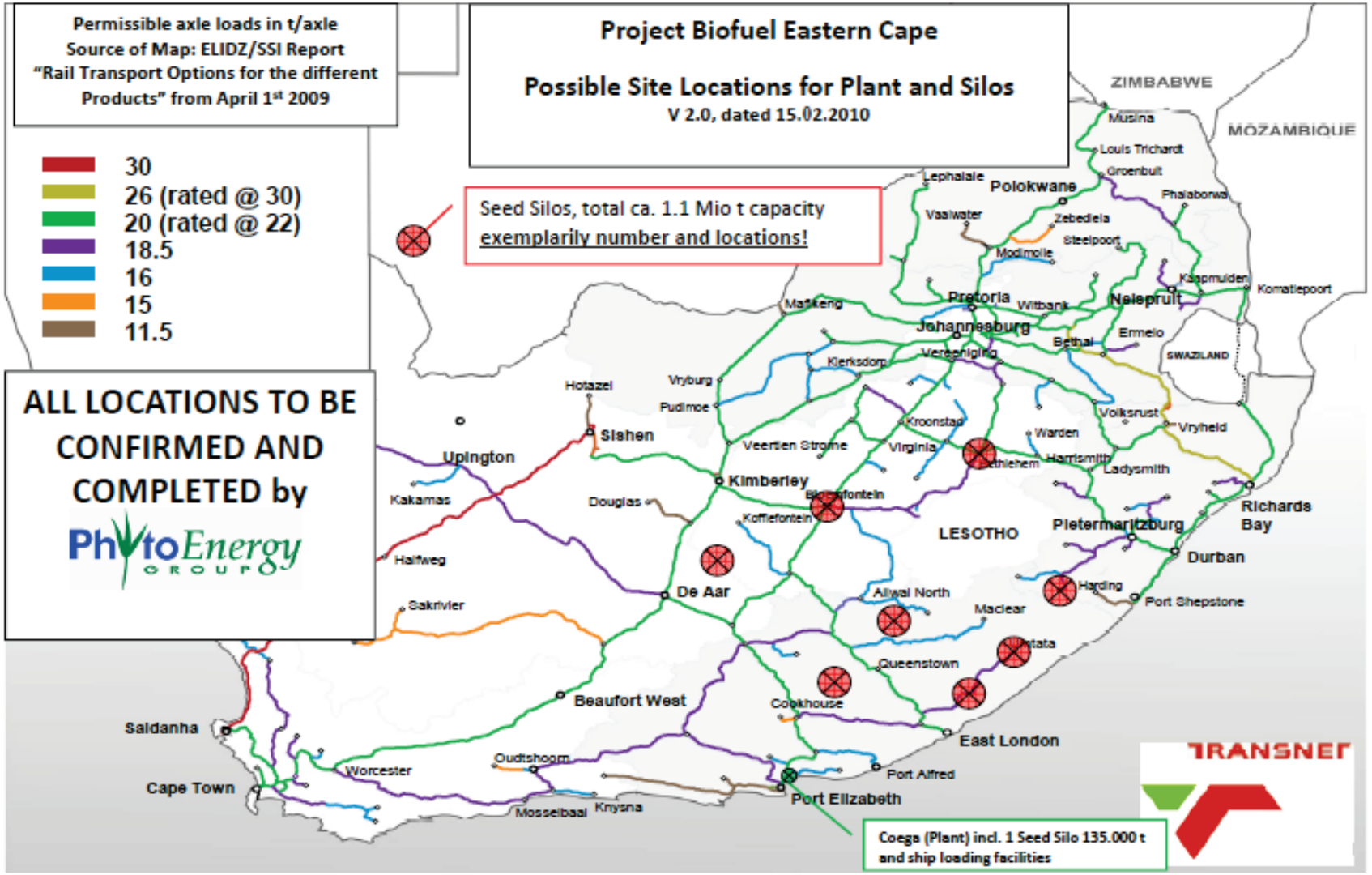

Figure 2-4 Locations of proposed storage facilities and existing railways for the storage and transport of feedstock.

2.3 PROJECT DEVELOPMENT CYCLE

2.3.1 Detailed Planning and Design

Various aspects of the planning and design phase of the project still need to be finalised. Most notably, the siting of the pipelines needs to be confirmed, as well as the details pertaining to capacity and number of onsite chemical storage tanks. Further to this, the actual layout of the processing plant and energy generation capacity of the biogas facility will require detailed engineering, which will most likely result in slight modifications at a later stage.

