

OMNICANE ETHANOL PRODUCTION LTD

Installation and Operation of a Distillery and Concentrated Molasses Solids (CMS) Fertilizer Blending Plant

at Omnicane Sugar Cluster - La Baraque

Environmental Impact Assessment

TABLE of CONTENTS

EXECUTIVE SUMMARY	I
TABLE OF CONTENTS	I
CHAPTER 1: PROJECT BACKGROUND.....	1
1.1 INTRODUCTION.....	1
1.2 PROJECT RATIONALE.....	1
1.2.1 CENTRALISATION OF SUGAR INDUSTRY – DEVELOPMENT OF THE SUGAR CANE CLUSTER.....	2
1.2.2 MAAS STRATEGIC ENVIRONMENTAL ASSESSMENT.....	3
1.2.3 DISTILLERIES IN MAURITIUS.....	5
1.3 LEGAL AND INSTITUTIONAL FRAMEWORK.....	5
1.3.1 ENVIRONMENTAL PROTECTION ACT OF 2008.....	5
1.3.1.1 <i>Emission, Effluent Discharge and Noise Standards</i>	6
1.3.2 MINISTRY OF AGRICULTURE	6
1.3.3 MINISTRY OF HOUSING & LANDS.....	6
1.3.3.1 <i>Grand Port Savanne Outline Planning Scheme</i>	6
1.3.3.2 <i>National Development Strategy</i>	7
1.3.3.2.1 Policy AG 4: Rationalisation of Sugar Milling	7
1.3.3.2.2 Policy AG3: Agricultural Land Needed for National Strategic Projects.....	7
1.3.3.2.3 Policy I10: Storage of Hazardous Substances.....	7
1.3.3.2.4 Policy I5: Industrial Waste Processing	7
1.3.4 MINISTRY OF LABOUR, INDUSTRIAL RELATIONS AND EMPLOYMENT.....	7
1.3.5 MAURICE ILE DURABLE PROJECT (MID)	7
CHAPTER 2: PROJECT PROMOTERS & ORGANISATION	8
2.1 PROMOTERS	8
2.1.1 OMNICANE LTD	9
2.1.2 GROUPE ROLAND MAUREL LTÉE	9
2.1.3 ALCOGROUP SA	9
2.1.3 STATE TRADING CORPORATION (STC)	10
2.1.4 ISLAND RENEWABLE FERTILIZERS LTD.	10
2.1.5 AIR LIQUIDE/ GAZ CARBONIQUE LTD.	10
2.2 THE ORGANISATION.....	11
2.2.1 DISTILLERY SPECIALISTS	11
2.2.2 TECHNICAL AUDIT	11
2.2.3 PROJECT MANAGER.....	12
2.2.4 ENVIRONMENTAL ENGINEERS	12
2.3 INSTALLATION OF THE DISTILLERY.....	12
2.4 STAFFING OF THE DISTILLERY AT OPERATIONAL STAGE.....	12

