

TABLE OF CONTENTS

Sr. No.	Description	Page No.
1	NABET Disclosure	1-2
2	Executive Summary	3-4
Chapter 1	Introduction of the Project / Background Information	5
	1.1 Identification of project	6
	1.2 Project Proponent	6
	1.2 Brief description of nature of the project	7
	1.2.1 Climate	7
	1.2.2 Soil	7
	1.2.3 Means of irrigation	8
	1.2. Sugar Vs other cash crops	8
	1.3 Need for the project & its importance	8
	<u>Highlights of the Project</u>	9
	1.4 Demand – Supply Gap	10
	1.5 Imports Vs. Indigenous production	10
	1.6 Employment Generation (Direct & Indirect) due to the project	10
Chapter 2	Project Description	11
	2.1 Type of project	11
	2.2 Location	11
	2.3 Working Days: The Sugar Unit would work maximum 180 days.	16
	2.4 Alternative Sites	16
	2.5 Size or magnitude of operation	16
	2.6 Process details	16
	2.7 List of Products & Raw materials	19
	2.8 Resource Optimization/ Recycling and Reuse	20
	2.9 Requirement of Water, Energy / Power	20

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E-Mail : klp.dattsssk@gmail.com

	2.10	Schematic representation of the feasibility drawing which give information of EIA purpose.	25
	3. Site Analysis		26
	3.1	Connectivity	26
	3.2	Land Form, Land use & Land Ownership	26
	3.3	Topography	28
	3.4	Existing Infrastructure	28
	3.5	Soil classification	28
	3.6	Climatic data from secondary sources	28
	3.7	Social Infrastructure available	28
	4.Planning Brief		29
	4.1	Planning Concept, Town & Country Planning/Development authority classification	29
	4.2	Population Projection	29
	4.3	Land use planning (Break up along with green belt)	29
	4.4	Assessment of Infrastructure Demand (Physical & Social	30
	4.5	Amenities/Facilities	30
	5.Proposed Infrastructure (Existing)		30
	5.1	Social Infrastructure	31
	5.2	Connectivity (Traffic & Transportation Road/ Rail/Metro/Water ways etc)	31
	5.3	Drinking Water Management (Source & Supply of Water)	31
	5.4	Sewerage System	31
	5.5.1	Industrial Waste Management	31
		a. Industrial Effluent	31
		b. Industrial Emissions	32
		c. Hazardous waste	32

		d. Solid Waste	32
	5.6	Solid Waste Management	32
	5.7	Power Requirement Supply / Source	33
	6.Rehabilitation & Resettlement (R&R) Plan		33
	6.1	Policy to be adopted in respect of the project affected persons including home oustees, land oustees & landless labourers.	33
	7.Project Schedule & Cost Estimates		33
	7.1	Likely Date of start of construction & likely date of completion	33
	7.2	Estimated project cost along with analysis in terms of economics viability of the project	34
	7.3	Proposed Schedule of Implementation	34
	8.ANALYSIS OF PROPOSAL		34
	8.1	Financial & social benefits with special emphasis on benefits to the local people including tribal population.	34
Chapter 3	AIR QUALITY MODELLING		40
	3.2	Location and plant layout	41
	3.3	Fuel used	41
	3.4	Stack Height Calculations	41
	3.4.1	Stack Height Calculation Based on SO₂ Emission	41
	3.5	Air quality estimation	42
Chapter 4	4.1	Environmental Status	50
Chapter 5		GEOMORPHOLOGICAL,GEOLOGICAL AND HYDROGEOLOGICAL STATUS ORF SHIOL TALUKA, KOLHAPUR DISTRICT, MAHARASHTRA	92
	5.1	Introduction	92
	5.2	Geomorphology	93
	5.3	Drainage	93

	5.4	Soil	94
	5.5	Geology	95
	5.6	Seismicity and Tectonics	95
	5.7	Hydrogeology	96
	5.8	Ground water related issues and problems	96
Chapter 6		LANDUSE (LU)	97
	6.1	Introduction	97
	6.2	Data	97
	6.3	Methodology	97
	6.4	Study Area	97
	6.5	General Landuse	99
	6.6	Village wise General Landuse of Study Area	101
	6.7	IRRIGATION AND LANDUSE	102
	6.8	Source of Irrigation	103
	6.9	Village wise Irrigation	104
	6.10	LANDUSE STUDY WITH SATELLITE DATA	106
	6.11	Limitation	111
Chapter 7		ECOLOGY AND BIODIVERSITY	112
	7.1	Introduction	112
	7.2	Objectives of the ecological studies:	112
	7.3	Survey Methodology:	113
	7.4	Assessment of flora :	114
	7.4.1	Agricultural and Commercial Crops	115
	7.4.2	Ornamental Plants	116
	7.4.3	Natural vegetation	118
	7.5	Species diversity index and species richness of plant population	123
	7.6	Faunal study	125
	7.7	Species diversity index and species richness of bird population	134
	7.8	Aquatic ecosystem :	135

	7.9	Pollutants absorbing and Carbon sequestrating plants	140
Chapter 8		SOCI-ECONOMIC PROFILE OF THE PROJECT AREA	141
	8.1	Introduction	141
	8.2	Methodology <i>a. Field survey</i> <i>b. Socio - economic study of Project Affected Persons (PAPs)</i> <i>c. Outcome of the survey</i> <i>d. Steps of the SIA/EIA</i> <i>e. Study area</i> <i>f. Objectives</i> <i>g. Sources of information</i> <i>h. Sampling</i>	142-145
	8.3	Geography and Climate	146
	8.4	Rainfall	148
	8.5	Size of the land holding	149
	8.6	Land use pattern	149
	8.7	Demographic features	150
	8.8	Agriculture sector	156
	8.9	Rivers and Irrigation	159
	8.10	Industrial sector in the location	160
Chapter 9		ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)	176
	9.1	ENVIRONMENTAL POLICY:	176
	9.2	ORGANIZATIONAL COMMITMENT:	176
	9.3	ENVIRONMENTAL IMPACT ASSESSMENT:	176
	9.4	COMMUNITY CONSULTATION:	176

	9.5	ENVIRONMENTAL MANAGEMENT CELL PATTERN AND REPORTING	177
	9.6	LABORATORY FACILITIES	177
	9.7	DOCUMENTATION	177
	9.8	OPERATIONAL AND EMERGENCY PLAN:	177
	9.9	TRAINING:	183
	9.11	WASTE MINIMIZATION OPTIONS:	183
	9.12	WATER RECYCLING:	183
	9.13	INTERLOCKING THE PROCESS WITH ETP PERFORMANCE AND AIR EMISSIONS 1.REFERENCE BOOKS: - <u>2. LIST OF JOURNALS IN THE OF ENVIRONMENT</u>	184-185
Chapter10		ENVIRONMENTAL MANAGEMENT PLAN (EMP)	186
	10.1	IMPACTS AND MITIGATION PLAN:	186
	10.2	RECORDS AND DOCUMENTATIONS: -	194
	10.2 A	DOCUMENTATIONS: -	195
	10.2.B	GAZETTE NOTIFICATIONS: -	195
	10.2 C	TROUBLESHOOTING: -	195
	10.3	MEASURES BUILT IN THE PROCESS	197
	10.4.1	WATER MANAGEMENT	197
	10.4.2	SURFACE WATER QUALITY	197
	10.4.3	GROUND WATER QUALITY	198
	10.4.4	AIR QUALITY	198
	10.4.5	NOISE	198
	10.4.6	LAND	198
	10.4.7	ECOLOGY	198
	10.4.8	SOCIO – ECONOMIC FACTORS	199
	10.5	OPERATIONAL PHASE MANAGEMENT PLAN	199

	10.5.1	WATER MANAGEMENT	199
	10.5.1. A	WATER RESOURCES	199
	10.5.1. B	WASTE WATER	199
	10.5.2	AIR ENVIRONMENT	199
	10.5.3	SOLID WASTE	200
	10.5.5	BIOLOGICAL ENVIRONMENT	200
	10.5.6. A	CRITERIA FOR SELECTION OF SPECIES FOR GREEN BELT	201
	10.5.7	Rain Water Harvesting:	201
	10.6	OCCUPATIONAL HEALTH STUDIES	201
	10.6.1	INTRODUCTION	201
	10.7	REHABILITATION AND RESETTLEMENT (R & R) PLAN	203
	10.8	ENVIRONMENTAL POLICY	203
	10.9	STANDARD OPERATING PROCEDURES OR PROCESSES	204
	10.10	NON COMPLIANCE REPORT	206
Chapter11		RISK ASSESSMENT AND SAFETY / EMERGENCY MANAGEMENT PLAN	207
	11.1	RISK ASSESSMENT	207
	11.1.1	HAZARD	207
	11.1.2	RISK	207
	11.1.3	RISK ASSESSMENT	207
	11.1.4	RISK PREVENTION OR CONTROL	207
	11.2	OBJECTIVES OF THE STUDY	208
	11.3	PROJECT FEATURES AND HAZARDS	208
	11.3.1	IDENTIFICATION OF POSSIBLE HAZARDS	208
	11.3.2	IDENTIFICATION INVOLVING RELATIVE RATING TECHNIQUE THROUGH FIRE EXPLOSION AND TOXICITY INDEX	208

	11.3.3	GENERAL PROCESS HAZARD (GPH)	209
	11.3.4	SPECIAL PROCESS HAZARD (SPH)	209
	11.3.5	MINIMUM PREVENTIVE AND PROTECTIVE MEASURES FOR FIRE AND EXPLOSION	209
	11.4	HAZARD ANALYSIS	210
	11.4.1	PRELIMINARY HAZARD ANALYSIS	210
	11.4.2	HEALTH HAZARDS	210
	11.5	MAXIMUM CREDITABLE ACCIDENT ANALYSIS 1.HEAT RADITION MODEL-POOLFIRE 2.VISUALISATION AND SIMULATION OF MAXIMUM ACCIDENTAL SCENARIOS 3.EFFECTS OF POOL FIRE 4.DAMAGE CRITERIA FOR HEAT RADIATION 5. CRITICAL RADIATIONS OF INTEREST ON HUMAN BODY 6. PHYSIOLOGICAL EFFECT OF THRESHOLD THERMAL DOSES	211-212
	11.6	CONSEQUENCE ANALYSIS	213
		i. FAILURE FREQUENCIES	213
		ii. FAILURE DATA	213
		iii. PROBABILITY OF OCCURRENCE OF IDENTIFIED HAZARDS	213
		iv. IGNITION SOURCES OF MAJOR FIRES	214
		v. SITE SPECIFIC CONSEQUENCES	215
	11.7	SAFETY MANAGEMENT PLAN	215
	11.8	OBJECTIVE OF EMERGENCY MANAGEMENT PLAN	215
	11.8.1	ON-SITE EMERGENCY	215
	11.8.2	OFF-SITE EMERGENCY	215
	11.8.3	RISK ASSESSMENT	215

