Environmental Impact Report : DM0103/08
Buckman Laboratory Expansion
Addition of 3 Processing Vessels with Bulk Handling Capabilities to Existing Operations
1 Buckman Boulevard, Hammarsdale, Durban, KwaZulu/Natal

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EXECUTIVE SUMMARY:

Buckman Laboratories (Buckman Lab/ Buckman) has experienced significant growth in production over the last 2 years. Buckman Lab has identified potential new business opportunities.

However, due to current constraints with high vessel occupancies, it is not in a position to effectively and efficiently meet customer needs.

The increased sales demand as per the projections for 2008 to 2010 necessitates an expansion in production capacity.

The increase in sale requirements will result in Buckman running out of vessel capacity, thus impacting on its ability to meet customer requirements and to sustain its business.

Accordingly, Buckman proposes to expand their existing plant at Hammarsdale to cater for the growing need and customer demand.

To expand the current production facility, Buckman propose to include 3 x 25 000 litre processing vessels with bulk handling capabilities. It will consist of two non-pressure vessels and one pressure rated vessel (3200 KPa) with heating and cooling capabilities as well as a hoist and hopper mechanisms to handle bulk bags.

In addition, it proposes to upgrade its effluent treatment facility with new technology and facility.

According to Buckman, if nothing is done to improve the current facility in order to cater for future growth, the company will be out of business and 240 people will be out of employment, thereby impacting on over 1000 people, assuming each family consists of 4 people.

Buckman Lab's activity has been identified as an "activity" listed in clause 1 (c), (e), (g), (p), (q) and (r) of Regulation No.387 of 2006 and which specifically refers to:

> *"(c) the above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of 1000 cubic metres or more at any one location or site including the storage of one or more dangerous goods, in a tank farm;"*
>
> *"(e) Any process of activity which requires a permit or license in terms of legislation governing the generation or release of omissions, pollution,*

effluent or waste and which is not identified in Government Notice No. R386 of 2006."

"(g) the use, recycling, handling, treatment, storage or final disposal of hazardous waste."

(p) the treatment of effluent, wastewater or sewage with an annual throughput capacity of 15 000 cubic metres or more;

(q) the incineration, burning, evaporation, thermal treatment, roasting or heat sterilization of waste or effluent, including the cremation of human or animal tissue;

(r) the microbial deactivation, chemical sterilization or non thermal treatment of waste or effluent

Many of the potential impacts identified with the proposed activities are assessed to have low or no impact and the proposed implementation of the mitigation measures will reduce any potential adverse impacts.

In summary, it is concluded that the expansion of the plant as proposed will have low to no impact on the environment and that the effluent treatment plant is in itself a mitigation measure that will have a positive impact on the environment.

Accordingly, it recommended that the project should be approved with the following conditions:

1. All existing best practices to continue such as audits, monitoring and continual improvement.
2. All mitigation measures recommended are complied with in its entirety
3. The EMP for the construction phase should be implemented, including the associated requirements for auditing by an independent environmental control officer (ECO) to ensure compliance with the EMP.
4. An operational EMP to be drawn up and implemented to ensure that the operational efficiency and environmental conformance of the proposed activities is subject to regular independent audits.

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TABLES AND APPENDICES

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APPENDICES

1. INTRODUCTION:

Buckman Laboratories (Pty) Ltd is part of the Buckman Laboratories Inc., a privately owned company based in Memphis, U.S.A., which operates on a world wide basis. The local company was established at No 1, Buckman Boulevard, Hammarsdale, in 1979 and currently supplies Buckman products to the African and Asian markets. Buckman Laboratories manufacture a variety of proprietary chemicals, including microbiocides, scale inhibitors, polymers, dispersants and defoamers, for a wide range of industries, including pulp and paper, industrial and municipal water treatment, sugar, paint, leather, mining, and metal industries.

Appendix 1 indicates the following:

Map 1: Context Map

Map 2: Locality Map

Map 3: Site Plan

Map 4: Surrounding Land Uses

Map 5: Ward Context

Map 6: 5km Buffer Map

Map 7: 1km Buffer

Sales volumes, both local and exports have increased significantly over the past two years and are forecast to increase further in the immediate future. In order to meet these future local demands and to increase exports, it is necessary to increase the production capacity of the Hammarsdale plant.

To expand the current production facility, Buckman propose to include 3 x 25 000 litre processing vessels with bulk handling capabilities.

It will consist of two non-pressure vessels and one pressure rated vessel (3200 KPa) with heating and cooling capabilities as well as a hoist and hopper mechanisms to handle bulk bags.

The process involves adherence to Buckman Laboratories standard operating procedures (recipes) which entails liquid with other liquids, powders with liquids, liquids with liquids, liquid, wax and powder blends and reactions. The process will be carried out at ambient and

high temperatures (= or > 165 ^{o} C) and under atmospheric and elevated pressures (= or < 2800 KPa). Appendix 2 indicates the information on the proposed plant.

The recipe calls for agitation with stipulated periods of time with heating or cooling at certain stages of the manufacturing process. Some of the reactions are carried out under temperature and pressure control.

All the vessels will be equipped with automated safety interlocks namely, high/high and low/low pressure and temperature alarms as well as a manual double check during the manufacturing process. The vents will be connected to a scrubber system to prevent any material from entering the atmosphere.

Having the processes automated will reduce the cycle times for each batch reducing noise levels, and vessel charging times. By converting from 25 kg bags to one ton bags, the packaging will be reduced by 44 % which will be recycled. By automating the rinsing out of vessels the liquid waste will be reduced by 30 %. The intention is to have a positive impact on the occupational health and safety by moving to 500 – 1000 kg bulk bags for powders.

Buckman has ISO 9001:2000, ISO 14001:2004, OHSAS 18001:2007 accreditations and are a signatory to Responsible Care (International Chemical Allied Industries Association), which ensures that the highest standards of quality, environment, safety and health are applied. They currently employ 240 people at Hammarsdale.

Buckman USA insists that all their subsidiaries employ the highest level of personal safety at all times. Anyone, including visitors, entering the premises, for example, must be wearing long sleeved shirts, closed shoes and long trousers (both men and women) and are subject to a zero tolerance alcohol test. Operators working in the production areas must wear overalls, safety helmet, goggles and safety shoes at all times.

2. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP):

Pravin Amar Development Planners were appointed by Buckman Laboratories to undertake the EIA on its behalf. He is assisted by Mr. A. Childs, a qualified chemist as a specialist examining the chemical inputs, process and the outputs.

Name of Consultant / Company:	Pravin Amar Development Planners
Contact person:	Mr Pravin Amar Singh – BA; Master of Town & Regional Planning (MTRP), Integrated Environmental Management (UCT); LLM (Environmental)
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The EAP has extensive experience in environmental management including inter alia environmental impact assessments; project management and developing planning.

The CV of EAP and the specialist are attached as Appendix 3.

3. DETAILED DESCRIPTION OF THE PROPOSED ACTIVITY:

The project is an expansion of the existing facility that has been in existence since 1979, to increase the current production facility to include 3 x 25000 litre processing vessels with bulk bag handling capabilities, which will cater for the immediate increased sales volumes and for future growth. The site will also consist of a 20000 litre storage/feed tank.

The expansion will consist of two non- pressure process vessels and one pressure rated vessel (3200 KPa) with heating and cooling capabilities as well as a crane and hopper facilities to cater for bulk bag handling.

The proposal will address the demands for the next 3 years by creating the additional vessel availability to cater for the new sales growth. The installation of the new processing vessels will also manage the business risks and ensure continuity of supply.

Conversion of the existing production "staging" area which is in front of the manufacturing plant and increasing the building height by 5m. The area in this facility will be approximately 995m².

Table 1: Inputs for the Expansion Project:

Raw Material Chemical Description	Total Vol. in Tons
Acrylate	1651
Aldehyde	456
Amide	404
Amine	1045
Ammonium compounds	273
Carbonates	32
Chlorinated compounds	66
Epoxy	1143
Ester	124
Hydrocarbon	1577
Inorganic metal	27
Nitrogen compounds	213
Organic acid	97
Organic Hydroxides	59
Sulphur compounds	440
Surfactants	245
Vegetable oil	564
Totals	**8416**

Table 2: Outputs for the Expansion Project:

Chemical Description	Total Vol/ Tons/ pa
Acrylate	11585
Amides	900
Amine	3540
Ammonium compound	810
Carbonates	643
Chlorinated compounds	566
Ester	1185
Inorganic metal	321

Organic acid	205
Sulphur compound	1258
Surfactant	585
Totals	**21598**

Appendix 2 indicates pictures of the proposed plant.

Appendix 4 indicates the process vessel and the process flow diagram.

3.1 The Current Operations:

The Tables below provide information on the current plant that is operational.

Table 3: Inputs for the Existing Plant:

Chemical Description	Total Volume in Kgs per Annum
Acids	630248
Acrylates	246364
Aldehyde	70210
Alkalis	383520
Aluminum compounds	195494
Amide	641190
Amine	1141261.7
Ammonium compound	402290
Carbonates	32100
Chlorinated compound	1059480
Ether	20676
Ether	44002.8
Hydrocarbon	2468806
Inorganic metal	185100
Ketone	357000
Nitrogen compounds	47700
Organic acid	612456
Organic Hydroxides	645262
Phenolic	115190
Phosphorous compound	12300
Polysaccharide	6580
Silicates	6065
Silicones	166480
Sulphur compounds	647887.2
Surfactant	35398
Vegetable oil	5500

Table 4: Outputs for the Existing Plant:

Chemical Description	Total Volume in Kgs per Annum
Corrosion inhibitor	1002
Enzyme	2002
Quinolines	19912
Polysaccharides	69342
Phosphate compounds	74648
Bromine	108428
Ammonium compound	121032
Aldehydes	162000
Salt	198932
Ketones	199314
Akalil's	219644
Alkalis	344016
Organic Acid	379410
Cynates	392410
Acids	400744
Nitrogen compounds	805826
Silicones	870330
Ammonium compounds	870656
Inorganic metals	913084
Chlorinated Compounds	1001230
Ester	1170904
Hydrocarbons	1591760
Sulphur compounds	2310252
Acrylates	2660968
Surfactants	2820950
Amines	3132374
Amides	8491662

3.2. Description of Effluent Management

3.2.1. The Historical Treatment of Effluent:

During the manufacture and shipping preparations, liquid waste that could not be re-used was sent to the effluent pond. Buckman has 3 x 300m^3 concrete and lined effluent holding ponds on site.