2.5 SOURCES OF MOLASSES.....	13
2.6 DISTILLERY PRODUCTS	13
2.7 DISTILLERY RELOCATION TIME-SCHEDULE AND OPERATION DATE.....	13
CHAPTER 3: PROJECT DESCRIPTION AND LOCATION	14
3. PROJECT LOCATION AND ZONING.....	14
3.1 THE SITE	14
3.1.1 <i>Ownership</i>	14
3.1.2 <i>Site Topography</i>	14
3.2 SITE OCCUPANCY.....	14
3.3 ALTERNATIVES TO SITE.....	15
3.4 PROJECT DESCRIPTION AND COMPONENTS.....	15
3.5 SOURCES OF RAW MATERIALS	15
3.5.1 <i>Quality Requirements for Molasses</i>	16
3.6 THE DISTILLERY PLANT.....	16
3.6.1 <i>Molasses Storage and Handling</i>	17
3.6.2 <i>HIFERM Fermentation Process</i>	17
3.6.2.1 Molasses Weighing and Distribution.....	17
3.6.2.2 Mash Preparation.....	17
3.6.2.3 Yeast Propagation	17
3.6.2.4 Pre Fermentation – Yeast Activation	18
3.6.2.5 Fermentation	18
3.6.2.6 Alcohol Recovery and Mash Handling	18
3.6.2.7 Material balance for the Fermentation Process	19
3.6.3 <i>Distillation</i>	19
3.6.3.1 Material Balance for the Distillation Unit.....	21
3.6.3.2 Quality of Neutral Alcohol	21
3.6.4 <i>Molecular Sieve Dehydration Unit – Production of Fuel Grade (Anhydrous) Alcohol</i>	22
3.6.4.1 Material balance for the Molecular Sieve Dehydration Unit.....	23
3.6.4.2 Quality of Anhydrous Ethanol	23
3.6.4.3 Product Stream.....	24
3.7 CARBON DIOXIDE BOTTLING PLANT.....	24
3.7.1 <i>Raw Carbon Dioxide from Fermentors</i>	24
3.7.2 <i>Water Scrubber</i>	24
3.7.3 <i>PPM scrubber</i>	24
3.7.4 <i>CO₂ Balloon storage and Compressor</i>	24
3.7.5 <i>Dehumidifier</i>	24
3.7.6 <i>Dehydrator and moisture transmitter</i>	25
3.7.7 <i>Purification Unit</i>	25
3.7.8 <i>Distillation column and re-boiler</i>	25
3.7.9 <i>Bulk CO₂ storage tank, analysis of final product and deliveries</i>	25
3.7.10 <i>Refrigerant</i>	25
3.7.10.1 Ammonia as Refrigerant (R-717)	25
3.8 THE CONCENTRATED MOLASSES SOLIDS (CMS) EVAPORATION PLANT.....	26
3.8.1 <i>Cleaning in Place (CIP)</i>	27
3.8.2 <i>Material balance for the CMS Evaporation Plant</i>	27
3.8.3 <i>Quality of Concentrated Molasses Solids (CMS)</i>	28
3.8.4 <i>CMS Storage Ponds</i>	28
3.9 CMS FERTILIZER BLENDING PLANT	29
3.9.1 PRODUCTION CAPACITY OF CMS FERTILIZER BLENDING PLANT	29
3.10 WATER REQUIREMENTS	30
3.11 ELECTRICAL AND THERMAL POWER REQUIREMENTS.....	30
3.11.1 <i>Electricity Requirements</i>	31
3.11.2 <i>Thermal Requirements</i>	31
3.11.3 <i>Source of Electrical and Thermal Power</i>	31
3.12 CHEMICAL USAGE	32
3.13 PROCESS EFFLUENTS	32
3.13.1 <i>Sources and Flows</i>	32