	11.9	STRUCTURE OF EMERGENCY ORGANIZATION	215
	11.9.1	EMERGENCY CONTROL ROOM (EMR)	216
	11.9.2	LIST OF FACILITES AT EMERGENCY CONTROL ROOM	216
	11.9.3	SAFETY MEASURES	216
		1. COMMUNICATION SYSTEM	217
		2. FIRE FIGHTING FACILITY	217
		3. SFETY EQUIPMENTS AND APPLIANCES	217
		4EMERGENCY TRANSPORT VEHICLE	217
		5. AMBULANCE	218
		6. ASSEMBLY POINTS	218
	11.10	ACTION PLAN FOR CONTROL OF EMERGENCY	218
		1. IDENTIFICATION AND ASSESSMENT OF HAZARDS	218
		2. DECLARATION OF EMERGENCY	218
	11.11	FUNCTIONS OF EMERGENCY MANAGEMENT PRSONNEL	218
		i. FUNCTIONS OF DECLARER OF EMERGENCY	218
		ii. FUNCTIONS OF INCIDENCE CONTROL INCIDENCE CONTROLLER	219
		iii. EVACUATION TEAM	219
		iv. REPAIR TEAM	219
		v. ESSENTIAL SERVICE TEAM	219
		vi. FUNCTIONS OF EMERGENCY CO-ORDINATION EMERGENCY CO-ORDINATOR:	220
		vii. TRANSPORTATION VEHICLE TEAM AND	220

		viii. MEDICAL ASSISTANCE TEAM	220
		xi. SECURITY	220
		x. COMMUNICATION TEAM	220
		xi. EMERGENCY SHUT DOWN OF PLANTS	220
		xii. EVACUATION OF PERSONNEL	221
		xiii. ACCOUNTING OF PERSONNEL:	221
		xiv. INFORMATION TO THE RELATIVES OF AFFECTED PEOPLE:	221
		xv. MEDICAL TREATMENT:	221
		xvi. MUTUAL AID	221
		xvii. SECURITY	221
		xviii. LAW AND ORDER	222
		xix. ALL CLEAR SIGNAL:	222
		xx INTIMATION TO AUTHORITIES	222
		xxi. RELIEF AND REHABILITATION	222
		xxii. REVIEW OF INCIDENCE	222
		xxiii. UPDATE OF EMERGENCY PLAN	222
		xxiv. TRAINING AND REHEARSAL	222
	11.12	IDENTIFY HAZARD	223
ANNEXURES		<u>ANNEXURE I</u> PHOTOGRAPHS OF GREEN BELT	226
		FRONT VIEW ADMINISTRATIVE BUIDLING	228
		<u>ANNEXURE II</u> <u>MANUFACTURING PROCESS</u>	230
		<u>ANNEXURE III</u> Techno Economic feasibility report of ETP facilities provided at Shree Datta Shethkari SSK Ltd., Dattanagar, Tal: Shirol, Dist: Kolhapur	235

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		ANNEXURE IV Contour Map	240
		ANNEXURE V Environmental Clearance for 7500 TCD Compliance	241-247
		ANNEXURE VI TORS issued by SEIAA	248-255
		ANNEXURE VII Site Specific Meteorological Data	256
		ANNEXURE VIII Ambient Air Quality monitoring data of 24 Hours average twice in Week for 3 Months	257-281

LIST OF TABLES

Table No.	Description	Page No.
1.1	The list of the present Board of Directors	6
2.1	List of Raw materials & Products 1. Raw Materials required for sugar plant of capacity (9000 TCD) 2. List of Products with Production Capacity (9000 TCD) 3. Raw Materials required for sugar plant of capacity (9000 TCD) 4.. List of Products with Production Capacity (9000 TCD)	19-20
2.2	Land Utilization Pattern in Shirol Taluka	27
2.3	Land use planning (Break up along with green belt)	29
2.4	A.STANDRAD TERMS OF REFERENCE B.SPECIFIC TERMS OF REFFERANCE FOR EIA STUDIES FOR SUGAR INDUSTRY & THERMAL PLANTS	35-39
3.1	Air quality estimation	42
3.2	AMBIENT AIR QUALITY STANDARDS :(Prescribed by CPCB)	43-44
4..1	<u>ANALYSIS REPORT</u>	51-88
4.2	<u>NOISE LEVEL MEASUREMENT REPORT</u>	89-90
4.3	<u>ANALYSIS REPORT FOR STACK EMISSION</u>	91
6.1	Villages Within 10Km Radius from Factory Site	98-99
6.2	Summary of General Landuse of Study Area	100
6.3	Village wise General Landuse of Study Area	101-102
6.4	Summary of Irrigated and Un-Irrigated Land	102
6.5	Source of Irrigation	103
6.6	Village-wise Irrigation Status of Study Area	104-105
7.1	List of Agricultural and Commercial Crops	115-116
7.2	List of Ornamental Plants	117-118
7.3	Herb vegetation	118-119
7.4	Shrub vegetation	119
7.5	Tree vegetation	119-120
7.6	The sites studied for plant and bird indices	124
7.7	Shannon Weiner Index and Species richness of plant population in study area.	124

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E-Mail : klp.dattsssk@gmail.com

7.8	Category wise Index of total study area:	124
7.9	The list of mammals, amphibians, reptiles, butterflies, fishes, insects and dragonflies found in the study area	125-128
7.10	The list of bird species found in the study area.	130-132
7.11	Shannon Weiner Index and Species richness study of bird population in study area	135
7.12	Zooplankton List	136-138
7.13	Phytoplankton List	138-139
7.14	The list of selected plants and trees which can be grown in the surrounding area of the factory	140
8.1	Name of the Villages within the Radius of 15 KM	145-146
8.2	Average Rainfall in Shirol Taluka (mm)	149
8.3	Land Use Pattern	149-150
8.4	Demographic Features of the Selected Villages	155-156
8.5	Area under Different Crops	156-157
8.6	Soil Salinity Land in Shirol Taluka in 2007	158
8.7	Irrigation by Different Sources in Shirol Taluka	159
8.8	Sample families in the Project Area	161-162
8.9	Dependents in the Family	162-163
8.10	Profile of the Sam Fpleamilies Surveyed for SIA.	164
8.11	Educational Level of the Persons in the Families	165
8.12	Micro-enterprising Activities of the Families	165-166
8.13	Size of Land Holding	167
8.14	Agricultural Training	169
8.15	Cultural Resilience	170
8.16	Classification of the Responses in the Advantages of the Project	172
8.17	Classification of the Responses for willingness to accept	173
8.18	Classification of Expectations from the Sugar Factory	174
9.1	Objectives and Targets	176-177
9.2	LIST OF LABORATORY EQUIPMENT	178
9.3	EFFLUENT TREATMENT PLANT MONITORING DATA	179

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PO : DATTANAGAR 416 120 TALUKA-SHIROL, DIST.KOLHAPUR, (MS) India
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9.4	PERFORMANCE OF EFFLUENT TREATMENT PLANT	179
9.5	AIR POLLUTION DATA (STACK)	180
9.6	AIR POLLUTION DATA (AMBIENT)	180
9.7	SOUND LEVELS (dB) Leq	181
9.8	Well Water/Surface Waters Proform to monitor impact of pollution discharged to environment	182
9.9	Soil Proform to monitor impact of pollution discharged to environment	183
10.1	Impacts and Mitigation Plan	186-187
10.1.A	Impacts and Mitigation measures specific to SHREE DATTA SSK Limited	187-193
10.1.B	Impact Assessment based on Battelle Environment Evaluation System (BEES)	194
10.2	Troubleshooting	195-197
10.3	Employees Health Status	202-203
10.4	NON COMPLIANCE REPORT	206
11.1	Minimum preventive and protective measures are recommended.	210
11.2	ORGANIZATION-CHART EMERGENCY	224
11.3	AUTHORITIES	225
ANNEXURES	ANNEXURE II 1.Addition of Equipment Suitable For 9000 TCD & its Tentative Cost	233
	ANNEXURE II 2.Addition of Equipment Suitable For 9000 TCD & its Tentative Cost	234
	ANNEXURE III 1.Estimated COD, BOD, Suspended Solids removal efficiency of ETP 2. ETP Flow Chart	238 239
	ANNEXURE V ENVIRONMENTAL CLEARANCE CONDITIONS AND COMPLIANCE FOR 5000 TO 7500 TCD	244-247
	ANNEXURE VII Site Specific Meterological Data at Shree_Datta Shetakari Sahakari Sakhar Karkhana Ltd.	256

LIST OF FIGURES

Figure No.	Description	Page No.
2.1	Location Map	12
2.2	LOCATION MAP OF STUDY AREA	13
2.3	Toposheet Map	14
2.4	Layout Map of SDSSSK Ltd., Shirol	15
2.5	Process details	17-18
2.6	Water Balance for (7500 MT) sugar cane, m3/day	21
2.7	Raw Water balance (7500 MT) m3/day	21
2.8	Condenser Cooling Water Balance, (7500 MT) m3/day	22
2.9	Total water balance (7500 MT), m3/day	22
2.10	Water Balance for sugar cane, (9000 MT) m3/day	23
2.11	Raw Water balance (9000 MT) m3/day	23
2.12	Condenser Cooling Water Balance, (9000 MT) m3/day	24
2.13	Total water balance(9000 M.T), m3/day	24
2.14	Schematic representation of the feasibility drawing which give information of EIA purpose.	25
3.1	PREDICTION OF AIR QUALITY AND PRESENT STATUS OF ENVIRONMENT <u>10 KM RADIUS MAP</u>	40
3.2	WIND ROSE DIAGRAM (AERMET)	45
3.3	ISOPHELETES FOR PM 10 (AERMOD)	46
3.4	ISOPHELETES FOR SO _x (AERMOD)	47
3.5	ISOPHELETES FOR NO _x (AERMOD)	48
3.6	ISOPHELETES FOR PM 2.5 (AERMOD)	49
4.1	ENVIRONMENTAL STATUS	50
5.1	Map of Maharashtra and Kolhapur District	92

5.2	Flat topography of the region	93
5.3	Krishna basin map	94
5.4	Deep black soil near river bed	95
6.1	Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol Location Map	98
6.2	General Landuse	100
6.3	Irrigated and Un-irrigated Land	103
6.4	Source of Irrigation	104
6.5	Satellite Image View	107
6.6	Village Map	108
6.7	Landuse - Landcover	109
6.8	Landuse / Land Cover Map (Satellite Image)	110
6.9	Road Map	111
7.1	Map of study sites with grids	114
7.2	Natural Vegetation	121-123
7.3	Fanual study	128-129
7.4	Bird species in study area	132-134
7.5	Phytoplankton List:	139-140
8.1	Google Map	148
8.2	Agriculture sector	157
8.3	Rivers and Irrigation	160
10.1	Hierarchical System	205
ANNEXURS	ANNEXURE I PHOTOGRAPHS OF GREEN BELT	226-229
	ANNEXURE II Manufacturing Process Flow Sheet	232
	ANNEXURE III ETP Flow Chart	239
	ANNEXURE IV Contour Map	240

NABET DISCLOSURE

Declaration of experts contributing to EIA Report for the expansion of the Sugar factory capacity from 7500 TCD to 9000 TCD at Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Dattanagar, Tal: Shirol, Dist: Kolhapur, Maharashtra State.

I, hereby certify that we were part of the team in the following capacity that developed the above project document.

Signature:

Name of EIA Co-ordinator: Dr. B. Subbarao

Date: 20-08-2016

Period of Involvement: September 2015 till date

Contact Information: "Arundhati" Bungalow, MSEB road, Opp., Sahyognagar, Vishrambag-416415, Sangli, Maharashtra State

TelNo. (0233)2301857 Mobile: 09372109522

Functional Area Experts:

Sr.No.	Functional Area	Name of Expert	Involvement (Period & Task)	Signature
1	WP, SHW(ISW & HW) AQ, AP	Dr.B.Subbarao	September 2015 till date	B. Subbarao
2	WP	Mrs. Nagiyoti Bollapragada	September 2015 till date	Nagiyoti
3	AP	Mr.S.B.Patil	September 2015 till date	S.B. Patil
4	NV	Dr.S.P. Chavan	September 2015 till date	S.P. Chavan
5	SE	Dr.V.B.Jugale	September 2015 till date	V.B. Jugale
6	LU	Dr. Pradip Saymote	September 2015 till date	Pradip Saymote
7	RH, SC	Mr. G.G. Watwe	September 2015 till date	G.G. Watwe
8	GEO, HG	Prof. M.B.Kulkarni	September 2015 till date	M.B. Kulkarni
9	EB	Dr.P.D. Raut	September 2015 till date	P.D. Raut
10	SE	Dr.J.B.Chougule	September 2015 till date	J.B. Chougule

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD., SHIROL
PO : DATTANAGAR 416 120 TALUKA-SHIROL, DIST.KOLHAPUR, (MS) India
E-Mail : klp.dattsssk@gmail.com

QCI-NABET Scheme for accreditation of EIA Consultant Organisations/Version 3/June 2015

Declaration by the Head of the accredited consultant organization/ authorized person

I, B. SUBBARAO, hereby, confirm that the above mentioned experts prepared the EIA Shree Datta Shetkari SSK Ltd.. I also confirm that the consultant organization shall be fully accountable for any mis-leading information mentioned in this statement.