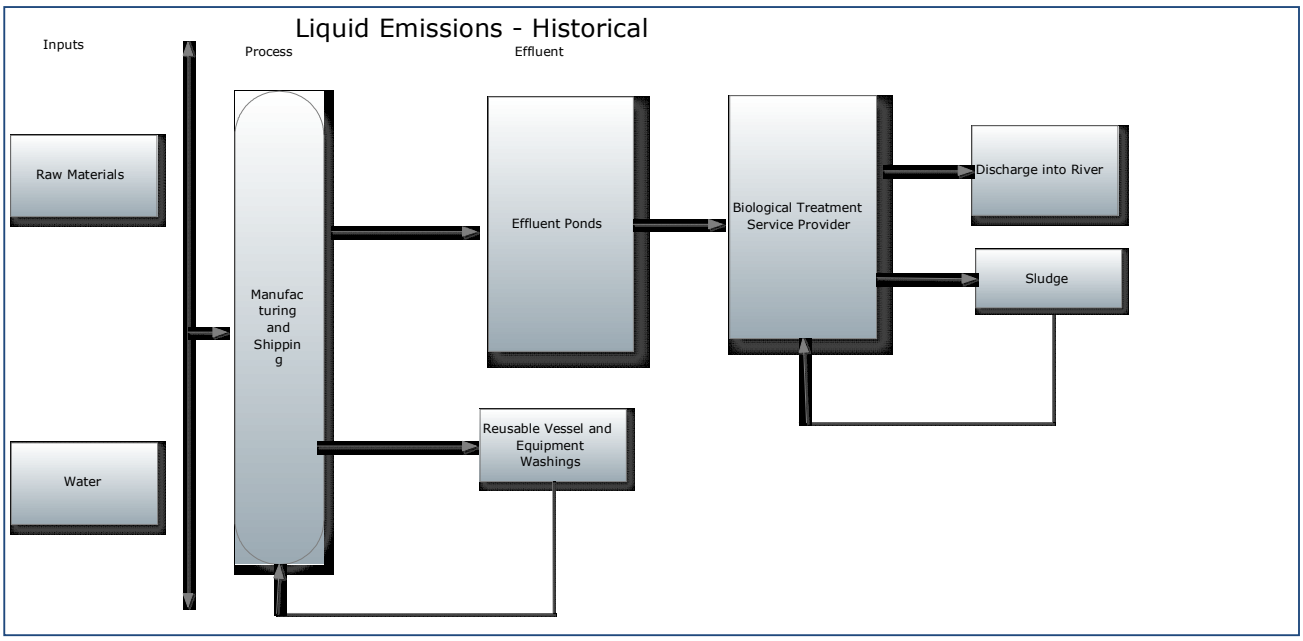
Vessel, lines and equipment washings was collected in containers and re-used in products as diluents. On average, Buckman generated approximately 30 tons of effluent per day.

The waste from the effluent ponds was transported to a local biological treatment works for disposal. The treated effluent was then discharged into the river, by the treatment works, as per the specifications outlined in the permit issued by DWAF to the treatment plant.

Buckman has since discontinued the use of the service provider due to it not having a permit as a Water Service Provider (WSP).

Buckman was also directed to investigate alternatives for its effluent management as part of the EIA process. It has evaluated a number of pre-treatment technologies in order to effective manage the waste generated and to comply with the NEM: Waste Act of 2009.

The diagram below illustrates the historical treatment of its liquid effluent.



4. DESCRIPTION OF THE PROPERTY ON WHICH THE ACTIVITY IS TO BE UNDERTAKEN:

Buckman Laboratories is located in the industrial area of Hammarsdale. The plant comprise of numerous process buildings and storage facilities. The location of this plant is provided in the drawings in Appendix 1.

The Buckman Laboratories' site is located on a hill and at the west are the valley, a river and a dam. To the north and south the land slopes and is slightly downwards. The nearest residential is to the east at the rear of this property.

Buckman Laboratories is located on:

- Sub 9 of Lot 11 Sterkspruit 1609
- Sub 10 of Lot 11 Sterkspruit 1609
- Rem of Sub 6 of Lot 11 Sterkspruit 1609
- Sub 8 of Lot 11 Sterkspruit 1609
- Sub 11 of Lot 11 Sterkspruit 1609

The proposed development is geographically positioned at Latitude: 29°48'27, 3"S and Longitude 30°39'31, 9"E.

The current use of the site is industrial and the surrounding land uses include motor engineering, residential housing, textile and plastic production.

The Buckman Laboratories Plant manufactures a variety of special chemicals. The plant is divided into number of small buildings. These buildings are used for:

- Administration Offices
- Storage Warehouse
- Process plant
- Bulk storage tanks
- Workshops

Manufacturing occurs in the production area which contains a number of process vessels. A large number of storage tanks on site store raw materials and finished goods.

Diagrams illustrating Buckman Laboratories and the site in relation with all other land uses, is provided in Appendix 1

A variety of chemicals are used and stored in this plant. Some of the chemicals are stored in bulk containers, whilst others used, are in drums and/ or in bulk tanks.

Appendix 1 provides the relevant maps of the site.

5. DESCRIPTION OF THE ENVIRONMENT THAT MAY BE AFFECTED BY THE ACTIVITY:

5.1 Physical and Biological:

5.1.1 Temperature and rainfall

In summer very high temperature in excessive of 35^0 C can occur, whilst in winter temperature can be as low as (4^0 C) at times.

5.1.2 Wind Speed and Direction

Buckman Laboratories is located on a hill with a large valley. Therefore, the prevailing wind direction is north north-east and south to south west.

Wind speeds are generally moderate at an average of below 20 K/ph.

There are also a high percentage of wind calm days in the year mostly in winter and also calm periods during the evenings. In winter and periods outside of winter inversion occurs. This is regular and only clears later on in the day if no wind occurs.

5.1.3 Natural Drainage/ terrain

The natural fall from this plant is towards the river and down below.

5.2 Social & Economic:

The site of the proposed activity falls between two wards, i.e. Ward 4 and Ward 6.

The ward councillor for Ward 4 is Mr. Dennis Mzwamasoka Shozi. Buckman Laboratories is located to the far south of Ward 4 on the boundary with Ward 6.

The following tables contain the available important information on **Ward 4.**

Age		%
Age 0 -4	3 885	11
Age 5- 14	8 875	24
Age 15 – 34	13 547	37
Age 35 – 64	8 711	24
Age >65	1 531	4

Dwelling Type				
Number of House holds	**Formal**	**Informal**	**Traditional**	**Other**
7081	3 712	182	3 025	162
%	52	3	43	2

Employment Status		
	15 – 65 years	%
Employed	6 135	27
Unemployed	8 075	36
Not Economically active	8 192	37

Delivery of Basic Household Services									
Electricity	**%**	**Refuse disposal**	**%**	**Flush Toilets**	**%**	**Water in Dwelling**	**%**	**Water< 200m**	**%**
5135	70	826	11	1191	26	4155	57	783	11

Overall, this is a ward that has low delivery of services and a high percentage of unemployment, leading to the conclusion that this is a disadvantaged community. However, many live in formal housing and only a few in an informal settlement. The site of the proposed development is located in the far north of Ward 6

The ward councillor for Ward 6 is Mr. Lucky Nhlanhla Mngwengwe.

The following tables contain available important information on **Ward 6.**

Age		**%**
Age 0 -4	3 668	10
Age 5- 14	7 936	22
Age 12- 34	14 121	39
Age 35- 64	8 945	25
Age >65	1 261	4

Population	**35 932**	**%**
African	35 870	99
Coloured	32	0
Indian	3	0
White	27	0
Pensioners	1 261	4
Disabled	1 493	4
Male	16 924	47
Female	19 008	53

Dwelling type		
Number of households	**7 383**	**%**
Formal	6 635	90
Informal	433	6

Traditional	310	4
Other	5	0

Household Income (pa)	**Household**	**%**
No income	2 394	32
R1 – 4 800	265	4
R4 801 – R 9 600	1 279	17
R9 601 – R19 200	1 442	19
R19 201 – R38 400	1 276	17
R38 401 – R76 800	580	8
R76 801 – 153 600	148	2
R153 601 – 307 200	35	0
R307 201 – 614 400	7	0
R 614 401 – 1 228 800	1	0
R1 228 801 – R2 457 600	8	0
R2 457 601 and more	4	0
Work Status	**15 – 65 years**	**%**
Employed	5 457	24
Unemployed	10 077	43
Not Economically Active	7 644	33
Literacy Ratio (Grade 7 and above)	18 630	52
Dependency Ratio		7

Delivery of Basic Household Services									
Electricity	**%**	**Refuse disposal**	**%**	**Flush Toilets**	**%**	**Water in Dwelling**	**%**	**Water< 200m**	**%**
5 638	76	5 400	65	5 367	72	6 407	86	399	5

Major Community Facilities located in the ward Include:	
Library	1
Clinics	0
Police	1
Hospital	0
Pension pay points	1
Billing points	0
Metro police	1
Fire stations	0
Community halls	1
Post office	0
Schools	14

Approved Capital Projects (R million)				
Project	Type Task	2007/2008	2008/2009	2009/2010
Cleansing and solid Waste Operations	1.8	0.0	0.0	0.0
Engineering Roads	0.1	0.0	0.0	0.0

The general assessment of Ward 6 is that it has the typical former black group area profile i.e. with high levels of unemployment and lacking many essential major community facilities such as a clinic. However, service delivery is quite high and a vast majority live in formal housing.

6. DESCRIPTION OF THE PUBLIC PARTICIPATION PROCESS :

The Public Participation process for the scoping phase was conducted in order to provide I&AP's with an opportunity to raise their issues and concerns regarding the proposed development at a conceptual level for the main purpose to introducing the project to interested & affected parties (I & AP's) and the authorities.

a) Invitation to Public Meeting

- **Advertising**

The adverts inviting all I&AP's and relevant stakeholders were placed in the following local newspapers:

Name of Newspaper	Date of Publication	Language
1. Ilanga	16 – 18 June 2008	IsiZulu
2. Mercury	17 June 2008	English
3. Highway Mail	20 June 2008	English

- **Notice to I&AP's**

Written notices were sent to all I&AP's to inform them of the date and venue of the public meetings.

- **Site Notices**

Site notices were displayed in and around the main access points of the proposed site including Hammarsdale community.

b) Public Meeting : Scoping Phase

The public Meeting for the E.I.A. scoping phase was convened as follows:

Date: 2 July 2008

Time: 17h00 for Site Visit, 17h30 for Public Meeting

Venue: Buckman Laboratories, 1 Buckman Boulevard, Hammarsdale.

An updated I & AP's list is attached as Appendix 5.

c) Submission of the Draft ESR for Public & Authority Review:

The draft ESR was published for public and authority review on the 31 July 2008.

Advertisements informing the public about the launch of the Draft ESR were placed in the following local newspapers:

Name of Newspaper	Date of Publication	Language
1. Mercury	01 August 2008	English
2. Ilanga	04 – 06 August 2008	IsiZulu
3. Highway Mail	08 August 2008	English

Further, the reports were distributed as follows:

- Planning & Development Department - eThekwini Outer West as representative of the "Hub" for EIA processes
- Department of Agriculture and Environmental Affairs (former DAEA, now DAE & RD)
- Department of Water and Forestry Affairs
- Health Department- Outer West
- Ward 6 Councillor's Office
- Mpumalanga Library
- WESSA

Comments received on the draft ESR were incorporated and the final ESR was submitted to the DAEA and lodged on the 1 September 2008.