3.13.2	<i>Characteristics of the Process Effluents</i>	33
3.13.3	<i>Treatment of Process Effluents</i>	34
3.14	DOMESTIC WASTEWATER	35
3.14.1	<i>Quality and Rate of Production</i>	35
3.14.2	<i>Treatment and Disposal</i>	35
3.15	SPECIFIC PLANT AND EQUIPMENT FOR THE DISTILLERY.....	35
3.16	PROJECT INFRASTRUCTURE	35
3.16.1	<i>Product Tank Farm at La Baraque</i>	36
3.16.2	<i>Product Tank Farm in the Harbour Zone</i>	36
3.16.3	<i>Summary of footprints for Distillery, CMS Evaporation Plant and the CMS Fertilizer Blending Plant</i> 36	
3.16.4	<i>The CMS Storage Ponds</i>	37
3.16.4.1	Design features	37
3.16.4.2	Construction of the CMS Ponds	38
3.16.4.3	Method of Construction of Embankments	38
3.16.4.4	Rain Collection on Top of Aquatan Liner	39
3.16.4.5	Leak Detectors.....	39
3.17	CMS FERTILIZER BLENDING PLANT.....	39
3.18	UTILITY REQUIREMENTS FROM THE PUBLIC NETWORKS.....	40
3.18.1	<i>Electricity Requirements</i>	40
3.18.2	<i>Potable Water Requirements</i>	40
3.18.3	<i>Telecommunications</i>	40
3.19	ACCESS ROAD AND PARKING FACILITIES	41
3.19.1	<i>Access to Site</i>	41
3.19.2	<i>On-Site Parking Facilities</i>	41
3.20	FIRE AND SAFETY SYSTEMS	41
3.21	SITE SECURITY	41
3.22	TRANSPORT AND LOGISTICS SUPPORT FOR MOLASSES AND PRODUCTS.....	41
3.23	HYDROCARBON WASTES.....	42
3.23.1	<i>Production Rates</i>	42
3.23.2	<i>Disposal</i>	42
3.24	SOLID WASTES	42
3.24.1	<i>Non domestic Distillery solid wastes</i>	42
3.24.2	<i>Spent yeast in Distillery tanks</i>	42
3.25	<i>Distillery and CMS Fertilizer Blending Plant Schedule of Operation</i>	43
3.25.1	<i>Distillery and CMS Evaporator Plant</i>	43
3.25.2	<i>Carbon Dioxide Bottling Plant</i>	43
3.25.3	<i>The CMS Fertilizer Blending Plant</i>	43
CHAPTER 4: BUILT ENVIRONMENT OF THE PROJECT		44
4.1	DEMOGRAPHY	44
4.1.1	GENERAL	44
4.1.2	REGIONAL SETTLEMENT & POPULATION	44
4.2	TOURISM & PARA-TOURISTIC ACTIVITIES	45
4.3	REGIONAL PUBLIC BEACHES AND RECREATIONAL SITES.....	45
4.3.1	PUBLIC BEACHES	45
4.3.2	RECREATIONAL SITES	45
4.4	REGIONAL INDUSTRIAL ACTIVITY	46
4.4.1	THE SUGAR INDUSTRY	46
4.4.2	POWER GENERATION AT COMPAGNIE THERMIQUE SAVANNAH (CTSAV).....	46
4.4.3	POWER GENERATION AT COMPAGNIE THERMIQUE DU SUD (CTDS).....	46
4.4.4	POULTRY FARMING	46
4.4.5	MONKEY BREEDING	47
4.5	HISTORICAL SITES	47
4.6	PUBLIC UTILITIES	47