Signature: B. Subbarao

Name: B. SUBBARAO

Designation: Head of the organization

Name of the EIA consultant organization: Dr. Subbarao's Environmental Centre

NABET Certificate No. & Issue Date: Revlon Ltd. 5th August 2016 Version 3, Sr. No 29.

DECLARATION OF ASSOCIATION IN THE EIA

3

EXECUTIVE SUMMARY

1. Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd proposes to expand the sugar factory capacity from 7500 TCD to 9000 TCD. The industry follows hundred percent recycling of excess condensate and as such fresh water requirement for process is Zero. The domestic consumption of water would be 1000 Cum/day and the process water for its Distillery unit would be 800 Cum/day. Thus the total fresh water requirement is 900 Cum/day even after expansion.
2. The effluent generation would be 332.23 Cum/day even after expansion as compared to 324.25 Cum/day for its present crushing capacity of 7500TCD. This could be achieved due to complete recycling, reuse and dry washing practices followed by the industry.
3. The Industry draws steam from Urjankur Shree Datta Power Company limited as per the bilateral agreement for establishing 36 MW power plant. At present 72T/hr of Baggase is received to generate 180T/hr of steam by Urjankur Shree Datta Power Company limited which in turn supplies 138T/hr of steam to Shree Datta Shetkari SSK Ltd for its Sugar factory and Distillery operations i.e. for sugar process 128T/hr Distillery 10T/hr. Even after expansion of the sugar factory capacity from 7500TCD to 9000TCD, the steam required shall remain unchanged as 128T/hr for sugar unit as it is proposed to reduce steam consumption from 39% to 34% per ton of cane crushed by modernizing the process operations.
4. The power requirement for 7500TCD and 9000TCD shall remain same as 176400KW/day. Shree Datta SSK Ltd provided full pledged ETP for sugar effluent and also for excess condensates. The treated sugar factory effluent along with spray pond over flow is used for irrigation on 1000acres of land. The excess condensate is used as process water.
5. The environmental status study of the project area is surveyed for ambient air quality. Noise levels, Ground water, River water and soil. The salinity of Ground water is found to be high. However, the water can be used for cash crops like sugarcane. The ambient air quality and sound levels are found to be well within the standards. The Krishna river water is found to be fit for Drinking after treatment.
6. The air quality modeling was done as per AERMOD version 7.4 for PM₁₀, PM_{2.5} SO₂ and NO_x.

a. Air quality estimation

Air quality modeling is done based on AERMOD version 7.4. The required meteorological data is monitored at the site and the data for AERMOD model was obtained from Envitrans Gaziabad, UP based on the model studies, the Isoplethes were drawn. It is observed that the maximum concentrations in Study area are well within the NAAQS standards.

Sr. No.		SO x μg/m³	NO x μg/m³	PM 10 μg/m³	PM2.5 μg/m³	CO mg/m³
1	CONCENTRATIONS	19.28	41.82	76.45	48.45	***
2	NAAQS	80	80	100	60	2

7. The Occupational Health studies were carried out for the employees who are vulnerable to fugitive emissions and heat. As per the medical reports of X ray, lung function test and General check up, all the employees are found to be fit. The factory has well established Hospital to carry out the medical check-up for the employees and nearby villages and the farmers.
8. The Industry established educational facilities for the benefit of nearby villages and employees and local people and created confidence on the activities of the Industry.
9. Rain water Harvesting was done for the entire campus and collected in a pond. The rain water so collected is used for Green belt development.
10. The Industry has developed Greenery and around 18000 trees are planted. Industry committed to develop Greenbelt as per CPCB guidelines of 1500 trees per hector of the factory area.
11. Industries earmarked 2.5% of the total cost of the project for CSTactivities and utilize the funds for social activities such as education, health camps, soil testing and Drinking water supply in drought affected villages.
12. The socio economic development in the study area is excellent. The vulnerability index responds very low and resilience is high. The project has positive impacts. Willingness to pay and the willingness to accept. The expansion has positive outcomes which is 1:10.09 which means the benefits are more 10 times than the loss.
13. The pollution absorbing trees are suggested. Shannon Weiner Index suggests maximum species diversity which should be protected. The flora and fauna in the study area are found to be very rich.
14. The parking area provided is 12.0 hectares and Green belt area is 29.64 hectares out of total area of 85.46 hectares.
15. The capital cost of the modernization of sugar factory crushing capacity from 7500TCD to 9000TCD would be 14.84 crores.

CHAPTER 1

INTRODUCTION

INTRODUCTION OF THE PROJECT/ BACKGROUND INFORMATION

Shree Datta Shetakari Sahakari Sakhar Karkhana Ltd., (SDSSSKL), Shirol, Taluka Shirol, Dist Kolhapur is a Co-operative sugar factory with an installed capacity of 7500 TCD. The average crushing rate of the Sugar Factory is 7500 TCD and crushes around 12-13 lakh MT per annum.

The growth of Sugar Industries in the state of Maharashtra started prior to Independence in the private sector and in the Co-operative sector since 1950. Maharashtra State assumes a leadership position in India in terms of area under sugarcane cultivation, number of Sugar factories, sugarcane production, yield, recovery and Sugar production in the country. Almost 85% of the Sugar factories in Maharashtra are in Co-operative sector. The growth of this Industry in the Co-operative sector has certainly helped to improve Socio-economic conditions of the rural parts of the State.

Shree Datta Shetakari Sahakari Sakhar Karkhana Ltd., (SDSSSKL), Shirol, Taluka Shirol, Dist Kolhapur, was established on 9th June 1969 with an initial installed capacity of 1250 TCD. The first crushing operations started in the 10th June 1970. The capacity of the sugar plant was expanded from 1250 TCD to 2000 TCD in 31st May 1978. The capacity of the sugar plant further expanded from 2000 TCD to 2500 TCD in 7th May 1986. The capacity of the sugar plant 2500 TCD to 5000 TCD was commissioned in 9th December 1988. The capacity of the sugar plant from 5000 To 7500 TCD was commissioned on 1st August 2001. The industry now proposes to expand / modernize the sugar plant capacity from 7,500 TCD to 9,000 TCD.

The command area of the sugar factory has excellent cane potential and the sugarcane grown in this area is rich in sucrose content. Sugarcane potential of SDSSSKL from its command area is around 16 lakh tonnes. It has also installed a 36 MW cogen facility on

BOOT principles with Urjankur Shri Datta Power Company Ltd., suitable for operation during crushing season as well as off-season.

SDSSSKL is today one of the best professionally managed and financially sound co-operative sugar factory in Maharashtra.

Backed by a proven managerial and financial track record, SDSSSKL management now propose to implement further expansion / modernization programme to operate the sugar factory at optimum capacity with high up time and lower captive energy consumption with a view to enhance the financial capability of the factory to pay better cane price to its members.

1.1 Identification of project

It is Modernization and Expansion of Sugar unit from 7500 TCD to 9000 TCD.

1.2 Project Proponent

Shri Ganpatrao Appasaheb Patil, Chairman of SDSSSKL, a great visionary, has successfully guided the revival of the factory ever. The list of the present Board of Directors is as below:

Table No. 1.1

Sr. No.	Name	Designation
1	Hon. Shri Ganapatrao Appasaheb Patil	Chairman
2	Hon. Shri Sidgauda Gurusidgauda Patil	Vice Chairman
3	Hon. Shri Usufsaheb Rasulsaheb Mestri	Director
4	Hon. Sou. Vinaya Ramesh Ghorpade	Director
5	Hon. Shri Anilkumar Dinakarao Yadav	Director
6	Hon. Shri Shrenik Jaygaunda Patil	Director
7	Hon. Shri Babaso Shankar Patil	Director
8	Hon. Shri Sharadchandra Vishwnath Pathak	Director
9	Hon. Shri Arunkumar Shankar Desai	Director
10	Hon. Shri Raghunath Devgaunda Patil	Director

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Sr. No.	Name	Designation
11	Hon. Shri Vishwnath Dhondi Mane	Director
12	Hon. Shri Shekhar Kalgaunda Patil	Director
13	Hon. Shri Basgaunda Malgaunda Patil	Director
14	Hon. Shri Pramod Vasant Patil	Director
15	Hon. Shri Annaso Appaso Pawar	Director
16	Hon. Shri Khema Hanama Kambale	Director
17	Hon. Sou Yashoda Balaso Koli	Director
18	Hon. Sou Sangita Sanjay Patil	Director
19	Hon. Shri Indrajit Pasgaunda Patil	Director
20	Hon. Shri Ranjit Ashok Kadam	Director
21	Hon. Shri Raosaheb Giryappa Naik	Director
22	Hon. Shri Vijay Nivruti Suryawanshi	Director
23	Hon. Shri Raosaheb Annaso Bhosale	Director
24	Regional Deputy Director (Sugar), Kolhapur	Director
26	Hon. Shri Mahadev Vithal Patil	Managing Director

1.2 Brief description of nature of the project

1.2.1 Climate

The normal temperatures in the region are between 18⁰ C to 42⁰ C in summer and 8⁰C to 25⁰ C in winter. There is no occurrence of frost in area of operation of factory. Hence, climate of the region is well suited for sugarcane cultivation.

1.2.2 Soil

The Soil in area of operation is loamy and sandy loamy soil. The soil conditions are well suited for sugarcane cultivation. The structure of Soil are Sand is 40 to 60%, Clay is 10 to 20% and Silt is 30 to 40%.

1.2.3 Means of irrigation

The following are the four major direct sources of irrigation in area of operation;

(1) Panchaganga River, Krishna River. These are a major source of water to fields located on both sides of the area of operation.

(2) Private Pipelines, Wells, Adequate facilities for irrigation ensure a steady sugarcane crop.

1.2.4 Sugar Vs other cash crops

Adequate water for sugarcane cultivation is available throughout the year. Sugarcane has the following advantages over other crops for the farmers. Sugarcane prices paid by sugar factories are always higher than other crops in the region. The varietal pattern of sugarcane in the area of operation of the factory is satisfactory.

1.3 Need for the project & its importance

Sugarcane Potential, agro climatic conditions and the cost of conversion and overheads etc. are the major deciding factors for fixing the crushing capacity of a sugar plant. It has been established that wages and other overhead costs per tonne of sugar get reduced substantially with higher plant sizes.

Most of the land in the operational area of the factory is suitable for cane cultivation. The average sugarcane yield is 115-120 tonnes/hectare in the operational area of SDSSSKL. The total sugarcane availability at present is about 16 lakh tones of cane.

SDSSSKL, keeping in view the above cited reasons, plans to expand / modernize its existing 7500 TCD sugar plant and also carry out balancing so as to increase its capacity utilization to about 125% which will enable it to crush the available sugarcane in optimum season duration of 160-180 days.