This draft EIR was subject to public review at a public meeting scheduled for the 23 October 2008. The meeting was advertised in the relevant newspapers. (Refer to Appendix 8)

The Department & Water Affairs & Forestry were the only party that responded to the draft EIR. The comment and the response to that correspondence is included in Appendix 7.

7. DESCRIPTION OF THE NEED & DESIRABILITY OF THE PROJECT:

Buckman Laboratories has experienced significant growth in production volumes over the last 2 years. As such, they have identified potential new business opportunities. However, due to current constraints with high vessel occupancies, they are not in a position to effectively and efficiently meet customer needs.

The increased sales demand as per the projections for 2008 to 2010 necessitates an expansion in production capacity.

The increase in sale requirements will result in Buckman running out of vessel capacity, thus impacting on its ability to meet the customer requirements and to sustain its business.

Buckman's main customers are Mondi, Sasol, Sappi, Mittal, Kimberly Clark, Columbus Stainless Steel, Eskom, Municipal Potable Water Treatment and Richards Bay Minerals. These customers are growing and expanding and if Buckman is not in a position to supply its products in time, there could potentially be a significant impact on their production output, depending on the particular application.

According to Buckman, if nothing is done to improve the current facility in order to cater for future growth, the company will be out of business and 240 people will be out of employment, thereby impacting on over 1000 people, assuming each family consists of 4 people.

Accordingly, the installation of 3 processing vessels of bigger capacity is proposed, as it would be inefficient to run 2 batches concurrently in smaller vessels, thereby causing the following constraints:

- Increasing the possibility of contamination in the bulk tanks
- Increasing liquid emissions
- Creating bottlenecks with tanker availability and reduced service levels to customers
- Creating a negative impact on the ability to pursue new business opportunities and to grow the business

From a business continuity viewpoint, Buckman have contractual agreements with some customers, whereby the current high vessel occupancy puts the business at risk if they have a prolonged vessel downtime – thus impacting on the ability to meet customer requirements.

In terms of potential claims from a paper customer for downtime, a paper machine produces 40 tons per hour at a cost of about R4000 per ton, which will result in a loss/claim per hour of

ZAR 160, 000, just from one customer. This equates to a potential liability amount of ZAR 3,840,000 /day (R3, 8m) that Buckman could incur.

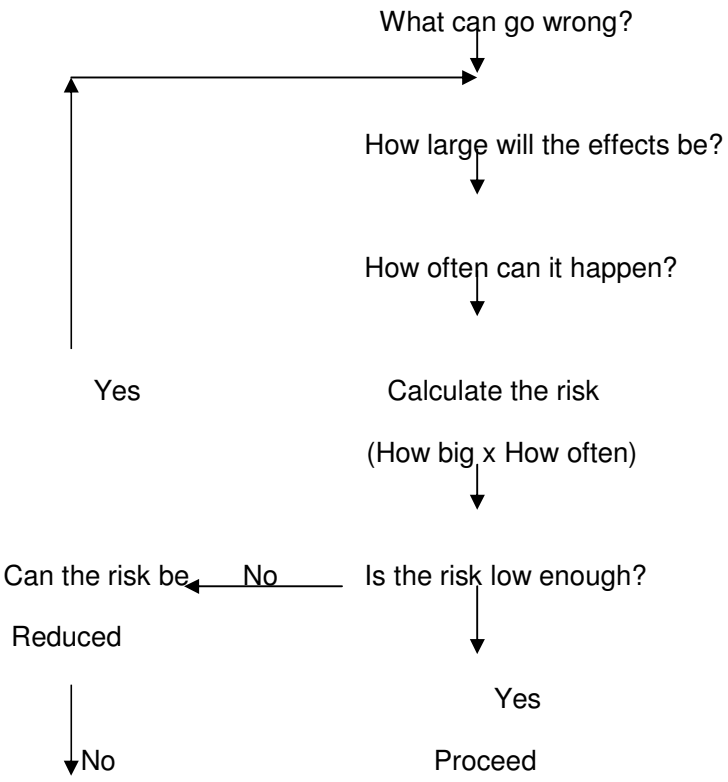
Accordingly, Buckman proposes to expand their existing plant at Hammarsdale to cater for growing need and customer demand.

8. METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

8.1 Quantitative Risk Assessment.

An environmental impact assessment for a chemical storage and processing plant will consider the normal day to day impacts posed by the facility. These types of impacts can be estimated before installation, and then monitored on an ongoing basis after commissioning and reduced if necessary.

However there is another type of impact that cannot be quantitatively measured either before or after commissioning. That is the possible impact of abnormal and/or accidental emergency situations. In order to understand these potentially disastrous situations a tool called “risk assessment’ is used. In the case of chemical plants “risk” is a technical term used to express the chance of a specific level of harm occurring within a specific time frame. The following process is used in compiling a risk assessment.



8.1.1 Method of assessment.

Potential environmental impacts are evaluated according to their severity, duration and extent together with their frequency and probability. The methodology derives environmental significance on the basis of the impact on the environment and the likelihood of the impact occurring.

- Consequence is calculated as the average of the sum of the ratings of severity, duration and extent.
- Likelihood is the average of frequency and probability.
- Significance is the sum of consequence and likelihood.

8.1.1.1 Consequence.

Consequence is calculated as the average of the sum of the ratings of severity, duration and extent of the impact.

Severity

Rating

1 Negligible / non-harmful / minimal deterioration.
2 Minor / potentially harmful / measurable deterioration.
3 Moderate / harmful / moderate deterioration.
4 Significant / very harmful / substantial deterioration.
5 Irreversible / permanent deterioration.

Duration

Rating

1 Less than 1 month / quickly reversible.
2 Less than 1 year / quickly reversible.
3 More than 1 year / reversible over time.
4 More than 10 years / reversible over time / life of the project.
5 Beyond the life of the facility / permanent.

Extent

Rating

1 Within the immediate area of the activity
2 Surrounding area within the project boundary.
3 Beyond the project boundary.
4 Regional / provincial.
5 National / international.

Consequence equals (Severity + Duration + Extent)/3.

8.1.1.2. Likelihood

Likelihood is calculated from the frequency of the activity and the probability of an environmental impact occurring.

Frequency

Rating

1 Annually or less.

2 Six monthly.

3 Monthly.

4 Weekly.

5 Daily.

Probability

Rating

1 Almost impossible.
2 Very seldom / highly unlikely.
3 Infrequent / unlikely.
4 Often / likely / possible.
5 Definite / highly likely.

Likelihood equals (Frequency + Probability)/2

8.1.1.3. Significance

Significance equals (Consequence x Likelihood)

C x L

1 – 4.9 Low environmental significance.

5 – 9.9 Low to medium environmental significance.

10 – 14.9 Medium environmental significance.

15 – 19.9 Medium to high environmental significance.

20 – 25 High environmental significance.

9. DESCRIPTION OF THE COMPARATIVE ASSESSMENT OF ALL ALTERNATIVES IDENTIFIED

9.1 Replacement of Process Vessels

In April 2008, PV11 which is an 8000 litre vessel was decommissioned due to the integrity of the glass lining and the internal corrosion that has occurred due to the cracks in the lining.

Replacement of the vessel with a 10 ton vessel is not a feasible option as this will hinder future business growth and our ability to effectively and timeosly meet customer demands. This also has a major negative impact in that we have to manufacture a number of smaller batches resulting in loss of productivity, increased effluent generation and poor customer service delivery.

Replacement of the smaller vessels within the current facility, with 25 ton vessels, is not a viable option as the current plant layout is very congested and going this route would further complicate the space availability. It will also impact on flexibility to manufacture products that are required in smaller quantities. This will also increase the inventory holding and will require further capital expenditure to install bulk tanks and an additional bulk tank farm.

9.2 Product Re-Allocation into Other Vessels

Buckman has evaluated the re-allocation of products into other vessels to cope with the demand. The net impact of the increased demands is that Buckman are out of vessel capacity to effectively grow the business and consistently meet customers' needs. Customers are operating on a "Just in Time" (JIT) system and are demanding products with a short lead time (in as little as 5 days) which does not allow for much room for flexibility.

9.3 Bulk Bag Handling

The current layout of the plant does not make it feasible to include the structural requirements to handle bulk bags. The roof of the building is too low and the piping configuration is very congested. This will require the reconfiguration of the existing piping and to increase the roof height. This will result in a large capital expenditure requirement and substantial vessel downtime, increasing the current constraints experienced with the vessel availability. This will have a negative impact on the ability to timeosly meet customer requirements.

9.4 Sourcing from Associate Companies

This is not a feasible option due to the costs associated with shipping these products which will dilute the profitability of the company. Also, due to large volumes, logistics, and costs involved, purchasing from associates companies have the following negative impacts:

- Negative impact on the Cost of Goods, Gross Profit, profitability and free cash flow.
- Increased stock holding of high volume products - importation from Americas or Europe or Asia requires a lead time of 4 – 8 weeks
- Decreased customer service – this creates a logistics issue in terms of supply and demand
- Construction of added infrastructure (bulk tanks & warehouses) to cater for the long shipping time.

9.5 Toll Manufacturers

There are no suitable “Toll” manufacturers that have the equipment and infrastructure to cope with the high volumes. Also, the chemicals that are manufactured is proprietary information and unique to Buckman Laboratories.

9.6 Expansion Limitations

The congested layout of the current plant inhibits any further expansion within the same area due to a number of constraints:

- The current piping above the vessels is a maze which does not allow for the inclusion of powder handling (hopper) systems.
- Replacement of the smaller vessels with 25 ton vessels will result in further congestion of the current facility
- The height of the roof and the existing support structure for the roof is not sufficient to cater for bulk bag handling.

9.7 Alternative Technology

The products manufactured in the Hammarsdale site is highly specialized and contains proprietary information with the latest technology for the specific application of the product to improve the customers output. The products manufactured are generally non-hazardous, environmentally friendly and safe to use. The vessels will be automated and have better handling and cleaning equipment thereby reducing waste and improving ergonomics.

Hence, Buckman can find no alternative technology that can better achieve the products manufactured by Buckman. This is vindicated by the increased customer demand and market domination in its propriety products.

9.8. Consideration of Alternatives for the Treatment of Effluent

Buckman has decided to use two of the technologies that have proved to be effective. In addition it is segregating the streams of effluent generated which is re-used in production as diluents. This has resulted in a reduction in the daily effluent generation from approximately 30 to about 10 tons per day.