4.6.1	DOMESTIC WATER SUPPLY	47
4.6.2	ELECTRICITY SUPPLY	47
4.6.2.1	<i>Production Policy</i>	47
4.6.2.2	<i>Power Transmission and Distribution Network</i>	48
4.6.3	TELECOMMUNICATIONS	48
4.6.4	WASTEWATER TREATMENT AND DISPOSAL	48
4.6.5	ROAD INFRASTRUCTURE	48
4.7	INDUSTRIAL WATER.....	48
4.7.1	ORIGIN OF INDUSTRIAL WATER	48
4.7.1.1	<i>Savannah Sugar Estate</i>	48
4.7.1.2	<i>CTSAV Power Station</i>	49
4.7.1.3	<i>Mon Trésor - Mon Désert (MTMD) Sugar Estate</i>	49
4.7.2	WATER RESOURCES	49
4.7.2.1	<i>Water Rights</i>	49
4.7.3	WATER REQUIREMENTS FROM SUGAR MANUFACTURING & OTHER ASSOCIATED ACTIVITIES AND IRRIGATION OF SUGAR CANE FIELDS.....	49
4.7.3.1	<i>Water requirements for SUDS and CTSAV</i>	50
4.7.3.2	<i>Deficit in Irrigation for Savannah</i>	50
4.7.3.3	<i>Sources of Water</i>	50
4.7.3.4	<i>Retained Strategies</i>	51
4.7.3.5	<i>Design Flows</i>	51
4.7.4	INDUSTRIAL WATER NETWORK.....	52
4.7.5	WATER QUALITY	53
CHAPTER 5: NATURAL ENVIRONMENT.....	54	
5.1	INTRODUCTION.....	54
5.2	CLIMATE.....	54
5.2.1	RAINFALL.....	54
5.2.2	TEMPERATURE.....	55
5.2.3	WIND DATA	55
5.2.3.1	<i>Wind data under normal climatic conditions</i>	55
5.2.3.1.1	<i>Trade Winds</i>	55
5.2.3.1.2	<i>Average wind distribution</i>	56
5.2.3.2	<i>Cyclonic Winds</i>	56
5.2.3.3	<i>Site Exposure to Winds</i>	56
5.3	GEOLOGY.....	57
5.4	PEDOLOGY.....	57
5.5	SURFACE HYDROLOGY AND HYDRO-GEOLOGY	57
5.5.1	REGIONAL SURFACE HYDROLOGY	57
5.5.2	SITE HYDROLOGY	57
5.5.3	HYDRO-GEOLOGY	58
5.6	AIR QUALITY.....	58
5.6.1	GASEOUS POLLUTANTS EMISSIONS	58
5.6.2	BASELINE DATA	58
5.6.3	DUST EMISSIONS	58
5.6.4	AMBIENT AIR QUALITY.....	59
5.7	NOISE	60
5.8	WASTEWATER QUALITY FROM THE SUGAR CLUSTER AT LA BARAQUE -SAVANNAH.....	61
5.8.1	BACKGROUND	61
5.8.2	CTSAV POWER STATION.....	62
5.8.3	WASTEWATER CHARACTERIZATION 2007-2009.....	62
5.8.3.1	<i>Sugar Mill Wastewaters</i>	62
5.8.3.2	<i>Sugar Refinery Effluents</i>	64
5.8.3.3	<i>Proposed Distillery Effluents</i>	64

5.8.4	REDUCTION OF CONTAMINATED FLOWS	65
5.8.5	FURTHER WASTE MINIMISATION ACTION FOR 2011 CROP SEASON	65
5.8.6	WASTEWATER CHARACTERIZATION STUDY CROP SEASON 2011	66
5.8.7	WASTEWATER TREATMENT STRATEGY.....	66
5.8.7.1	<i>Implementation of Phase I (Crop season 2011).....</i>	67
5.8.7.2	<i>Implementation of Phases II & III.....</i>	68
5.9	FLORAL ENVIRONMENT	68
5.9.1	NATURE RESERVES	68
5.9.2	ENDANGERED SPECIES	69
5.10	FAUNAL ENVIRONMENT.....	70
5.10.1	ENDEMIC WILDLIFE.....	70
5.10.2	EXOTIC SPECIES	70
CHAPTER 6: ENVIRONMENTAL MANAGEMENT PLAN		71
6.	GENERAL.....	71
6.1	OBJECTIVES OF THE ENVIRONMENTAL MANAGEMENT PLAN.....	71
6.2	SOURCES OF IMPACTS.....	72
6.3	IMPACTS AT PROJECT CONCEPTUAL STAGE.....	72
6.3.1	SITE SELECTION, HISTORY AND PRESENT STATUS.....	72
6.3.2	AESTHETICS AND VISUAL IMPACTS	73
6.4	IMPACTS AT CONSTRUCTION PHASE	73
6.4.1	NOISE GENERATION	74
6.4.1.1	<i>Nature and Intensity of Impact.....</i>	74
6.4.1.2	<i>Impact Receptors.....</i>	74
6.4.1.3	<i>Mitigating Measures</i>	74
6.4.2	DUST GENERATION	74
6.4.2.1	<i>Nature and Intensity of Impact.....</i>	75
6.4.2.2	<i>Impact Receptors.....</i>	75
6.4.2.3	<i>Mitigating Measures</i>	75
6.4.3	WATER POLLUTION FROM EQUIPMENT AND SITE STAFF	75
6.4.3.1	<i>Nature of Impact</i>	75
6.4.3.2	<i>The Impact Receptors.....</i>	76
6.4.3.3	<i>Intensity of Impact.....</i>	76
6.4.3.4	<i>Mitigating measures.....</i>	76
6.4.3.4.1	<i>Mitigating Biological Pollution</i>	76
6.4.3.4.2	<i>Mitigating Pollution from Plant/Equipment servicing on Site</i>	76
6.4.4	SOLID WASTES AND EXCAVATED SPOILS	77
6.4.4.1	<i>Nature and Intensity of Impacts</i>	77
6.4.4.2	<i>Impact Receptors.....</i>	77
6.4.4.3	<i>Mitigating Measures</i>	77
6.4.5	IMPORT OF BACK FILL MATERIALS	78
6.5	IMPACTS DURING OPERATION PHASE.....	78
6.5.1	GASEOUS EMISSIONS	78
6.5.2	PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT	78
6.5.2.1	Preliminary and chemical risk screening	78
6.5.2.2	Chemical Risk Screen Major Hazards	79
6.5.2.3	Chemical Risk Screen: Standards	79
6.5.2.4	Physical Risk Screen.....	79
6.5.2.5	Hazard Analysis.....	79
6.5.2.6	Emergency Plans.....	80
6.5.2.7	Conclusions.....	80
6.5.3	IMPACTS OF GENERATION OF VINASSE.....	80
6.5.3.1	<i>Origin and Impact.....</i>	80
6.5.3.2	<i>Mitigating Measures</i>	81