2.3.2 Construction Phase

The construction phase will include activities such as site clearance, levelling, earthworks and construction. During this phase, specific provision will be made to ensure compliance with the CDC's Environmental Specifications for Construction and the Construction Environmental Management Plan that will form part of this EIA. During the construction phase, a temporary construction site will be located within the site boundary. Effluent generated during this period will be managed by chemical toilets or by use of conservancy tanks. Upon completion of the earthworks, further contracts will be assigned to suitable contractors for tankage, civil, mechanical, electrical and instrumentation construction. All efforts will be made to ensure that all construction work will be undertaken in compliance with local legislation, local and international best practice, as well as the Environmental Management Plan (EMP), which will be compiled during the EIA phase. During the construction phase of the processing plant it is expected that both skilled and unskilled temporary employment opportunities will be created. It is difficult to specify the actual number of employment opportunities that will be created at this stage; however it is anticipated that between approximately 400 and 1600 employment opportunities will be created during the construction phase. PhytoAmandla will comply with the CDC Zone Labour Agreement requirements in terms of training and appointments.

2.3.3 Operation Phase

The projected operations are proposed to provide several services and added economic spin-offs towards the agricultural, shipping, trading and trucking industries. Operations at the plant will be carried out by competent personnel trained to PhytoAmandla standards.

The maintenance of plant equipment will be carried out on a routine basis in order to ensure the reliability of the equipment and the integrity of the assets. A stringent maintenance programme will include and specify the methods adopted to keep the plant and concomitant infrastructure fully functional and operational. Furthermore, in line with PhytoAmandla and CDC standards, environment, health, safety and security will make an integral part of the daily operations at the biofuel processing plant.

The operational phase of the project is expected to create skilled employment opportunities. Other opportunities may also arise for unskilled labour to be integrated to the ancillary activities. The exact number of employment opportunities will be specified at a later stage.

PhytoAmandla has the main objective to source locally to fill most of the positions of the proposed new facility in the Coega IDZ. However, it is expected that initially, expatriate staff may be used to fill some highly specialized positions. All other key management positions and all operations staff shall be recruited locally to ensure that this development maximizes the local employment opportunities for the proposed project.

PhytoAmandla will adopt an employment equity policy promoting equal opportunity and fair treatment in employment through the elimination of any discriminatory practices and prejudices. An environment shall be created in which every employee has the opportunity for advancement. PhytoAmandla will be committed to the development of all its employees and to this end supports initiatives aimed at

promoting training, education and development. PhytoAmandla is bound to comply with the CDC Zone Labour Agreement.

The operation phase is expected to create employment opportunities for operators for truck loading, daily supervision, assistant supervisors, processing facility operations, control room operations, monitoring and maintenance support.

The operation phase of the development is also expected to create external support or temporary employment opportunities, as well as indirect employment opportunities. Employment opportunities are likely to include the following:

- feedstock production;
- security services;
- annual maintenance;
- building housekeeping;
- catering contracts for the supply of food and consumables to the office;
- local workshops will be identified for specialized activities such as welding and valve lapping to take place;
- tank cleaning;
- supplier for general consumables and supplies such as lube oils, greases, tools, gaskets, uniforms and paints etc.;
- in-house contractors for undertaking regular modifications to the processing plant;
- waste management services; and
- suppliers of utilities such as potable water, electricity and nitrogen.

2.3.4 Decommissioning Phase

Should the need for decommissioning arise the following procedures will be undertaken. The main aim of decommissioning is to return the land to its original, pre-construction condition. The closure and subsequent decommissioning of the processing plant and all associated infrastructure will be treated with the same care and attention as operating and maintenance works. The work concerning the closing and decommissioning of the processing facility and associated facilities requires proper planning, control and reporting.

The work carried out during this phase will ensure that the local laws and regulations are adhered to. In addition, all subcontractors' employees will be inducted on the procedures to be followed during this phase. A risk assessment will be carried out during the planning stage of the decommissioning phase in order to identify any possible additional hazards that the actual decommissioning may cause. All applied methods and the complete approach and procedures to be followed will be clearly described in advance to avoid mishandling.

It will be stressed that all personnel working during the decommissioning phase are covered by insurance. Further to this, it is anticipated that all necessary operational clearances and permits will be obtained prior to the commencement of the decommissioning phase.

The material stored in the tanks and pipelines will be carefully removed to a bulk liquid storage terminal or disposed at a licensed disposal facility capable of handling products of that nature. All equipment will be removed, and positively isolated and de-energized from all active equipment and connecting facilities, piping or wiring. All tanks and pipelines will need to be certified as gas free, which may be achieved by a third party inspector.

A full time qualified site safety supervisor who is experienced in demolition work will be employed prior to the planning phase. It is expected that prior to any demolition being carried out, a full and detailed method statement will be prepared by the contractors. The supervisor will be responsible for the work permits, compliance and method statements. The supervisor will also have the authority and ability to give instructions to contractors, particularly with regards to halting work in case of non-compliance.