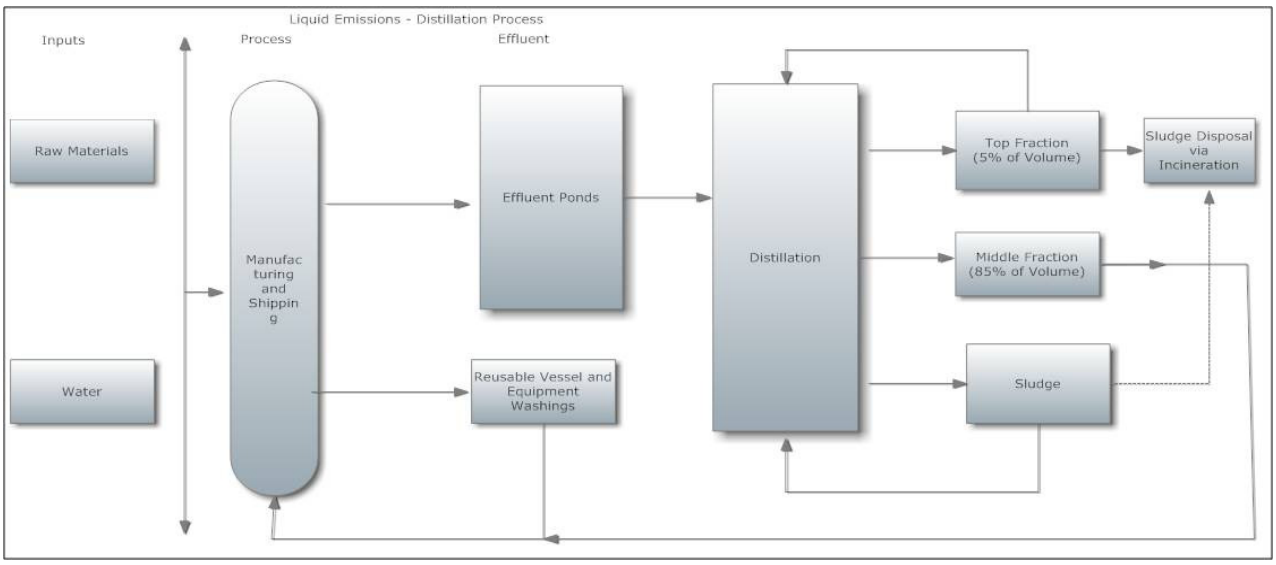
9.8.1. Distillation

- The liquid waste from the effluent ponds is transferred to a process vessel.
- The vessel contents are heated to 110^{o}C and the top distillation fraction (5% of volume) is collected.
- The middle fraction (85% of the volume) is distilled off into a holding tank and reused as diluents for the manufacture of water based products.
- The bottom fraction (10%) is collected and redistilled in the process vessel. The sludge that cannot be distilled further is collected and sent for disposal via an approved disposal site.

  However, Buckman has found that this is not the preferred option as this process is:

  - Time consuming and has limitations due the vessel availability.
  - Energy Intensive

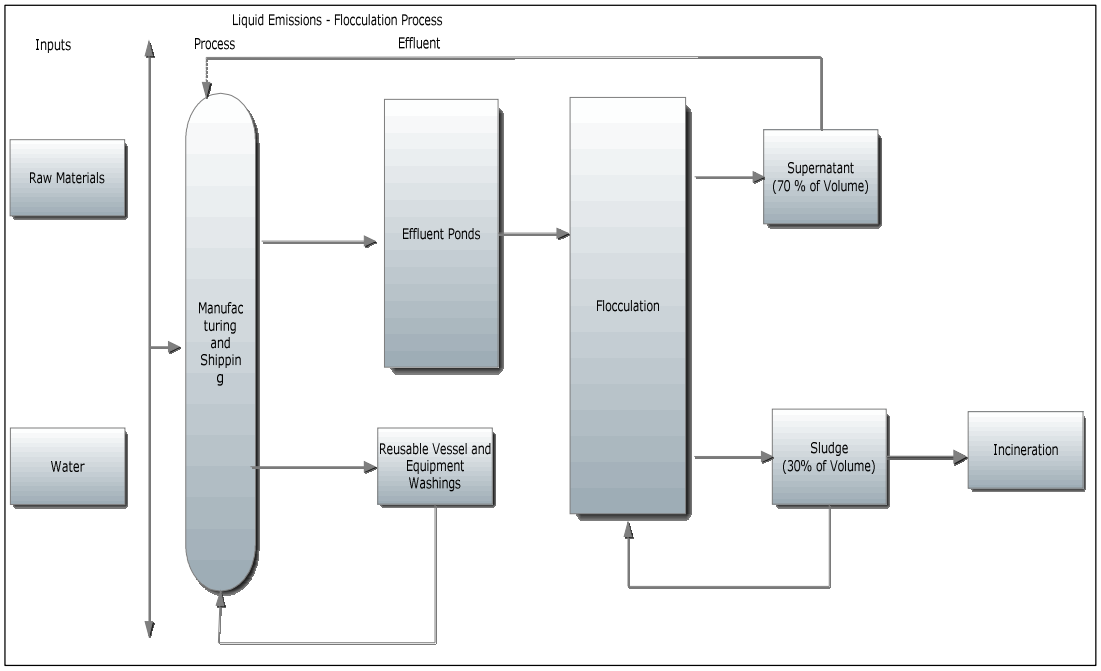
The Distillation Process:



9.8.2. Flocculation (Solid/Liquid Separation)

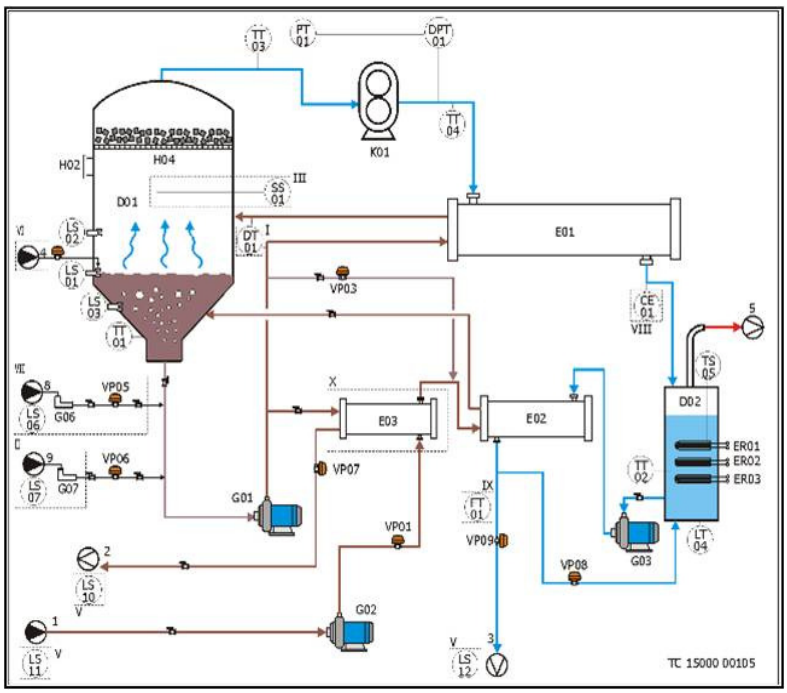
- The effluent in the holding pond (300 m^3), is treated with Poly Aluminium Chloride, and allowed to settle.
- The supernatant from the top is pumped out to a holding tank via a filter. Approximately 70% of the supernatant is recovered.
- The supernatant is then used in the manufacture of water based products.
- The sludge (30% of the volume) is disposed via an approved disposal site.

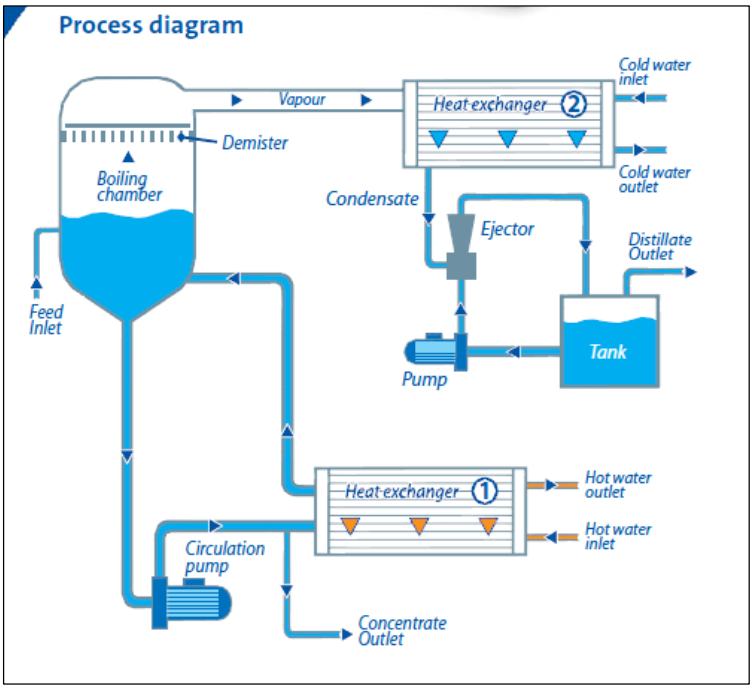
Although this method is more favourable than distillation, it has its limitations in that the settling period required is long and the sludge still has to be disposed off.



9.8.3. Preferred Alternative :

Based on the treatment options that were evaluated, Buckman decided to use the flash evaporation and crystalliser technology that is less energy intensive and generates a lower volume of sludge. Based on the pilot plant trials, the recovery of distillate is approximately 94 % and the sludge portion is 6%.





(i) Process Liquids :

The liquid to be treated is preheated in the heat exchangers E03 from the concentrate (if the optional system X is installed) and E02 from the discharging distillate.

Within D01 the pressure is 70 kPa and the temperature is 90°C.

The process liquid is recycled by the pump G01 which pumps it through the primary heat exchanger E01.

Within E01 the liquid receives the heat necessary to boil. The heated liquid returns to the boiling chamber D01, where, as a result of the vacuum, a portion of the liquid immediately boils (flash evaporation).

The produced vapour passes through a packed bed in order to eliminate suspended liquid drops and improve the separation. The blower K01 compresses the vapour and sends it to the heat exchanger E01 where it releases the latent heat to the process liquid.

The distillate is collected in the tank D02 and then it's discharged by the pump G03 after a heat exchange in E02.

The concentrate is discharged automatically according to a pre set timer through the valve VP07.

(ii) Mechanical vapour recompression

The vapour produced in the boiling chamber D01 is sucked into the positive displacement blower K01, by means of the compression that raises the temperature; than the vapour passes through the shell of the exchanger E01 where it condenses and releases the latent heat to the recycled liquid of the boiling chamber.

(iii) Thermal recovery systems

Thermal recovery is realised through the exchangers E03 (if the optional system X is installed) and E02. The liquid to be treated crosses both of them and warm up before entering in the boiling chamber.