6.5.3.2.1	MMV1: Elimination of Odour Generation from Vinasse	81
6.5.3.2.2	MMV2: Stop the Operation of the Distillation Section	81
6.5.3.2.2	MMV3: Transformation of Vinasse in CMS for use as a Material input for the CMS Fertilizer Blending Plant 81	
6.5.4	MANAGEMENT OF THE CMS STORAGE TANKS	82
6.5.4.1	<i>Origin and Nature of Impact.</i>	82
6.5.4.2	<i>The Impact</i>	82
6.5.4.3	<i>Mitigating Measures</i>	82
6.5.5	ODOURS	83
6.5.5.1	<i>Origin and Nature of Impact.</i>	83
6.5.5.2	<i>Mitigation Measures</i>	84
6.5.6	IMPACTS OF PROCESS EFFLUENTS	84
6.5.6.1	<i>Origin</i>	84
6.5.6.2	<i>The Impact</i>	84
6.5.6.3	<i>Mitigating Measures</i>	85
6.5.6.3.1	MMPE1: Direct Reuse of Process Effluents.....	85
6.5.6.3.2	MMPE2: Treatment of Combined Process Effluents.....	86
6.5.6.3.2.1	Implementation of Phase I (Crop season 2011)	86
6.5.6.3.2.2	Implementation of Phases II & III	86
6.5.6.3.3	MM3: Monitoring of the water quality of the treated Effluent	87
6.5.7	BIOLOGICAL POLLUTION OF SURFACE AND UNDERGROUND WATER	87
6.5.7.1	<i>Nature of the Impact</i>	87
6.5.7.2	<i>Mitigating Measures</i>	88
6.5.8	NOISE FROM DISTILLERY.....	88
6.5.8.1	<i>Origin and Nature of Impact.</i>	88
6.5.8.2	<i>Intensity of Impact.</i>	88
6.5.8.3	<i>Mitigation Measures</i>	88
6.5.9	IMPACTS OF LOADED STORM RUNOFF.....	89
6.5.9.1	<i>The Impact</i>	89
6.5.9.2	<i>Mitigating Measures</i>	89
6.5.10	IMPACT ON PUBLIC ROAD INFRASTRUCTURE.....	89
6.5.10.1	<i>Origin and Mechanism of the Impact.</i>	89
6.5.10.2	<i>Intensity of the Impacts</i>	90
6.5.10.3	<i>Mitigating Measures</i>	90
6.5.11	IMPACTS DUE TO CHEMICAL AND OTHER HAZARDOUS MATERIAL HANDLING, MANAGEMENT AND DISPOSAL 91	
6.5.11.1	<i>Source and Origin of Impact.</i>	91
6.5.11.2	<i>Mitigation Measures</i>	91
6.5.12	GREENHOUSE GAS EMISSIONS	92
6.5.13	REFRIGERANTS	93
6.5.13.1	<i>Source and Origin of Impact.</i>	93
6.5.13.2	<i>Potential Impacts</i>	93
6.5.13.3	<i>Mitigating Measures</i>	93
6.5.14	DEMAND ON PUBLIC UTILITIES AND INFRASTRUCTURE.....	93
6.5.14.1	<i>Impact on Regional Potable Water Supply</i>	93
6.5.14.2	<i>Impact on Electricity Supply</i>	93
6.5.14.2.1	Nature of Potential Impacts	94
6.6	DECOMMISSIONING OF THE DISTILLERY AND CMS FERTILIZER BLENDING PLANT AT THE END OF PROJECT CYCLE.....	94
6.7	POSITIVE ECONOMIC IMPACTS AT OPERATIONAL PHASE	95
6.7.1	NATIONAL ECONOMY	95
6.7.2	IMPACT ON EMPLOYMENT	96
6.7.3	PRODUCTION OF BLENDED GASOLINE (E10) FOR THE LOCAL TRANSPORT SECTOR	97
6.7.4	CONCENTRATED MOLASSES SOLIDS (CMS) AS AN ALTERNATIVE TO MINERAL FERTILIZERS	97
CHAPTER 7: ENVIRONMENT MONITORING PLAN.....		99
7.	THE ENVIRONMENTAL MONITORING PROGRAMME.....	99
7.1	OBJECTIVES OF THE EMP	99