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The steam requirement for cane crushing is 36%. The Bagasse available is 28.5% on cane. From 7500 TCD, Bagasse available is 89.06 T/hr. The actual requirement is only 72.0 T/hr, taking into consideration Bagasse to steam ratio as 1:2.5. At present, the saving is 17.06 T/hr. The Bagasse availability after expansion would be 106.875 T/hr., whereas the Bagasse requirement to generate 180 T/hr steam would remain the same. The effective saving of Bagasse would be $106.875 - 72 = 34.875$ T/hr taking into consideration, the existing saving of Bagasse of 17.06 T/hr, the net saving of Bagasse would be $34.875 - 17.06 = 17.815$ T/hr. The present cost of Bagasse can be taken as Rs.2000=00. Thus the net gain would be $17.815 \times 24 \times 2000 = \text{Rs.}8,55,120=00$ per day as against the loss of revenue of sale of power of 1.52 MW which is required for expansion. Taking into consideration, the present cost of power as Rs. 6.07 per unit, the revenue loss would be $1.52 \times 1000 \times 24 \times 6.07 = \text{Rs.}2,21,433.60$. Thus the net gain in terms of fuel saving would be $\text{Rs } 8,55,120=00 - \text{Rs } 2,21,433.60 = \text{Rs } 6,33,686.40$ (Six lakh thirty three thousand six hundred eighty six rupees and paisa forty) only per day. This additional benefit can be transferred to farmers as cane price.

Besides the direct benefit, the expansion would help to crush cane intime so that the high recovery due to timely crushing would further improve the economy of the farmers.

To implement the above programme, the management of SDSSSKL has appointed consultants with the objective of expansion / modernization & capacity optimization of sugar plant, with emphasis on reduction in cost of production through improvement in milling efficiency and reduction in process steam/energy consumption.

This TOR prefeasibility report has been prepared for Shree Datta Shetakari Sahakari Sakhar Karkhana Ltd, (SDSSSKL) for expansion / modernization of Sugar unit for 375 TCH (9,000 TCD) at its existing sugar mill.

Highlights of the Project

Name and Address: Shree Datta S.S.S.K. Ltd.,

Factory Site: Dattanagar, Shirol, Taluka Shirol

District – Kolhapur – 416120

Maharashtra

Ph: (0) (02322) 236251, 236552, 236253; Fax: (0) (02322) 236555

Constitution & Type: Co-operative

Products : Sugar, Rectified Spirit, ENA, Ethanol

1.4 Demand – Supply Gap

During the year 2014-2015 the sugar production is 260 lakh tonnes. Where as the demand is 255 MT. However the Government of India as taken a discussion a minimum quantity of 40 Lakh MT should be exported in order to improve the economy of the sugar industries and also earn foreign exchange. There for the management decided to increase the crushing capacity not only to achieve the export target but also to meet the growing demand of the farmers to process there produce in time. Sugar cane is one off the stardust cash crop which can give better returns.

1.5 Imports Vs. Indigenous production

As has been already explain the Indigenous production can easily meet the demand. There is a great potential for export of Sugar in the third world.

1.6 Employment Generation (Direct & Indirect) due to the project

The existing staff would be adequate even after expansion. Thus there would not be any direct employment opportunities. However, there will be employment opportunities indirectly by way of additional transportation required to carry sugarcane to the factory and also the sugarcane cutting labour etc.

CHAPTER 2

PROJECT DESCRIPTION

2.1 Type of project

It is the expansion of existing sugar factory from 7,500 TCD to 9,000 TCD. The existing capacity of the project is from 5000 TCD to 7500 TCD in the year 2001.

2.2 Location

SDSSSKL is located at Dattanagar, Shirol, Tal: Shirol Dist: Kolhapur. There are no sensitive, historical, forest reserves and wild life sanctuaries etc within 10 Km radius of the factory site. The Mumbai – Bangalore National Highway (N.H. 4) is 45 Km away from the factory site. The Latitude and longitude are 16°45'N and 74°36'E respectively. The Elevation above the Mean Sea Level is 542 m.

The Project Site is conveniently located for development of the Project.

- a. 45 Km away from Kolhapur, which is district place
- b. Other important towns nearby are
 - i. Jaysingpur, at a distance of 06 Km.
 - ii. Sangli, at a distance of 16 Km.
- c. Jaysingpur, is nearest Railway station 07 Km away from factory site.
- d. Kolhapur is nearest Airport 45 Km away from factory site.

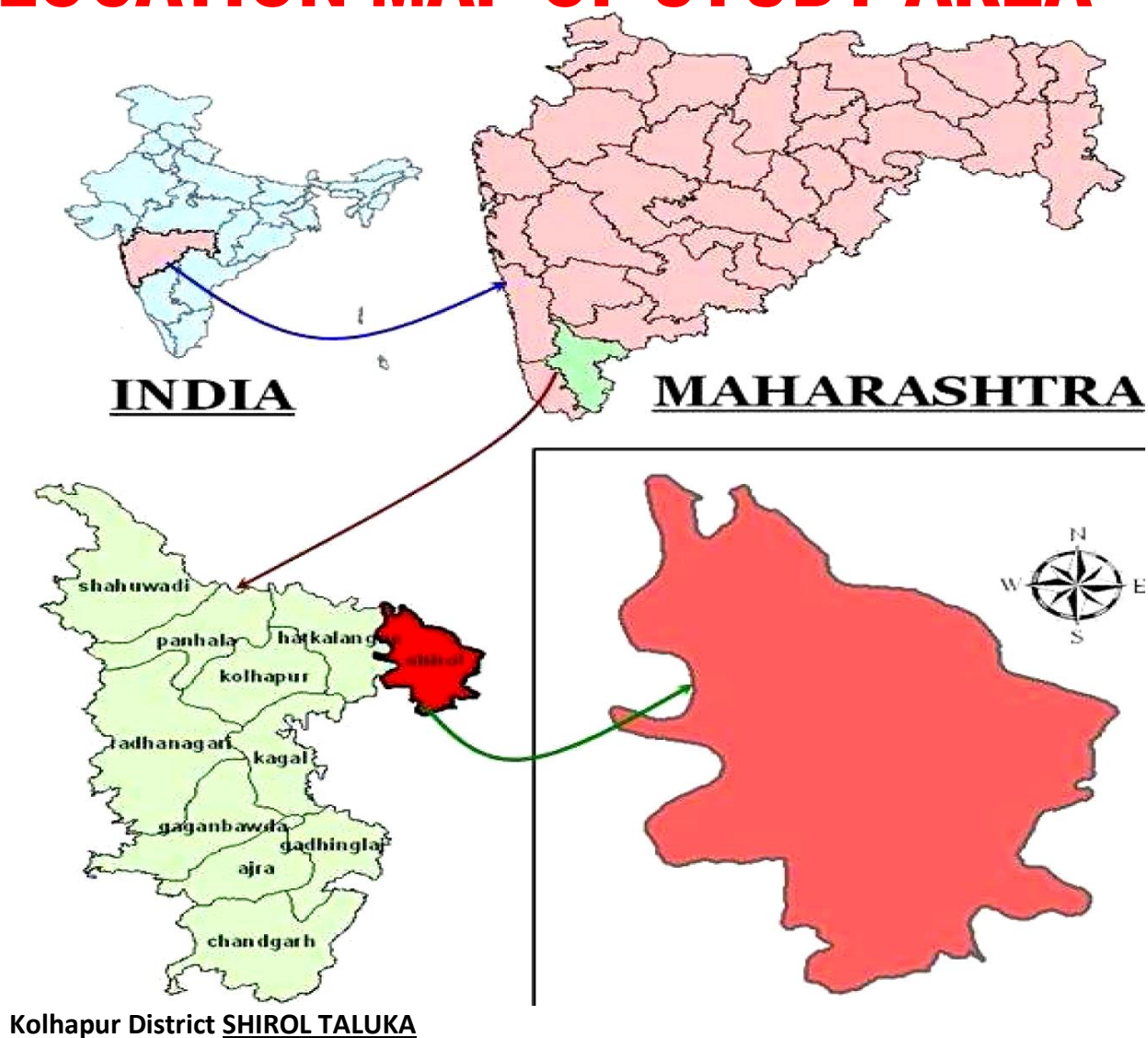
Refer Annexure-I for Photographs of Green Belt, front view of Administrative Building, Aerial views of factory.

FIG. 2.1 LOCATION



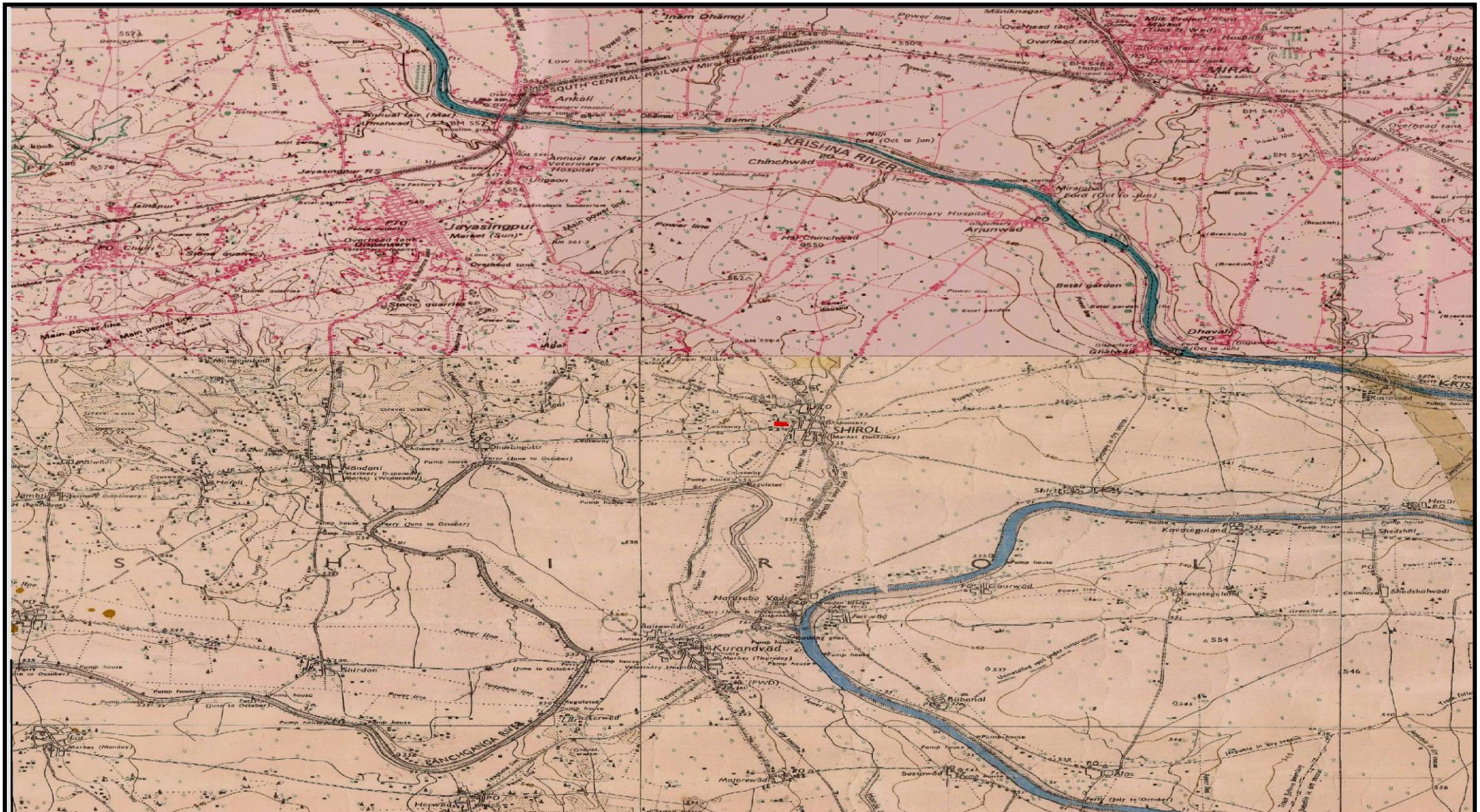
Fig. 2.2

LOCATION MAP OF STUDY AREA



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Fig. 2.3 Toposheet Map



Factory site

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**Fig. 2.4 Layout Map of SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD.,
SHIROL**