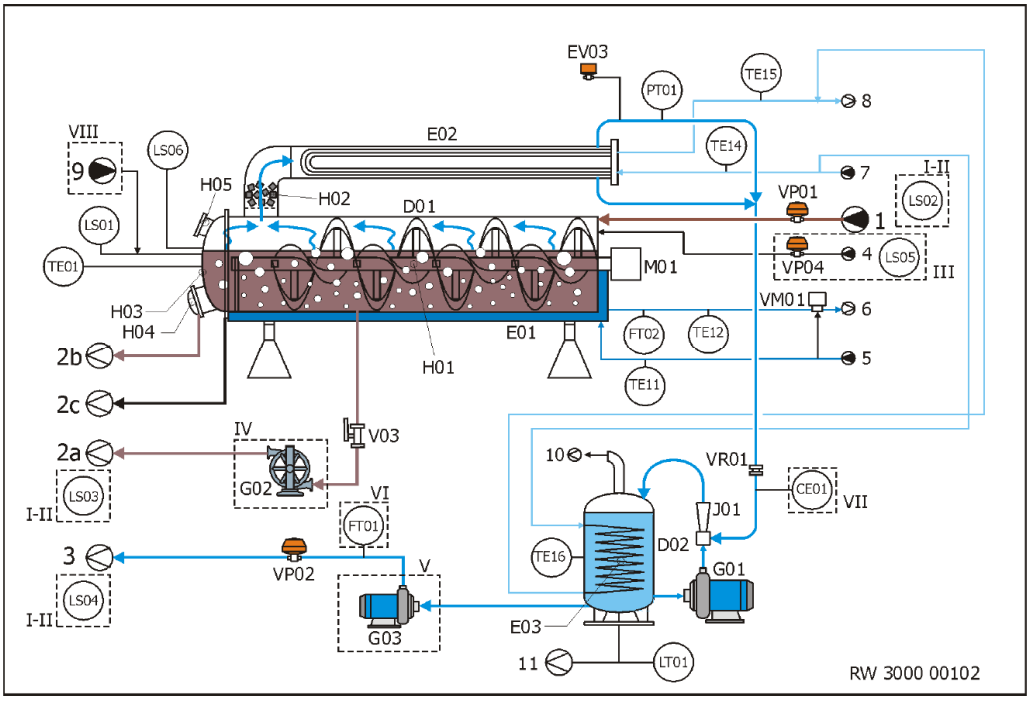
The concentrate passes through the exchanger E03 and cools down before it's discharging.

The distillate enters in E02 and cools down before its discharging.

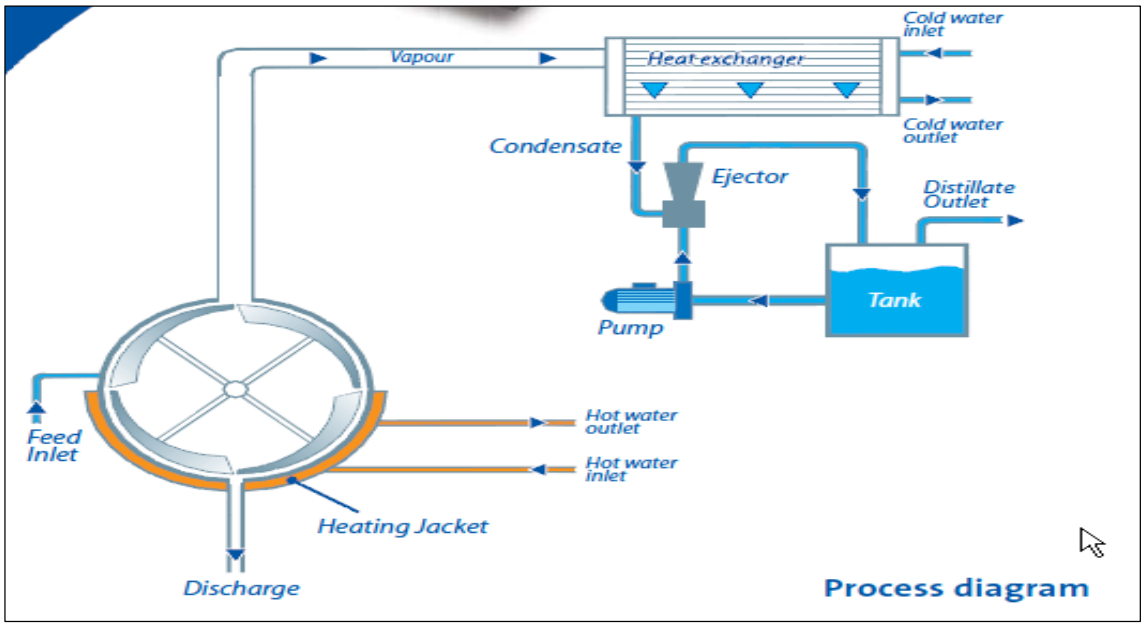
(iv) Crystalliser

The crystalliser is the hot/cold water evaporator with stirred and scraped heat exchanger surface that transfers heat by heating jacket containing circulating hot water.

Schematic of Crystalliser



Flow Diagram of Crystalliser



10. SUMMARY OF THE FINDINGS & RECOMMENDATIONS OF SPECIALIST STUDIES:

A quantatative risk assessment was for the Expansion and the Effluent Treatment Plant undertaken respectively for each by Mr. Alan Childs, a chemist with extensive experience and knowledge on the chemicals used in the plant.

The reports are contained in Appendix 6.

The specialist reports undertook a risk assessment identified 4 areas of potential impacts: the atmosphere; waste water; solid waste and potential impacts during the construction phase.

The detail of the assessments is best understood in reading the report in its entirety, as impacts have been identified, but mitigation measures are proposed.

In summary, none of the potential issues have been found to be of significance due to the strict safety and environmental practices already in place.

The current proposal is aimed at increasing production capacity and addressing a more environmentally positive way of dealing with liquid effluent through re-cycling and re-use.

Production activity will increase correspondingly but as the existing operating controls and safety measures will remain in force it may be assumed that there will be no increase in risk.

11. DESCRIPTION OF THE ENVIRONMENTAL ISSUES IDENTIFIED DURING THE EIA PROCESS AND ASSESSMENT:

11.1 Process Plant.

The existing plant is designed to the appropriate legal requirements and is fully automated and controlled. All pressure vessels are fitted with pressure relief systems and bursting discs. All electrical equipment is flameproof. All gaseous emissions pass through a cooling and collection system. Comprehensive safety rules and regulations are applied and operators training etc. are considered to be adequate. The new plant will be fully instrumented with temperature, high and low level controls etc. Once the final design and drawings have been completed and agreed and before construction commences, a HAZOP study will be conducted by the main contractor, who is ISO 9001:2000 accredited and is regularly audited by EMEX. The interior is however fairly dark and crowded. The plant is on two levels with the upper level being the main operating platform.

11.2 Raw Materials.

The majority of raw materials are water based and thus of low risk. Stock holdings of the few more hazardous raw materials are generally small. The proposal involves extending the existing production facilities to increase the volumes of certain products. This will result in an increase in the requirement for some raw materials. Generally however the storage facilities will not be extended. Although the number of deliveries of some raw materials will increase there will only be a relatively small increase in the average quantity of these materials in stock at any one time.

11.3 Hazardous Materials.

The majority of raw materials are either water based solutions or emulsions of polymers and are classified as non hazardous. The possible hazardous raw materials with their properties are listed in Table 1. Only four are classified as highly toxic, epichlorohydrin, formalin, sulphuric acid and sodium hydroxide. The latter two will be received, stored and used as dilute solutions and although they must be handled with care, their toxicity level, at the low concentrations involved, is reduced to that of irritants.

11.4 Raw Materials Stock Holding.

The average quantity of some materials held in stock at any one time will increase slightly but increasing delivery frequency will reduce this to a minimum.

11.5 Products.

All the products are in the form of aqueous solutions or dispersions and are rated as non hazardous.

11.6 Emissions and Waste.

Air emissions will increase slightly due to the increased production but there will be no significant change to the type or concentration of these emissions.

The liquid effluent is treated in the effluent treatment plant where it is recycled and re-used with the remaining sludge sent to an approved disposal site.

Buckman also has a contract with Drizit (Pty) Ltd to handle any significant chemical spills.

11.7. Traffic.

The extra plant capacity represents an increase of approximately 20% in the first phase and an additional 10% when the third mixer is commissioned in 2010. Traffic volumes, of both incoming raw materials and outgoing product will increase accordingly.

11.8 Associated Environment.

The proposed extension will be entirely within the existing built area and will not be visible from adjoining properties. No additional hardened surface will be created and hence the existing surface water handling facilities, which direct storm water into the Sterkspruit River, will be adequate.

The potential impacts that have been identified which could arise from the bulk storage tanks, process plant, drum storage and/ or the activities on this plant are:

- Vapour cloud fire (flash fire)
- Pool fire (burning of large puddles)
- Jet fire (pressurized gas or liquid escaping from a hole)

- Boiling Liquid Expanding Vapour Explosion (BLEVE) (an explosive release of expanding vapour and boiling liquid following a catastrophic failure of the pressurized vessel holding a liquefied gas or vapour on liquid)
- Vapour cloud explosion (a more violent flash fire)
- Toxic vapour release with no fire
- A combination of the above

Refer to the assessment table in Section 12.

12. THE ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT:

12.1 Atmosphere.

Atmospheric pollution can occur from a number of sources, the filling and emptying of the raw material storage tanks, certain processes and the emptying and cleaning of the process vessels.

Mitigation measures that are required are as follows:

- The plant must comply with the relevant SANS/SABS codes and standards.
- All employees must be trained in the operation of the plant and be aware of and apply the health, safety and environment policy of the company.
- All staff must be trained in and the appropriate emergency procedures.
- All plant and equipment must be regularly maintained and tested.

Mitigation Status	Severity	Duration	Extent	Conse-quence	Frequ-ency	Proba-bility	Likely-hood	Signif-icance
None	4	2	3	3.0	5	4	4.5	13.5 Medium
Full	1	1	2	1.3	1	2	1.5	2 Low

12.2 Waste Water.

Ground contamination can be caused by liquid spills, overflowing of the waste water system, over filling of the storage tanks and process vessels. Depending upon their severity spills etc they could affect the surrounding properties particularly those on the north-east of the site with severe pollution of the Sterkspruit River. However, the site is entirely "self-contained".

Mitigation measures that are required are as follows:

- All employees must be trained in the operation of the plant and be aware of and apply the health, safety and environment policy of the company.
- All staff must be trained in and the appropriate emergency procedures and spills recovery process.
- All plant and equipment must be regularly maintained and tested with particular reference to level controls.

Mitigation Status	Severity	Duration	Extent	Conse-quence	Frequ-ency	Proba-bility	Likely-hood	Significance
None	4	3	3	3.3	5	4	4.5	18 High
Full	1	1	1	1.7	1	2	1.5	1.5 Low

12.3 Solid waste.

Solid waste is accumulated from various stages of the process. Uncontrolled disposal could contaminate the surrounding area.

Mitigation measures that are required are as follows:

- All employees must be trained in the operation of the plant and be aware of and apply the health, safety and environment policy of the company.
- All staff must be trained in and the appropriate emergency procedures.

Mitigation Status	Severity	Duration	Extent	Conse-quence	Frequ-ency	Proba-bility	Likely-hood	Significance
None	4	5	2	3.7	5	5	5.0	18.3 High
Full	2	1	1	1.3	1	2	1.5	2 Low

12.4 Construction phase.

During the construction of the new plant certain impacts will be evident, mainly from the generation of dust and noise from the installation work and interruptions to the normal plant operations.