2.4 PROJECT ALTERNATIVES

Sections 24(4)(b)(i) and 24(4A) of the National Environmental Management Act, 1998 (Act 107 of 1998, as amended) require an EIA to include investigation and assessment of impacts associated with alternatives to the proposed project. In addition, Section 24O (1)(b)(iv) also requires that the competent authority, when considering an application for environmental authorisation, must take into account "where appropriate, any feasible and reasonable alternatives to the activity which is the subject of the application and any feasible and reasonable modifications or changes to the activity that may minimise harm to the environment". DEA&DP (2010) 2 states that: "if no feasible and reasonable alternatives are identified, only the comparative assessment of the preferred alternative and the option of not proceeding ("No Project" alternative), is required during the assessment phase". Alternatives of relevance for this project are:

- The location where it is proposed to undertake the project;
- The type of activity to be undertaken;
- The design and layout of the activity;
- The technology to be used in the activity; and
- The 'No Project' alternative.

2.4.1 Location Alternatives

It is a requirement for the PhytoAmandla Biofuel Processing Plant to be in close proximity to a deep water port and be easily accessible from major rail and road infrastructure. These requirements are important for the receiving of feedstock and export of the product. These requirements were considered as the main limiting factors when indentifying suitable development sites.

Initially, until 2009 the East London IDZ was identified as the preferred site for the construction of the processing plant due to its proximity to the planned feedstock production area. Several options (two in EL, one in Berlin next to EL) were investigated. After 2 years of negotiations with the East London IDZ it was concluded that the site allocated to the project in the East London IDZ could not be utilized due to logistical and land tenure issues. Consequently, in 2009, the project site was moved to the Coega IDZ near Port Elizabeth.

The mouth of the Coega River was in 2002 identified by the Government of South Africa for the construction of a harbour. As such, the construction of the Port of Ngqura started in 2002 and the port became operational in 2009. The areas around the port were earmarked for industrial development and the Coega IDZ established. The Coega IDZ is now a premier location for new industrial investments in South Africa and has been divided into a total of 14 different zones. Sectors which have been identified for the IDZ consist of Automotive, Agro Processing, Metallurgical, Educational and Training, Petro Chemical, General Manufacturing, Business Process Outsourcing and Energy. A site in Zone 5 (base metallurgical) has been allocated for the construction of the project and is considered to be the most suitable site for the establishment of the proposed PhytoAmandla Biofuel Processing Plant.

The site in Zone 5 of the Coega IDZ allocated for the construction of the processing plant is considered to be ideal, and due to the stringent requirements for a feasible site, no site alternatives have been identified for further investigation.

2.4.2 Activity Alternatives

The proponent, PhytoAmandla as part of the PhytoEnergy Group, is an international organisation specialising in biofuel production and will, therefore, not consider any alternative activities.

[2] DEA&DP (2010) Guideline on Alternatives, EIA Guideline and Information Document Series, p.10. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP)

2.4.3 Layout Alternatives

Initially it was proposed to construct an offsite storage facility on a 2 ha site bordering the port area (Zone 8). It was planned to store the product at this facility before piping it to the liquid berth where ships would be loaded for export. This layout alternative has since been discarded due to the environmental impact and cost of construction and operation of such an offsite storage facility and pipelines.

It is now proposed to pipe the product to the proposed bulk liquid storage and handling facility in Zone 8. The operator of the tank farm will thus be responsible for offsite storage of the biofuel and ship loading.

Route alternatives for the pipes connecting the processing plant to the OTGC bulk liquid storage and handling facility will be assessed as part of the EIA. The impact of the route alternatives on the Coega River as well as the Coega Open Space System will be assessed to identify the best alternative from an environmental perspective. Other considerations (e.g. cost) will also be taken into account when selecting a preferred alternative.

2.4.4 Technology Alternatives

Initially it was proposed to install a glycerol distillation facility to transform technical glycerol, produced as a by-product, to pharmaceutical grade glycerol that can be used for producing food and pharmaceutical products. After taking the inconsistency of the South African national electrical grid into consideration, it was decided to rather utilise the glycerol by-product in a biogas facility for the generation of process heat and electricity.

The purpose of the biogas unit is to use as much as possible of the by-products from the processing plant to generate energy and reduce the reliance of the plant on the national electrical grid. The biogas unit will minimise waste production by acting as a treatment facility for process water and any other suitable biological output from the plant.

The technology planned for the processing plant is based on existing German plants similar to the one proposed in the Coega IDZ. Final design is, however, still underway.

2.4.5 No-project Alternative

The main implication of the no-go alternative is the lack of an estimated capital investment of € 300 million to South Africa and the creation of 25 000 local jobs, as estimated by National Department of Trade and Industry[3] for this project. The alleviation of poverty and promotion of agricultural best practices and education in the Eastern Cape Province while increasing national food production will also not be realized. 600 000 tons of oilcake that can be used as livestock feed will also not be produced.

[3] Department of Trade and Industry COP 17 presentation. 15 December 2011. Available for download from: http://www.phytoenergy.org/. Accessed 10 May 2012.