7.2 SCOPE OF THE ENVIRONMENTAL MONITORING PROGRAMME	100
7.3 ENVIRONMENTAL REPORTING.....	100
7.4 ENVIRONMENTAL ACTION PLAN	101
7.5 EMP AT CONSTRUCTION PHASE.....	101
7.6 EMP AT OPERATION PHASE	101
7.7 DEVELOPMENT OF CONTINGENCY PLANS	101
CHAPTER 8: CONCLUSIONS	109
APPENDIX A – CERTIFICATES/AGREEMENTS/LICENCE/CORRESPONDENCES	112
APPENDIX B – NOTARY CERTIFICATE AND SURVEYOR’S REPORT	113
APPENDIX C – PRELIMINARY DRAWINGS OF THE DISTILLERY PLANT AND ITS ASSOCIATED COMPONENTS.....	114
APPENDIX D – QUALITY OF VINASSE AND CMS FROM THE ALCODIS PLANT	115
APPENDIX E – DETAILS OF LINER AND PONDS	116
APPENDIX F – CHEMICAL DATA SHEETS	117
APPENDIX G – CHARACTERISTICS OF PROCESS EFFLUENTS FROM ALCODIS PLANT	118
APPENDIX H – SEPTIC TANK/ABSORPTION PIT.....	119
APPENDIX I – GEOTECHNICAL INVESTIGATION REPORT FOR CTSAV POWER STATION SITE....	120
APPENDIX J – CONTINGENCY PLAN AND SAFETY PROCEDURES FOR THE ALCODIS DISTILLERY PLANT.....	121
APPENDIX K – WIND ROSES AT PLAISANCE.....	122
APPENDIX L – AMBIENT AIR QUALITY MONITORING REPORTS	123
APPENDIX M – NOISE SURVEY REPORT.....	124
APPENDIX N – WASTEWATER TREATMENT STRATEGY CONCEPT PAPER	125
APPENDIX O – ENVIRONMENTAL STANDARDS	126
APPENDIX P – WATER SUPPLY TO CTSAV & OTHER PROJECTS	127