Mitigation measures are that are required are as follows:

- Ensure that the contractor and the contractor's staff are aware of, understand and comply with all the safety procedures applicable to the area where they are working.

Mitigation Status	Severity	Duration	Extent	Conse-quence	Frequ-ency	Proba-bility	Likely-hood	Significance
None	2	5	2	3.0	5	5	5.0	15.0 High
Full	2	2	1	1.3	1	2	2	2 Low

12.5 Summary of Potential Impacts.

Cumulative Impact	Nature of the Impact	Extent & Duration of Impact	Probability of impact occurrence	Degree of Reversibility of Impact	Degree of Irreplaceable resource loss	Degree of Impact Mitigation
Construction phase	Contamination from dust and noise	Localised and intermittent	Probable	Reversible on cessation of operation.	None	Moderate
Operating Phase	Contamination of the atmosphere	Extensive and continuous	Definite	Reversible on cessation of operation.	None	High Mitigating measures recommended
Atmospheric emissions	Contamination of the ground and Sterkspruit River	Extensive and continuous	Definite	Reversible on cessation of operation	None	High Mitigating measures recommended
Waste water emissions	Local surface contamination	Localised and intermittent	Definite	Reversible on cessation of operation	None	High Mitigating measures recommended

Mitigation measures that are required are as follows:

- The plant must comply with the relevant SANS/SABS codes and standards.
- All employees must be trained in the operation of the plant and be aware of and apply the health, safety and environment policy of the company.
- All staff must be trained in and the appropriate emergency procedures.
- All plant and equipment must be regularly maintained and tested.

It is recorded these practices are currently in place with the existing plant operations and highlights the importance of the practices continuing with the proposal to increase capacity.

13. ASSUMPTIONS, UNCERTAINTITIES & GAPS IN KNOWLEDGE AS IT REALTES TO THE ASSESSMENT:

As an expansion to existing project with the necessary safety, health & environmental protocols in place with the associated sound management, it is assumed that the practices will continue.

14. OPINION ON THE ASSESSMENT:

Production activity will increase correspondingly but as the existing operating controls and safety measures will remain in force the assessment has found that there will be no impact arising from the expansion project.

With the proposed addition of 3 processing vessels with bulk handling capabilities to the existing operations with the effluent treatment plant that recycles and re-uses liquid effluent, the proposed development can be considered mitigation measures that address an environmental problem that has emerged at the plant.

The proposal entails improved methods for undertaking current operations and the expansion.

Many of the potential impacts identified with the proposed activities are assessed to have a low or no impact and the proposed implementation of the mitigation measures will reduce any potential adverse impacts.

In summary, it is concluded that the expansion of the plant as proposed will have a low to no impact on the environment and that the effluent treatment plant is in itself a mitigation measure that will have a positive impact on the environment.

Accordingly, it recommended that the project should be approved with the following conditions:

- All existing best practices to continue such as audits, monitoring and continual improvement.
- All mitigation measures recommended are complied with in its entirety
- The EMP for the construction phase should be implemented, including the associated requirements for auditing by an independent environmental control officer (ECO) to ensure compliance with the EMP.
- An operational EMP to be drawn up and implemented to ensure that the operational efficiency and environmental conformance of the proposed activities is subject to regular independent audits.

15. ENVIRONMENTAL IMPACT STATEMENT:

The assessment of the proposed expansion concludes that proposal is aimed at increasing production capacity and address the environmental problem of the effluent treatment.

Production activity will increase correspondingly but as the existing operating controls and safety measures will remain in force it may be there will be no increase in risk in the current practices are continued.

As an expansion project driven by demand for the existing products, alternatives have been assessed in Section 9 and the proposal to site the vessels within the existing plant location is the only feasible option.

16. DRAFT EMP:

This draft Environmental Management Plan has been developed to ensure minimum environmental impacts during the construction and operation of this project. It forms part of the Environmental Impact Report as required in terms of Section 32(2) (o) of the Environmental Impact Assessment regulations.

Buckman proposes to expand their existing plant at Hammarsdale to cater for growing need and customer demand. To expand the current production facility, Buckman propose to include 3 x 25 000 litre processing vessels with bulk handling capabilities.

It will consist of two non-pressure vessels and one pressure rated vessel (3200 KPa) with heating and cooling capabilities as well as a hoist and hopper mechanisms to handle bulk bags.

The Environmental scoping report and the public participation process has been performed as part of the EIA study. At present the EIR report is subject to review of which this EMP will be part of.

16.1. DETAILS & EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

This Environmental Management Plan was developed by Mr. P.A Singh of Pravin Amar Development Planners who is also the Environmental Assessment Practitioner for the proposed project.

Name of Consultant / Company:	Pravin Amar Development Planners
Contact person:	Mr Pravin Amar Singh/BA; Master of Town & Regional Planning (MTRP), Integrated Environmental Management (UCT); LLM (Environmental)
Telephone:	(031) 201 7510
Facsimile:	(031) 201 8939
Email address:	md@pravinamar.com

The EAP has extensive experience in environmental management including inter alia environmental impact assessments; project management and developing planning.

The EAP is a member of number of professional bodies namely:

1. International Association for Impact Assessment (IAIA-SA)
2. Environmental Law Association

3. Institute of Waste Management (IWM)
4. South African Council of Planners (Registered Professional Planner)
5. South African Planning Institute (SAPI)- KZN Branch
6. SAPI National Board (Member)
7. Project Management Institute for South Africa (PMISA)
8. Project Management Institute (PMI) USA
9. International Association for Public Participation (IAP2)
10. LEAD- Southern Africa –Cohort 7
11. SA Black Trade & Allied Carrers Organisations (SABTACO)

The CV of EAP and the specialist are attached as Appendix 3.

16.2. MANAGEMENT/MITIGATION OF ENVIRONMENTAL IMPACT

The management of environmental issues during the construction phase are dealt with through specific management and mitigation plans for each identified environmental component.
The following stages of development have been identified to be relevant to this development.

- Planning and design stage
- Pre- construction and construction stage
- Operation or undertaking of the activity
- Rehabilitation of the environment; and

16.2.1. PLANNING AND DESIGN

Proper steps will be made to ensure minimum environmental impacts during the planning and design phase of development.

Management and mitigations

- The building plans for the proposed development were submitted to the Outer West Council for approval prior the commencement the construction taking place.

16.2.2. PRE- CONSTRUCTION AND CONSTRUCTION AUTHORITIES

The contents identified are made up of the following components:

- access;
- establishment of the site office;
- ablution facilities;
- training and induction of construction staff;
- handling and disposal of contaminated water and contaminated soil;
- hazardous materials storage; and
- vehicle and equipment refuelling.

16.2.2.1 Access

The Contractor shall ensure, if necessary and relevant, that the choice of access roads minimise the disturbances to adjacent properties and the environment.

Management and mitigation:

- All maintenance, construction, and associated activities will be confined to the Buckman laboratories site
- Access to the construction site will be gained through the existing gate and existing control measures shall be enforced inter alia.
  i) alcohol testing
  ii) signing of the registrar at the gate.

16.2.2.2 Establishment of the site office

To minimize impacts associated with the establishment and operation of the site office, consideration must be given to the location of the site office, vehicles transporting material into the site, day to day running of the plant, Buckman Laboratories staff members and visitors.

Management and mitigation:

- The Contractor shall produce a site plan showing the positions of all buildings (e.g. site office and workshops), vehicle wash areas, fuel storage areas,

stockpile areas, and other infrastructure for the approval of the Project manager and the ECO prior to the establishment of the site.

- The site office shall be located in an area which has already been cleared or disturbed by previous human activity and it must be levelled.
- Materials, soil stockpile areas, fuels, chemical storage areas, concrete batching areas, and vehicle maintenance areas shall be located away from environmentally sensitive areas; chemical storage areas and protected from storm water runoff, fire, and access by unauthorized persons.
- The placement of buildings and equipment will be done to minimise the footprint and visual impact of the sites.
- Vehicles and equipment shall undergo regular maintenance to identify and remedy fuel and oil leaks, as well as remove any combustible material.
- Locate and clearly indicate convenient access routes, temporary loading and packing areas, and turning circles so that vehicle movement can be confined to these areas.
- Locate temporary waste bins and skips so that they are easily accessible for removal.

16.2.2.3 Ablution facilities

Ablution facilities shall be supplied at all construction sites. The Ablution facilities shall comply with applicable norms and standards.

Management and mitigation:

The Contractor must provide ablution facilities for the construction staff. The following will be taken into consideration for the location and management of ablution facilities:

- Ablution facilities provided will include shelter, toilets, and washing facilities.
- Toilets will be provided at the preferred ratio of 1 toilet per 15 workers, but not less than 1 toilet per 30 workers.
- Sanitation facilities shall be located within 100 m of any point of work, but not closer than 50 m from any water body.
- All temporary/portable toilets shall be secured to the ground to prevent them toppling due to wind or any other cause.
- Entrances to toilets will be adequately screened from public view.

- Only approved portable chemical toilets will be provided at work areas in residential areas.
- Ablution facilities provided shall be maintained in a hygienic state and serviced regularly to ensure proper operation.
- No spillage will be allowed when the toilets are cleaned or serviced.
- The contents of chemical toilets will be removed to an approved disposal site –no discharge into the environment or burying of sewage will be allowed.
- The toilets will be serviced and cleaned on the last construction day before the builder's holiday.
- Wash areas shall be placed and constructed in such a manner so as to ensure that no pollution occurs, including groundwater pollution.

16.2.2.4 Training and induction of staff

The Contractor must ensure that all people involved in the project (including subcontractors, casual workers, etc.) are aware of and familiar with the environmental requirements for the project.

Management and mitigation:

The E.C.O has the responsibility to provide the site foreman with environmental training and to ensure that he is capable of passing the information to all the construction staff. Training of the construction staff shall include:

- How construction activities can impact on the environment and what can be done to mitigate such activities.
- Possible disturbance to birds, animals, and reptiles, and their respective habitats shall be minimised.
- Management and minimising of waste
- Construction workers shall not make excessive noise (e.g. shouting and hooting).
- Maintenance of equipment to prevent the accidental discharge or spillage of fuel, oil, lubricants, and other chemicals
- Responsible handling of chemicals and spills and contaminated soil and water
- Emergency procedures and incident reporting
- The ECO will monitor the performance of the construction staff to ensure that the training and induction have been understood and are being followed. If required, a

translator may be requested to explain aspects of the environmental requirements or acceptable social behaviour that are unclear.

The Contractor shall ensure that construction staff is aware of the following rules:

- No alcohol or drugs are allowed on site.
- No firearms allowed on site.
- Pets are not allowed on site.
- Firewood may not be harvested from the site or from adjacent areas.
- Trespassing on neighbouring properties is forbidden.
- Cigarette butts will not be disposed of in the bush land or grassland areas.
- Fines shall be implemented for transgressions.