2.3 Working Days: The Sugar Unit would work maximum 180 days.

2.4 Alternative Sites

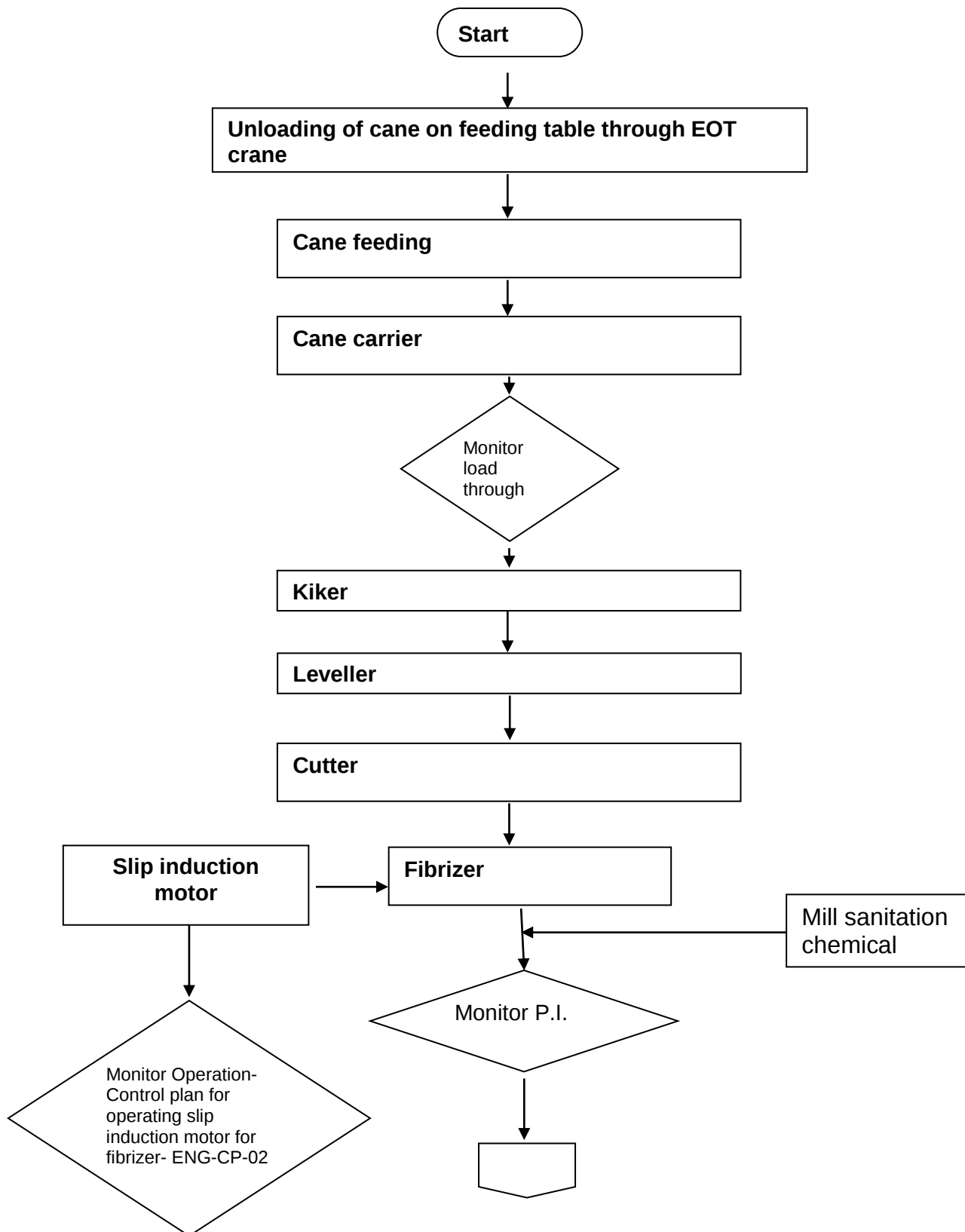
The existing facilities and utilities shall be used for expansion and modernization of the sugar factory capacity and as such alternative site is not warranted.

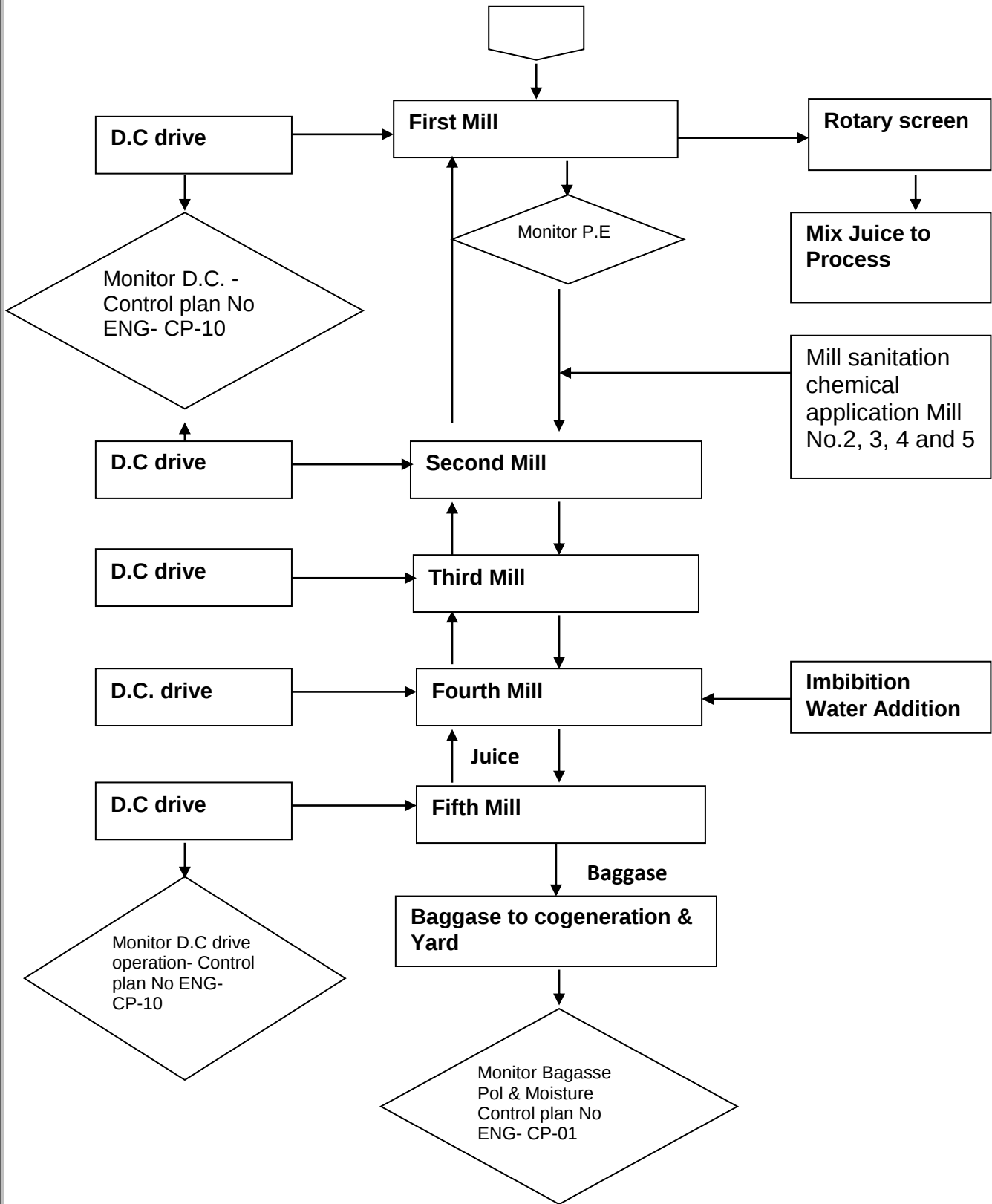
2.5 Size or magnitude of operation

After successful establishment of the sugar factory and its efficient operations since year 1970, the management of SDSSSKL planned and implemented allied projects in the campus which include 36 MW co-generation plant on BOOT principles. Based on availability of sugarcane in its area of operation, the management of SDSSSKL has planned to go for expansion/modernization of the existing sugar unit. The proposed expansion is for increased production.

2.6 Process details

Matured cane is harvested and brought to the factory through Trucks, and Bullock carts. Cane is weighed on automatic weighing scales at the factory gate. The prepared cane is subjected for extraction of the juice in milling system for successive compressing followed by imbibitions. The extracted juice is weighed automatically and subjected for sugar. By product of milling system which is known as Bagasse is passed for boiler as a fuel for generation of steam. The exhaust generated from prime movers is utilized for heating of the juice massecuite. The weighed juice is heated and subjected to automatic liming and Sulphitation process. This sulphited juice is heated and settled in clarifier. The supernatant liquid is taken for evaporation where it is concentrated up to 60° BX and passed for crystallization in the vacuum pans. The concentrated syrup is again sulphited and used as a pan boiling system. The three massecuite boiling system is adopted for production of white sugar. Separated crystals are packaged in the gunny bags and stitched and are sent to the godown.





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Refer Annexure - II for Manufacturing process and schematic diagram of manufacturing process, Addition of Equipment Suitable For 9000 TCD & its Tentative Cost, Addition of Equipment Suitable For 9000 TCD & its Tentative Cost.

2.7 List of Raw materials & Products

Table-1: Raw Materials required for sugar plant of capacity (9000 TCD) (2.1)

Sr. No.	Name of raw material	Existing required quantity MT/Month	Proposed required Quantity (MT/ month)	Total After Expansion (MT/M)	Mode of transportation	Source
1.	Sugarcane (M.T.)	225000	45000	270000	Trucks & Bullockcarts	Farmers
2.	Lime (M.T.)	382.500	76.500	459.000	Road	Open Market
3	Sulphur (M.T.)	120.000	24.750	144.750	Road	Open Market
4.	Phosphoric Acid (Kg)	10200.0	2052.0	12252.0	Road	Open Market
5	Flocculant (kg)	360	72.00	432.00	Road	Open Market
6.	Electricity	5292000 KW/Month	NIL	5292000 KW/Month	Own	Own

Table No. 2.: List of Products with Production Capacity (9000 TCD)

Sr. No.	Proposed Product	Existing Product Quantity (MT / month)	Proposed Product Quantity (MT / month)	Total After Expansion (MT/M)
1.	Sugar	28125.000	5625.000	33750.000
2.	Bagasse	64125.000	12825.000	76950.000
3	Filter cake	8400.000	1687.500	10087.500
4.	Molasses	8400.000	1687.500	10087.500
5.	Electricity	5292000 KW/Month	NIL	5292000 KW/Month

Table-3: Raw Materials required for sugar plant of capacity (9000 TCD)

Sr. No.	Name of raw material	Existing required quantity MT/Day	Proposed required Quantity (MT / Day)	Total After Expansion (MT/Day)
1.	Sugarcane	7500	1500	9000
2.	Lime	12.750	2.55	15.30
3	Sulphur	4.000	0.825	4.825
4.	Phosphoric Acid (kg)	340	68.40	408.40
5	Flocculant (kg)	12	2.40	14.40
6.	Electricity	176400 KW/Day	NIL	176400 KW/Day

Table No. 4.: List of Products with Production Capacity (9000 TCD)

Sr. No.	Proposed Product	Existing Product Quantity (MT / Day)	Proposed Product Quantity (MT/Day)	Total After Expansion (MT/Day)
1.	Sugar	937.500	187.500	1125.000
2.	Bagasse	2137.500	427.500	2565.000
3	Filter cake	280.000	56.250	336.250
4.	Molasses	280.000	56.250	336.250
5.	Electricity	176400 KW/Day	NIL	176400 KW/Day