16.2.2.5 Handling and disposal of contaminated water

To ensure that the handling and disposal of contaminated water is done within the specifications of the local authority regulations, there shall be no discharge of polluting elements to any storm water drain, stream or river. 100% compliance to relevant standards is expected.

Management and mitigation:

- No discharge of pollutants such as cement, concrete, lime, chemicals, fuels, or oils will be allowed into any water resource.
- Grey water from kitchens, showers, and/or sinks shall be discharged into the municipal sewerage system.
- Runoff from fuel depots, workshop areas, wash bays, and concrete swills shall be diverted through an inline oil trap before being released into the storm water system.
- Wash areas shall be placed and constructed in such a manner so as to ensure that no pollution occurs, including groundwater pollution.
- Contaminated water must be stored in an appropriate manner and removed by tanker to an appropriate disposal facility.

16.2.2.6 Hazardous materials storage

To ensure that hazardous materials storage is effective and compliant with national, provincial and local regulatory requirements.

Management and mitigation:

Hazardous materials include diesel, petroleum, oil, bituminous products, cement, solvent-based paints, lubricants, explosives, drilling fluids, pesticides, herbicides and LPG. Material Safety Data Sheets (MSDSs) shall be available on site for all hazardous substances to be used on site.

- Materials storage areas will not be allowed in close proximity to ecologically sensitive areas.
- Materials storage areas shall be sited outside the 1:50 year flood line of watercourses.
- Storage areas shall be roofed with impervious material.
- Hazardous chemicals or potentially hazardous chemicals used during construction shall be stored in secondary containers and all relevant MSDSs shall be available on site.
- The relevant emergency procedures relevant to particular chemicals used on site, as per the MSDSs and suppliers guidelines, will be followed in the event of an emergency.
- The contractor shall prevent discharge of any pollutants such as cement, concrete, lime, chemicals, fuels, and oils into any water sources and adequate storm water control measures will be implemented where these substances are handled.

16.2.2.7 Vehicle and equipment refuelling

To ensure that vehicle, plant and equipment refuelling is practiced in such a manner that no secondary pollution or emergency situation is created. The storage of flammable material shall be done according to prescribed standards at all times.

Method Statements

- Fuel (petrol and diesel) may be stored on site provided that all measures specified in the E.M.P. are strictly adhered to.
- If the combined capacity of all the containers used to store fuel is greater than 1 000 cubic meters, then approval from the Environmental Authorities will be required.
- All liquid fuels and oils will be stored in suitable above ground storage tanks or in tanks with lids, which will be kept firmly shut and under lock and key at all times.

- Areas used for storage of any flammable materials may require approval of the municipal fire department and Environmental Authorities.
- In the case of above ground storage tanks, written permission shall be obtained from the Chief Fire Officer for the installation.
- Areas around fuel tanks are to be bonded as per the requirements of SANS 089:1999 Part 1.
- Above ground fuel tanks will be at least 3.5 meters from buildings, boundaries, and any other combustible or flammable materials.
- Tanks will not be used for the storage of liquids other than those with a Flash point in excess of 40℃.
- In case of larger tanks required, a design based on relevant national and international codes shall be submitted to the local authority in terms of the National Building Regulations.
- All storage tanks shall be removed after construction.
- The rated capacity of tanks shall provide sufficient capacity to permit expansion of the product as a result of temperature variations.
- Only empty and externally clean tanks may be stored on bare ground – empty but externally dirty tanks shall be sealed and stored where the ground has been protected.
- Any electrical or petrol-driven pumps shall be equipped and positioned so as not to cause any danger of ignition of the product.
- If fuel is dispensed from 210 litres drums, the proper dispensing equipment will be used to minimise spill potential. This equipment shall be stored in a waterproof container when not in use.
- Under no circumstances may drums be tipped to dispense fuel.
- Fuel storage tanks and drums will not be over-filled.

The following shall be taken into consideration for the siting of fuel storage areas:

- The gradient of the ground must slope away from residential areas and environmentally sensitive areas.
- Access to facilities to and around the site must be adequate to allow supply vehicles to enter and leave easily.
- Available water supplies
- Fire protection, security, and general service facilities in the area, including the fire services response time housekeeping e.g. the removal of flammable materials such as rubbish, dry vegetation, and oil soaked soil

- In the interest of security, the facility shall be so enclosed as to prevent unauthorized access.
- The minimum distances between containers shall be as prescribed in SANS 10089-1:2003.
- The minimum distances from the boundary of a property that is or can be built on, including the far side of a public road is based on the volume stored. Thus the specifications shall be followed as prescribed in SANS 10089-1:2003. Bonding at these facilities shall comply with the following guidelines:
- A slope of at least 1:100 away from the tank shall be provided for at least 15 meters or the distance to the bund wall toe, whichever is less.
- Suitable and adequate supplies of absorbents shall be available at all times to control and absorb any spillages.
- The volumetric capacity of the bunded area will be a minimum of 110% of the volume of the largest tank. To allow for the volume occupied by the tanks, the capacity of the bunded area that encloses more than one tank shall be calculated after the volume of all the tanks, other than the largest tank, below the height of the bund wall has been deducted.
- To permit access, the outside toe of the bund wall at ground level shall be no closer than 3 metres to any property boundary that is or can be built upon.
- The wall of the bunded area shall be of earth or concrete, and shall be designed to be liquid tight and to withstand a full hydrostatic head of water. Earthen walls of height 1 metre or more shall have a flat section, not less than 0.6 metres wide at the top. The slope of an earthen wall shall not exceed the angle of repose of the material of which the wall is constructed.
- The wall height of the bunded area shall be restricted to 1.8 meters.
- The minimum distance between a tank and the toe of an interior bund wall shall be at least 1.5 metres.
- Each bunded area that contains two or more vertical tanks shall be subdivided at least by intermediate bund wall or by drainage channels, to prevent spills from one tank from endangering adjacent tanks within that bunded area.
- Where provision is made for draining water from bunded areas, such drains shall be so controlled as to prevent flammable or combustible products from entering natural water courses or stormwater drains. Under fire conditions, the controls of such drainage shall be accessible from outside the bunded area.

16.3. OPERATION OF THE ACTIVITY

16.3.1. Waste Management

The inappropriate handling and disposal of solid waste materials can impact on both human safety and risk contamination of the natural environment. This management and mitigation plan covers the handling and disposal of solid waste, including domestic, construction, and hazardous waste. The general waste management principles of prevent, minimise, recycle or re-use, with disposal as a last option must apply.

Only permitted and registered landfills will be considered as options for disposal of waste.

The plan is made up of the following components:
a. Domestic waste;
b. Construction waste; and
c. Hazardous waste and contaminated soil.

a) Domestic waste

To ensure that all domestic waste is disposed of at a registered waste disposal facility.

Management and mitigation:

- A refuse control system will be established for the removal of domestic waste.
- The Contractor will ensure that the site is kept clean and tidy at all times.
- Littering will not be allowed on site.
- The excavation and use of rubbish pits on site is forbidden.
- Burning of rubbish is forbidden.
- Timber, metal, oil, paper, bricks, tyres, batteries and any other major recyclable wastes will be stored in safe, secure areas.
- A separate oil container will be used to ensure that oil wastes are contained.
- Maintenance and domestic refuse (e.g. scrap metal, packaging materials, etc) will be collected in appropriate bins for recycling or sent to a registered landfill site at regular intervals for disposal.
- All chemical drums will be transported to a designated and bunded area when empty and appropriately disposed of.

b) Construction waste

To ensure that construction waste is disposed of at a registered waste disposal facility. The collection of construction waste should be done daily.

Management and mitigation:

- Construction waste will be recycled or re-used in the construction process.
- Waste that cannot be re-used or recycled will be disposed of at the nearest appropriate and licensed waste disposal site - disposal records will be kept.
- Waste will not be buried and/or burnt on site.
- A sufficient number of refuse bins that are wind and animal/scavenger proof will be provided.
- Regular clearing and disposal of litter and rubble.
- Where waste is to be transported by truck, it will be covered appropriately.

c) Hazardous waste

To ensure that hazardous waste, such as bitumen, tar, oil, etc. is disposed at a registered waste disposal facility for toxic/hazardous material.

Management and mitigation:

Oil and lubricant waste management:

- Used oil, lubricants, and cleaning materials from the maintenance of vehicles and machinery shall be collected in a holding tank and sent back to the supplier.
- Water and oil will be separated in an oil trap. Oils collected in this manner will be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at an approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit will be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company.
- All used filter materials shall be stored in a secure bin for disposal off site.

16.3.2. Spillages

To develop and implement practical measures to prevent spillages, and protect the environment from direct and/or indirect spillages.

Management and mitigation:

- The Contractor will develop procedures for potential hydrocarbon and chemical spill incidents.
- Spillage control will be provided by bonding or collecting spills to a sump for disposal or controlling by absorbent material on standby.
- Spill containment facilities such as impermeable bunds, compacted pads, or drip trays will be provided in oil and chemical storage sites and vehicle maintenance areas.
- Material from bunded areas will not be buried during rehabilitation.
- Any contaminated soil shall be removed and replaced
- Soils contaminated by hazardous waste shall be collected and disposed of at a facility designated by the local authority to accept contaminated materials.
- Refuelling and handling of chemicals will occur only in a designated area.
- Appropriate corrective actions will be undertaken if an incident occurs.
- The spill will immediately be cleaned up and appropriately disposed of.
- All spills and actions will be reported in the site Environmental Incident Book.

16.3.3. Emergency Procedures

In the event of an incident occurring, an emergency response and a contingency plan must be in place to limit the extent of environmental damage.

Management and mitigation:

All incidents will be reported immediately to the responsible person and documented in the Environmental Incident Book. Detailed information has to be recorded, including:

- The date, time, location, and nature of the incident.
- The response and investigation undertaken.
- Which actions were taken and who the person responsible for the action was.

16.3.4. Soil Management

To ensure that topsoil is suitably stored for the subsequent use in the rehabilitation and re-vegetation of the site.

Management and mitigation:

Prior to site establishment and any earthmoving operations, the Contractor will strip and stockpile all topsoil within the footprint of the construction activities.

- All topsoil shall be stockpiled separately from subsoil and/or rocky material.
- Soil shall be stripped in a phased manner, so as to retain vegetation cover for as long as possible to avoid prolonged exposure of soils to wind and water erosion.
- No imported topsoil will be used as the final backfill layer.
- Topsoil must not be stored in or near sensitive areas.
- Stockpiles will be located away from rivers, stream, drainage lines, and areas of temporary or permanent inundation.
- Stockpiled topsoil shall not be compacted.
- Topsoil stockpiles shall be convex and shall not exceed 2 meters in height
- The Contractor will implement measures to prevent topsoil form being blown away or washed away.

16.3.5. Drainage

The Contractor will ensure that no water resource is polluted.

Management and mitigation:

- The quality, quantity, and flow direction of any surface water runoff, including stormwater water drainage, shall be established prior to disturbing an area for construction purposes. These aspects will be taken into consideration and incorporated into the planning of all construction activities. A drainage plan will be submitted to the Engineer for approval.
- Surface water will be protected from erosion and from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels ,oils, aggregate, tailings, wash water, organic materials, and bituminous or tar products.
- Stormwater runoff from the construction site will not be discharged into adjacent properties.
- Potential contaminants, such as hazardous material, will be stored in bunded areas that are protected from stormwater ingress.

16.3.6. Materials Sourcing and Stockpiles

Ensure that materials are sourced from authorised operations and that stockpiled material does not impact on the environment.

The plan is made up of the following components:

a) Materials sourcing; and
b) Stockpiles.

a) Materials sourcing

Ensure that materials used are from authorised operations.

Management and mitigation:

- The Contractor will prepare a source statement to indicate the sources of all materials (including topsoil, sand, natural gravel, stone, asphalt, etc.) and submit these to the ECO for approval. Where materials are mined, proof of authorisation to utilise these materials will be provided, as given by the mineral rights owner and the Department of Minerals and Energy.

b) Stockpiles

Ensure that material stockpiled does not contaminate the surrounding environment.

Stockpiles are constructed and maintained so as to avoid erosion of the material and contamination of the surrounding environment.

Management and mitigation:

During the life of the stockpiles, the following measures will be taken:

- Stockpiles will be positioned and sloped to create the least visual impact.
- Stockpiles will not be allowed underneath trees or against the trunks of trees.
- Stockpiles will be constructed and maintained to avoid erosion of the material and contamination of the surrounding environment.

16.3.7. Noise

Noise must be kept to a minimum, as well as to standard working hours appropriate for construction activities.

In this regard, any mechanical plant and machinery must be suitably maintained and silenced in terms of the manufacturer's specifications for the purpose for which it is to be used. In addition, vehicles' exhaust system silencers should be correctly maintained and vehicles should not be used unnecessarily.

The contractor's attention is drawn to the Noise Regulations as promulgated in terms of the Environment Conservation Act, National Building Regulations and hours of operation, and accompanying noise regulations and relevant local authority bylaws. The contractor is to specify noise limits and operating times. Working hours outside of the standard 7am to 5pm Monday to Friday and 7am to 2pm on Saturdays are to be by special exception.

16.3.8. Dust Control

To maintain the emissions of dust particulates to a minimum to prevent dust emanating causing nuisance conditions in surrounding areas.

Management and mitigation:

- Vehicles travelling along the access roads must adhere to speed limits to avoid creating dust.
- A maximum speed limit of 30 km/hr must be adhered to on all site roads.
- Where dust is unavoidable, screening may be required.
- Vehicles and machinery are to be kept in good working order. If excessive emissions are observed, the Contractor is to have the equipment repaired/serviced as soon as possible.
- All vehicles leaving site must be free from debris and muck and all accesses to municipal roads are to be inspected daily and cleaned if required or instructed by the client.

16.4. REHABILITATION OF THE ENVIRONMENT

A meeting shall be held between the ECO, facilities manager and the Contractor to approve all remediation activities and to ensure that the site has been restored to a condition approved by the principal agent.

At the end of the contract the contractor will be required to leave the site in the condition in which it was handed over to him.

16.4.1. Site Clean Up

All structures comprising the construction camp are to be removed from site.

The area that previously housed the construction camp is to be checked for spills and should be remedied where necessary.

All hardened surfaces within the construction area should be ripped, all imported material removed and the area shall be top soiled and regressed using the guidelines set out in the re-vegetation specifications.

All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO.

16.4.2. Rehabilitation

Where appropriate, the contractor shall employ a suitably qualified person to rehabilitate areas damaged by construction activities within and surrounding the contractor's site. The contractor shall be responsible for rehabilitating areas identified by the ECO and the principal agent. The contractor’s procedure for rehabilitation shall be approved by the ECO.

All areas that have been disturbed by construction activities must be cleared of alien vegetation. Open areas are to be re-planted as per the Re-vegetation Specification for Civil Engineering Construction Projects (October 2002) of the eThekwini Standard EMP.

16.5. IDENTIFICATION OF THE ROLES AND RESPONSIBILITIES FOR THE IMPLEMENTATION OF THE EMP

The parties with environmental responsibilities for this development include, but are not limited to: the designated Environmental Control Officer (ECO), the Environmental Site Manager (ESM), the Developer, the Project Team and the Contractor. The responsibilities with respect to the implementation of the, CEMP, in summary, are:

16.5.1. Designated Environmental Control Officer (ECO)

For the purpose of the continuity, the E.I.A. Consultant shall be the Environmental Control Officer (ECO). The ECO will therefore be responsible for ensuring that the provisions of the EMP are complied with and to undertake regular compliance inspections and reporting findings to the developer, Council and the Department of Agriculture and Environmental Affairs and other bodies / parties as may be decided.

The ECO will be responsible for issuing instructions to the contractor where environmental considerations call for action to be taken. The ECO will submit weekly reports to the Principal Agent on site who will verify the information before being issued to the Contractor.
The Environmental Control Officer (ECO) is responsible for ensuring that the requirements of the EMP are implemented. Whereas the Principal Agent has overall responsibility for the construction site, the ECO's focus is on the environmental aspects.

The responsibilities of the ECO are to:

- Undertake ongoing monitoring of the site through regular site visits and record key findings. This includes photographic monitoring of the site. The frequency of these visits will be determined by the stage of the project, and shall occur at least monthly.
- Advise the Principal Agent and the Contractors on environmental matters of this development.
- Monitor the implementation of the EMP by the Contractor.
- Keep a site diary or other appropriate records in which events and concerns of significance are to be recorded. All site instructions issued by the Employer's Agents are to be copied to the ECO.

- Advise the Principal Agent on actions or issues impacting on the environment and provide appropriate recommendations to address and rectify these matters. The Principal Agent shall issue any required Site Instructions to the Contractor.
- Ensure that the Contractor has a copy of the EMP and all agreed Method Statements.
- Ensure that all environmental issues raised by the I&AP's and the Authorities, are dealt with at regular intervals.
- Act as a liaison with the DAEA, I&AP's, environmental consultant and other environmental authorities to ensure communication with key stakeholders with respect to the monitoring of compliance with conditions of authorization and the EMP.
- Any new, or amendments to existing, mitigation measures to address areas of concern notified by the ECO are to be acted on as necessary by the Main Contractor.
- Conduct regular monitoring to ensure compliance with this EMP. The results of this monitoring will be reported to the Main Contractor, the Developer, the eThekwini Municipality and the Department of Agriculture and Environmental Affairs in the form of a compliance monitoring report which must be submitted regularly.

16.5.2. The Developer

The Developer has overall responsibility for compliance with the EMP since it is a fundamental for the project.

This means that the developer must:

- Ensure that the professional team and the Contractors are appropriately briefed and that their appointment includes environmental requirements, as relevant.
- Ensure that he/she is kept fully informed of the performance of the project against the requirements of the EMP.
- Ensure that appropriate action is undertaken where consistent incidents of non-compliance are taking place.
- Ensure that any corrective action required by the authorities is implemented.

16.5.3. The Project Team

The Project Team is responsible for ensuring that on-site activities are undertaken in accordance with the requirements of the EMP. It should consist of representatives from the Developer, appointed Professionals (e.g. Principal Agents, Architects, Environmental Site Manager (ESM), Landscape Architects, etc.) the Contractor and the ECO. Ultimate on-site responsibility would typically lie with the Contractors.

The Project Team must:-

- Ensure that environmental requirements are properly recorded in tender and contract documents.
- Identify corrective action if non-compliance occurs or unforeseen environmental issues arise that require environmental management action and ensure that this is implemented.
- Ensure that appropriate records and information regarding compliance with environmental requirements are maintained.
- Ensure that information is provided on environmental performance to the developer.
- The Principal Agent must ensure that:

All site instructions are copied to the ECO; and Instructions as required by the ECO, are issued to the Contractor.

16.5.4. The Contractor and Sub-contractors

The Contractors are responsible for implementing the requirements of the EMP during the construction period.

This means that the Contractors must:

- Assign the environmental responsibilities to appropriate staff members on the site (e.g. the site foreman or foreman/supervisors responsible for particular aspects of the contract).
- Plan and schedule activities in a manner that minimizes the potential for disruption to neighbouring communities and impact on the environment. In this regard, the Contractor must discuss and agree such plans with the Principal Agent and the ECO.

- Attend the EMP induction process chaired by the ECO on the implementation of the EMP prior to the commencing of construction activities. This induction for all staff at all levels will be a condition of employment.
- Ensure adherence to the requirements of the EMP by all employees, sub-contractors, suppliers, agents, etc. The Contractor will need to include environmental requirements in the contracts with sub-contractors.
- Ensure that he/she and all staff and sub-contractors fully understand the requirements of the EMP.

16.6. PROPOSED MECHANISMS FOR MONITORING COMPLIANCE WITH THE ENVIRONMENTAL MANAGEMENT PLAN AND REPORTING THEREON

The purpose of the monitoring programme is to ensure that mitigation identified and described in the EMP is implemented.
The monitoring program shall also clearly indicate the linkages between impacts, indicators to be measured, measurement methods, and definition of thresholds.
Activities will be monitored and recorded by the ECO and audited against the EMP on a bi-monthly basis.

Management and mitigation:

- The Contractor will be responsible for environmental control on site during construction as well as during the maintenance period. During construction, activities will be monitored and recorded by the ECO and audited against the EMP on a weekly basis.
- Photographic records of the site will be taken prior to the start of construction.

Monitoring actions are listed below:

- Inspection of all erosion and sediment control devices on a regular basis, particularly after heavy rains.
- Inspection of site to check for compaction and contamination of soils. Inspection of soil stockpiled to check for erosion/adequate erosion control.
- Construction Phase Environmental Management Plan
- Inspection of development areas to ensure that soils have been satisfactorily stripped.

- Water control bunds, drains, ponds, and channels will be checked regularly and after each heavy rainfall to ensure they are functioning correctly.
- General housekeeping will be examined regularly to ensure storm water runoff does not contain refuse or contaminants.
- The local community will be informed of any incident, which may affect them.
- Noise generated on site will be assessed during site inspections.
- Regular visual assessment of all storage containers and areas for capacity, potential for recycling and evidence of spillage, etc.
- Adequacy of bonding will be assessed.
- Records of spills will be examined in the environmental incident book.
- Incident reports will be checked to ensure that there was appropriate follow up.

16.7. EMP COMPLIANCE

The EMP is binding on all contractors operating on the site and will be included within the contractual clauses.

Failure in compliance will be dealt with in terms of the relevant sections of the National Environmental Management Act (Act. No. 107 of 1998) and any other appropriate legal mechanisms.

It should be noted that in terms of NEMA, those responsible for Environmental Damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and / or environmental damage (the polluter pays principle.

17. LISTS OF PERSONS, ORGANISATIONS AND ORGANS OF STATE REGISTERED AS I&APS

Refer to Appendix 5. The I & AP list is updated as parties are identified.