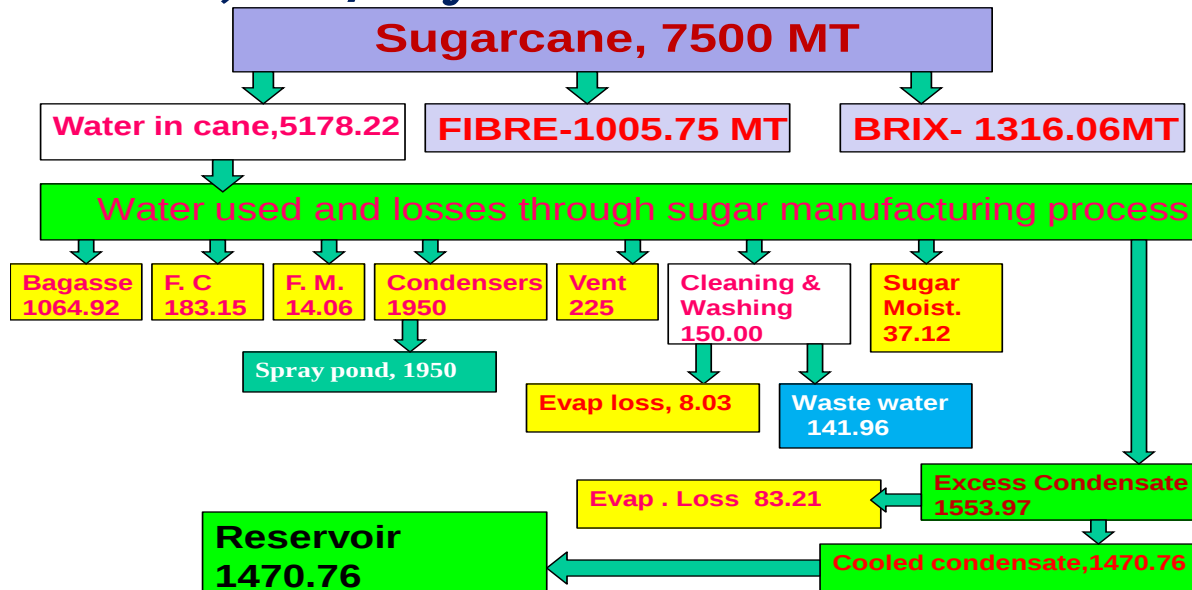
2.8 Resource Optimization/ Recycling and Reuse

SDSSSKL has adopted latest process technologies for the all manufacturing units of existing unit. Therefore, waste generation would be very negligible amount. There is no any extra water would be required for expansion activities. Further, the fuel for boiler is Bagasse from existing sugar factory which is less polluting than coal or any other solid fuel. The effluent from existing as well as expansion activities is treated in ETP provided in the existing sugar factory unit. The entire treated effluent quantity is used for gardening.

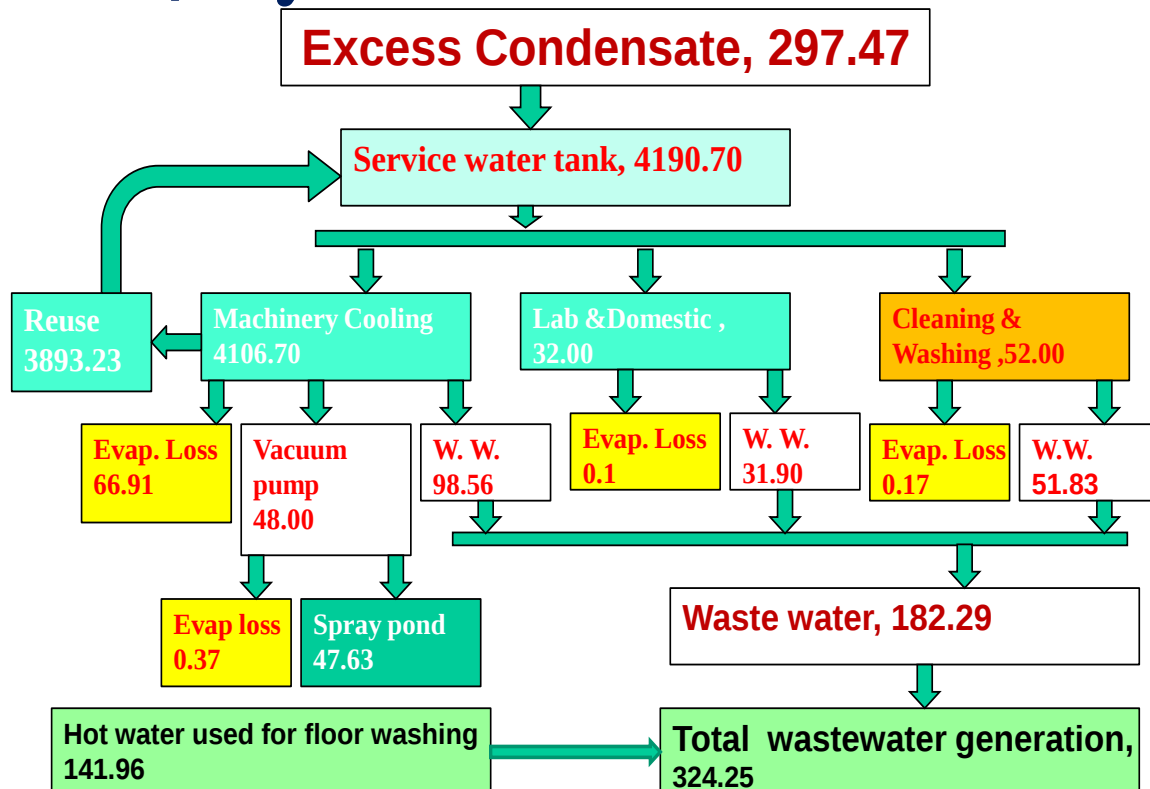
2.9 Requirement of Water, Energy / Power

- (I) **Source of water and its availability.** Commitment regarding availability of requisite quantity of water from the competent authority.
 - Krishna River is the source of water. Permission is being sought from Govt. of Maharashtra. The raw water requirement is 800 m³/day and shall be drawn from Krishna River which is 5 Km away from the site.
- (II) **Power required for 375 TCH cane crushing is 11.2 MW @ 24 kwh/TCH** which is supplied by existing setup of Co-generation having capacity 36 MW.

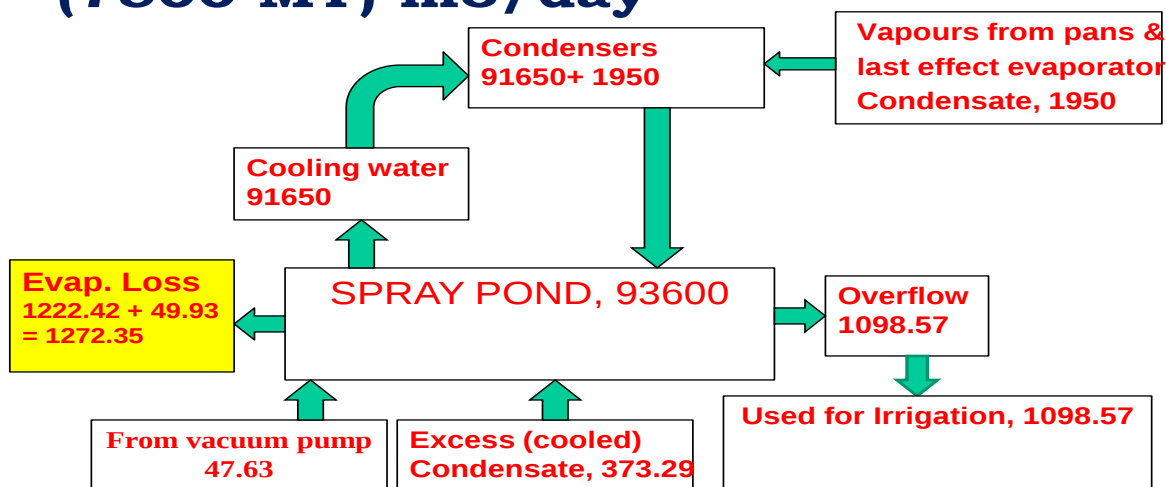
Water Balance for (7500 MT) sugar cane, m³/day



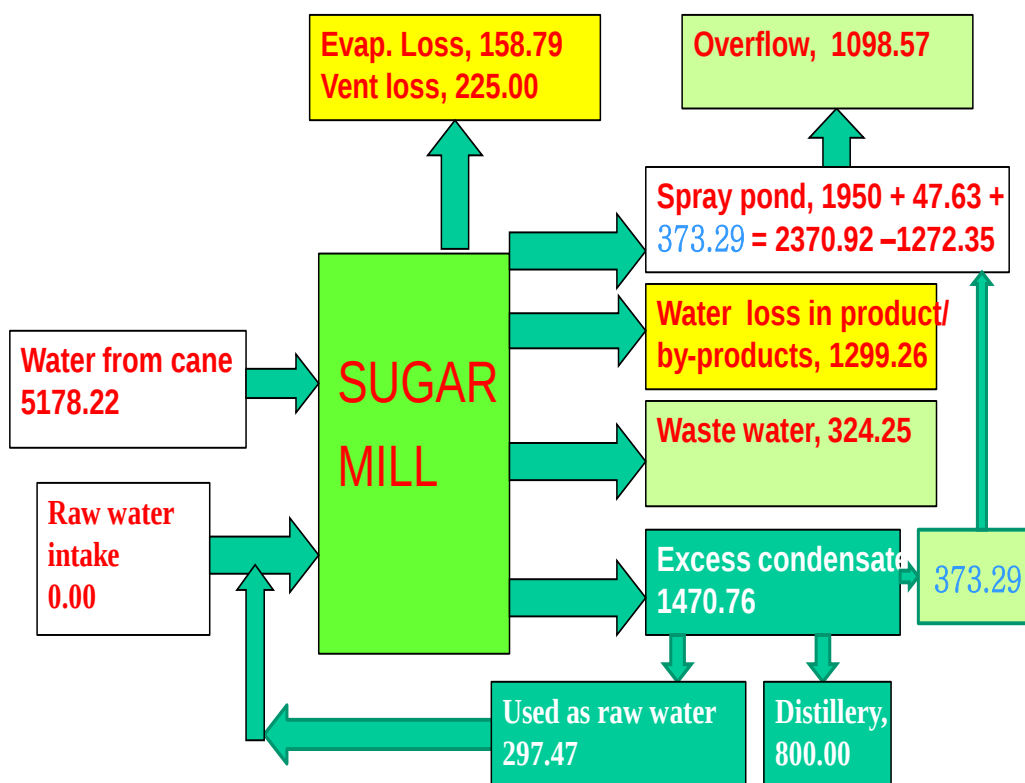
Raw Water balance (7500 MT) m³/day



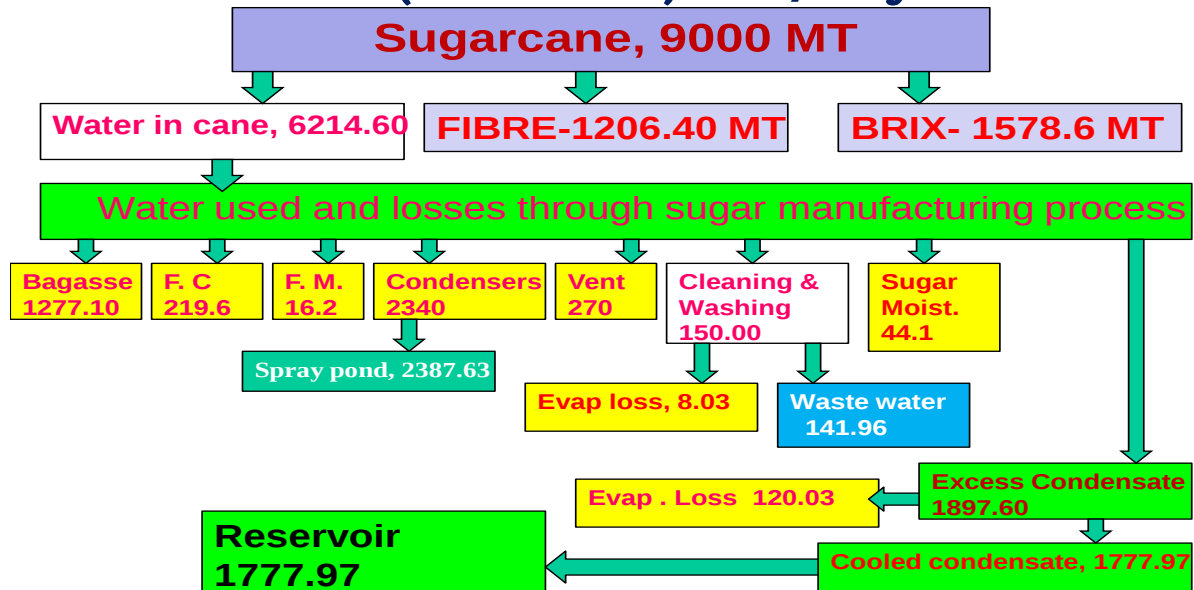
Condenser Cooling Water Balance, (7500 MT) m³/day



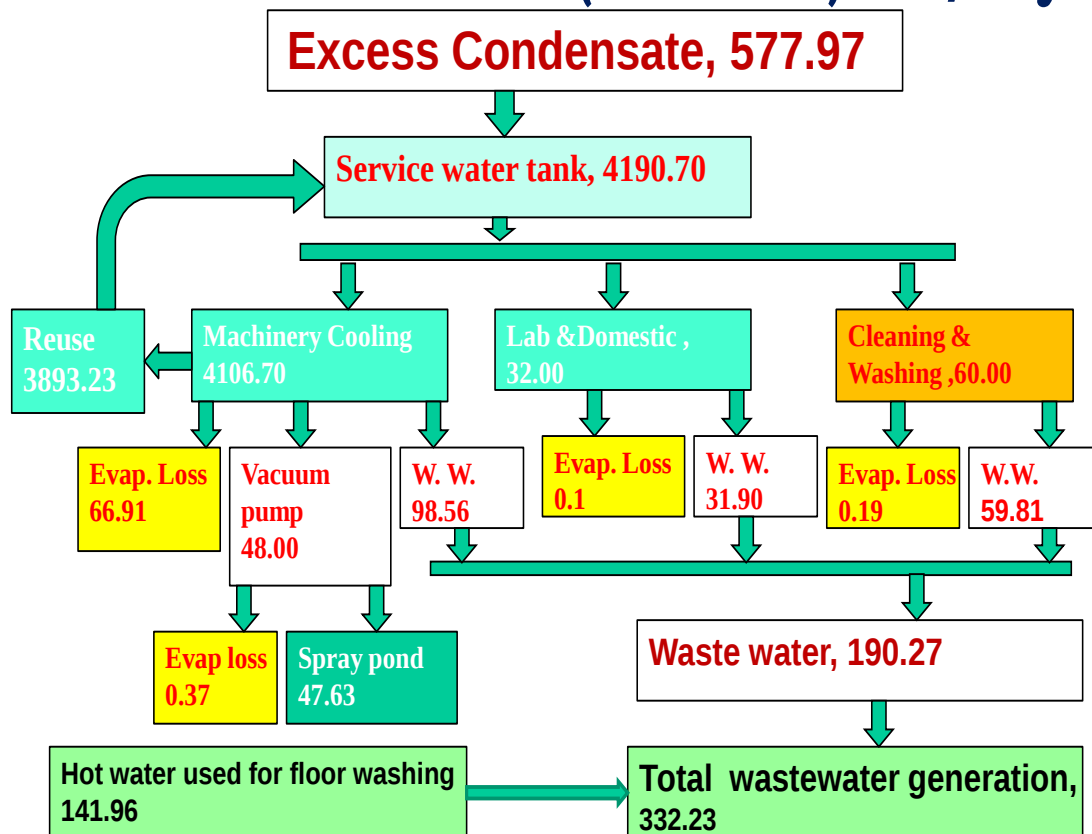
Total water balance (7500 MT), m³/day



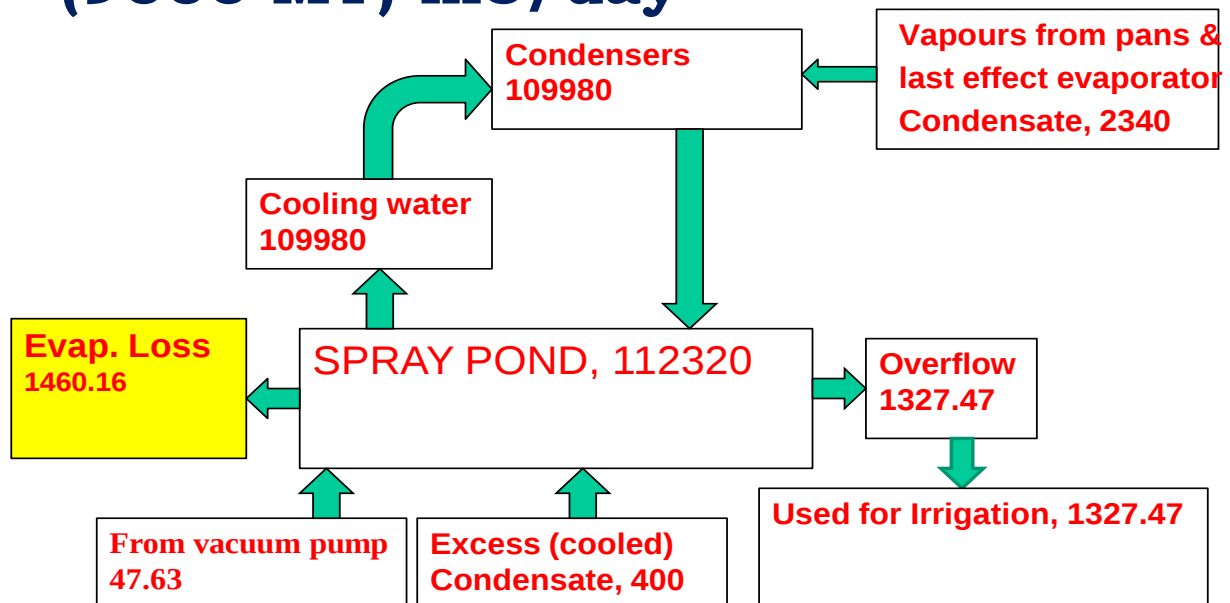
Water Balance for sugar cane, (9000 MT) m³/day



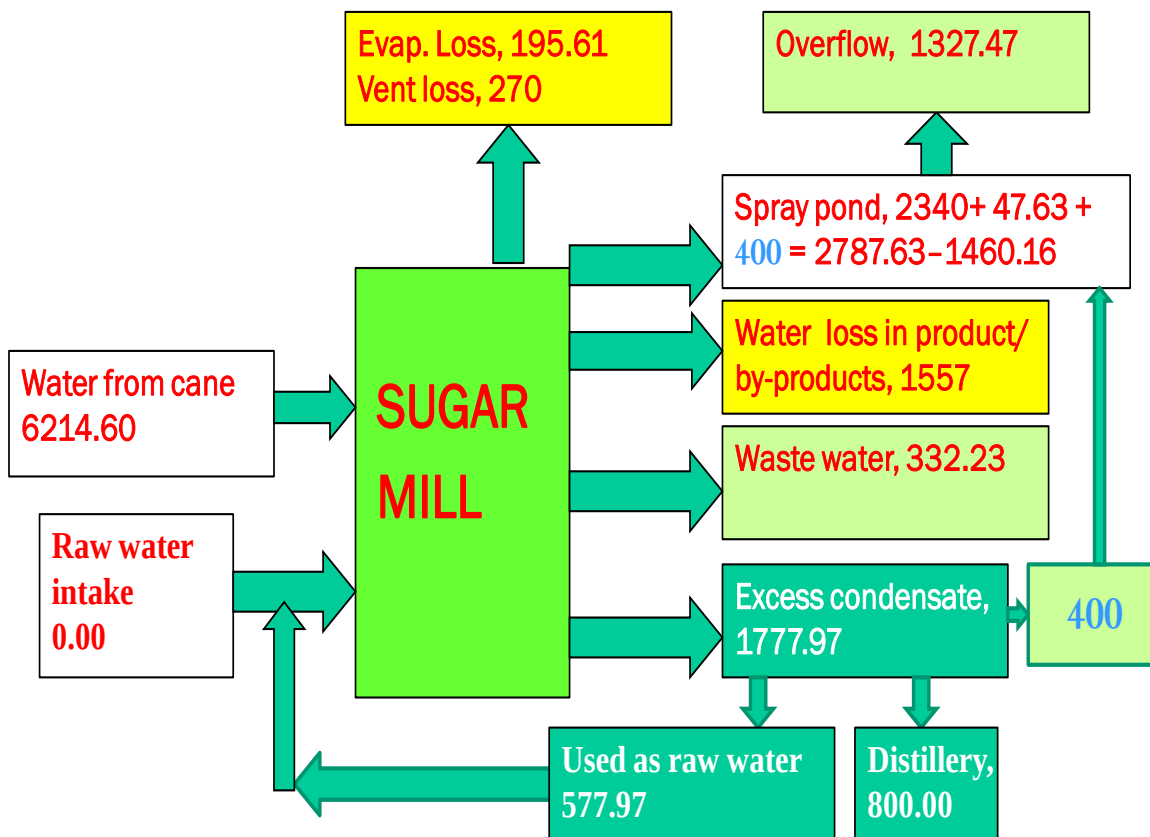
Raw Water balance (9000 MT) m³/day



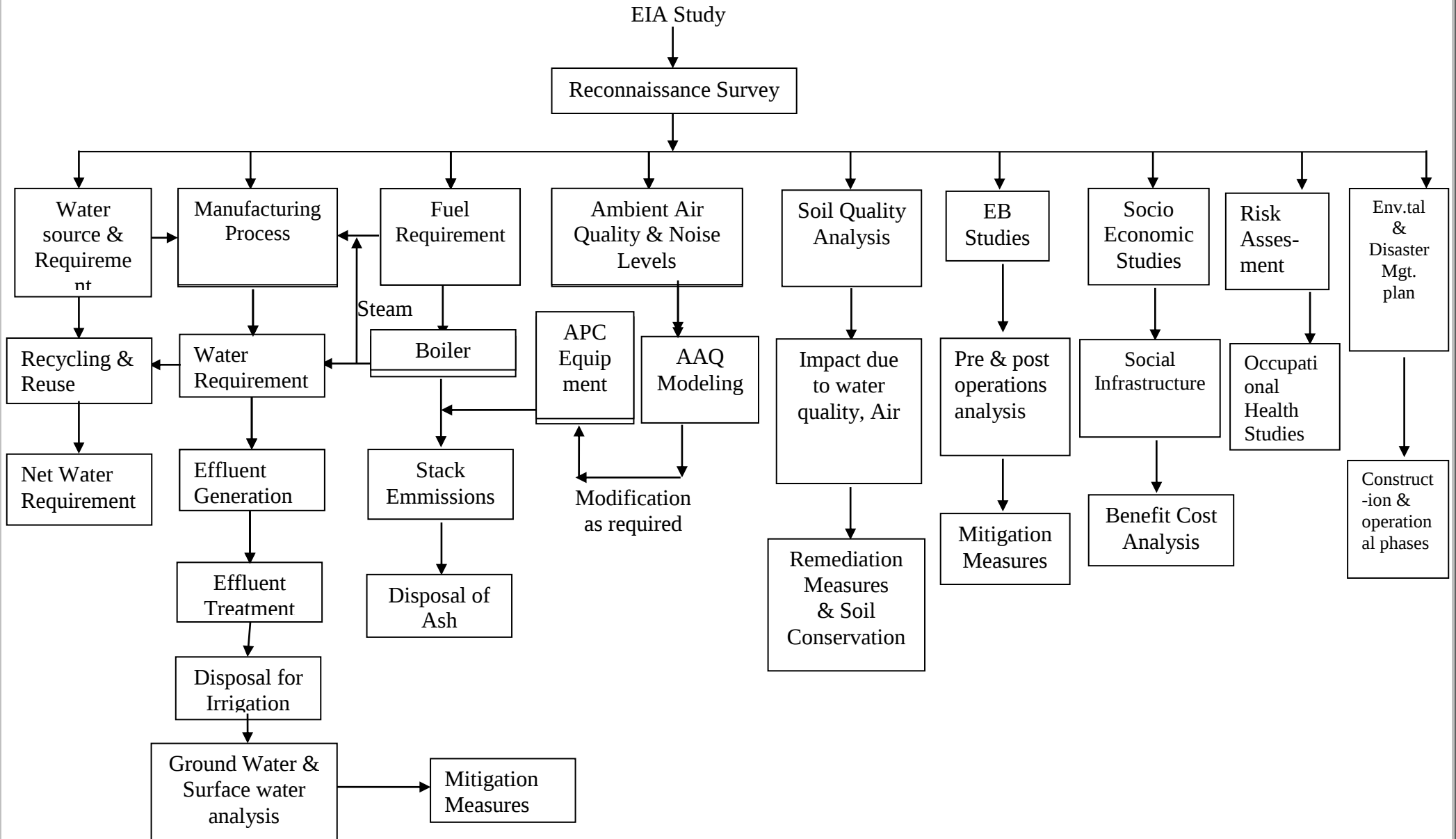
Condenser Cooling Water Balance, (9000 MT) m³/day



Total water balance(9000 M.T), m³/day



2.14 Schematic representation of the feasibility drawing which give information of EIA purpose. Fig. 5.



3.0 SITE ANALYSIS

The site is well developed and the entire land is non agriculture. The bearing capacity of soil is well above the requirement for construction activities. The contours of sites varying from 492 to 505 m. The factory is located the highest points. There would not be any drainage problems. The water source is Panchaganga River which is 3 Km. The industry is situated around the agricultural land so that the treated effluent can be used for cultivation purpose. The nearest cities are Jaysingpur and Shirol which are not so densely populated.

3.1 Connectivity

The Project Site is conveniently located for development of the Project.

- (i) 45 Km away from Kolhapur town, which is on Mumbai - Bangalore National Highway No.4
- (ii) 6 Km off the Kolhapur – Sangli State Highway.
- (iii) Other important towns nearby are
 - a. Sangli, at a distance of 16 Km.
 - b. Miraj at a distance of about 14 Km.
- (iv) 7 Km way from the nearest railway station, Jaysingpur.
- (v) Kolhapur airport is nearest to the site.
- (vi) Ratnagiri and Margaon/Vasco at 175 Km and 215 Km respectively are the nearest ports.

3.2 Land Form, Land use & Land Ownership

Most of the land in the operational area of the factory is suitable for cane cultivation. The average sugarcane yield is 115-120 tonnes/hectare in the operational area of SDSSSKL. Study of land use pattern and cropping pattern is primarily based on the information obtained from Government Departments, field interviews and discussions with farmers.

Table No. 2.2
Land Utilization Pattern in Shirol Taluka
(in hectares)

Sr. No.	Items		1960-61	1980-81	2010-11	Percentage
1.	Total Geographical Area		50809	50793	50300	
2	Area under Forest		902 (177)	896 (176)	1267 (2.59)	40.46
3	Area Not Available for Cultivation	Land Put Non-agriculture Use	339 (0.66)	2662 (5.24)	1220 (2.43)	259.88
		Barren and	3439 (6.77)	1152 (2.27)	-	-
		Cultivable Land	3778 (7.44)	3814 (7.51)	1220 (2.43)	- 67.70
		Total				
4	Other Uncultivable Land Excluding Fallow Land	Cultivable Waste Land	2178 (4.28)	1896 (3.73)	693 (1.38)	- 68.18
		Permanent	1134 (2.25)	1114 (2.9)	1491 (2.96)	31.48
		Pastured and Other Grazing Land under Misc. Tree Crop etc. not including Area	-	-	624 (1.24)	-
		Total	13312 (6.52)	3010 (5.92)	2808 (5.58)	- 78.90
5	Fallow Land	Current Fallow Land	48 (0.09)	576 (1.13)	3404 (6.77)	6991.67
		Other Fallow Land	01 (0.01)	208 (0.40)	1162 (2.31)	116100
		Total	49 (0.10)	784 (1.54)	4566 (9.07)	9218
6	Net Area Sown		42823	42289	35258	- 17.66
7	Area Sown More than Once		372 (0.86)	5834 (13.79)	1548 (4.39)	316
8	Gross Cropped Area		43195	48123	38806	- 10.16
9	Cropping Intensity		100.86	113.78	110.06	-

Source: Socio Economic Review of Kolhapur District from 1960-61 to 2006-07 & Agriculture Office, BDO, Shirol

Note : Figures in parenthesis shows percentage to total geographical area and in case of area sown more than once percent to net area sown Cropping Intensity = (Gross Cropped Area/Net Area Sown) x 100

The Table No. 3 shows that land utilization pattern of Shirol taluka since 1960-61.

3.3 Topography

Refer Annexure-V for the Countor map of the site.

3.4 Existing Infrastructure

Housing accommodation is provided for employs with drinking water & sanitation facilities. A well developed Hospital is established for the benefit of Employees, share holder & near by Villagers. Recreation facilities such as well developed Gardens, Fish pond, Temple and gymkhana are established. IT and Diploma college of engineering is established for the benefit of local people. Well developed Tar feltd/ Concrete Roads are constructed in the entire campus area.

3.5 Soil classification

The soil holding / binding vegetation such as grass shall be grown around the construction site before commencement of construction activity to reduce soil erosion.

3.6 Climatic data from secondary sources

The normal temperatures in the region are between 18⁰ C to 42⁰ C in summer and 8⁰C to 25⁰ C in winter. There is no occurrence of frost in area of operation of factory. Hence, climate of the region is well suited for sugarcane cultivation.

3.7 Social Infrastructure available

The cultural activities such as get-together of employs in various ockegens such as festivals and marriages are frequently arrange. Primary and Secondary schools are sponsored to the employees. Education loans are given to the employees. Farmers are supplied with agricultural seeds and security on bank Loans for seed capital for agricultural activities. As already mentioned a well developed Hospital is established in campus for the well fare of the employees.

4.0 PLANNING BRIEF

4.1 Planning Concept, Town & Country Planning/Development authority classification

The factory situated in a village which do not require from the town planning department however, the industry license rules are applied which are strictly followed any sanction.

4.2 Population Projection – As per Census 2001, the population was 359139. Among these, male population was 185014 and female population was 174165. The sex ratio is 941. The density is 707 sq. km. as per the census of 2001. There are 52 villages and 02 municipalities. The total urban area is only 27.20 sq. km. but as against the total rural area is 480.70 sq. km. The large numbers of people (294785) stay in rural area.

4.3 Land use planning (Break up along with green belt)

Table No. 2.3

Sr. No.	Description	Area in Hectares
1.	Built up area (Sugar & Distillery plants including storage facilities)	4.61
2.	Parking Area	10.5
3.	ETP (Sugar + Distillery)	13.0
4.	Roads	10.0
5.	Educational Institutes	2.50
6.	Green Belt	29.64
7.	Water Storage & Rain water Harvesting	2.0
8.	Domestic Colony	0.73
9.	Cogeneration plant on BOOT principles	12.0
10.	Vacant Land	0.48
	Total Area	85.46

4.4 Assessment of Infrastructure Demand (Physical & social) - It is not applicable.

4.5 Amenities/Facilities

Amenities like education, medical, water supply, communication, road network, electricity etc. are available in the project area.

5.0 PROPOSED INFRASTRUCTURE (EXISTING)

The total area available for the project is 85.46 hectares, out of which 4.61 hectares is built up area, 0.73 Hectares is a Residential area and 29.64 hectares for green belt development. Development of greenbelt in and around the industry is an effective way to check pollutants and their dispersion into surrounding areas. The degree of pollution attenuation by a green belt depends on its height and width, foliage surface area and density.

The main objective of green belt around the factory is:-

- a. Mitigation of impacts due to fugitive emissions.
- b. Attenuation of noise levels.
- c. Ecological restoration.
- d. Creation of aesthetic environment.
- e. Waste water reuse.

Criteria for selection of species for green belt:-

- a. Rapid growth and evergreen habitats
- b. Tolerance to water stress and extreme climatic conditions
- c. Difference in height and growth habits
- d. Aesthetic and pleasing appearance
- e. Provide shade
- f. Large bio-mass to provide fodder and nitrogen
- g. Improving waste land
- h. To suit specific climate and soil characteristics (local species).
- i. Sustainability with minimum maintenance

- j. Recommended plant species shall be utilized for development of green belt and greenery in and around the factory premises.

5.1 Social Infrastructure

Amenities like water supply, communication, electricity, education, medical, road network, etc. are available in the project area.

5.2 Connectivity (Traffic & Transportation Road/ Rail/Metro/Water ways etc)

The Project Site is conveniently located 7 Km way from the nearest railway station, which is Jaysingpur. Other important towns nearby are Sangli, at a distance of 16 Km & Miraj at a distance of about 14 Km. Ratnagiri and Margaon/Vasco at 175 Km and 215 Km respectively are the nearest ports.

5.3 Drinking Water Management (Source & Supply of Water)

The existing raw water requirement is 800 Cum/day and shall be drawn from Panchaganga River. For drinking purpose, the clarified water is treated in sand filters and chlorinated. No additional water is required for expansion/modernization.

Refer Annexure-III for Detailed Water Budget.

5.4 Sewerage System

The domestic effluent from existing and expansion activities is treated separately in septic tank followed by soak pits in a decentralized manner.

5.5.1 Industrial Waste Management

a. Industrial Effluent

The effluent shall be treated in the existing effluent treatment plant. The effluent treatment plant consist of preliminary treatment (Oil & Grease trap, flow meter), Equalization tank Anaerobic Filter, Aeration tank, Secondary Clarifier, Sludge drying beds and 15 days treated storage tank for no demand period. The total quantity of per day shall not exceed 700 Cum/day. The domestic effluent shall be 80 m³/day, which shall be treated in septic tanks followed by anaerobic filter. Existing ETP facilities is adequate for proposed modernization, as the effluent quantity shall not exceed 700 Cum/day as the Industry has already implemented recycle and reuse techniques of the entire condensates generated.

Refer Annexure-IV for Design feasibility report of ETP facilities provided.

b. Industrial Emissions

Steam and power are taken from Urjankur Shree Datta Power Company Ltd. There is one Boiler of 180 T/hr having a pressure of 110 Kg/Sqcm at 525°C. The Stack height is 95 meter with 4.0 meter diameter Electrostatic Precipitator is provided as APC equipment. There shall not be any additional boiler for generation of steam for proposed expansion / modernization of sugar cane crushing capacity of 9,000 TCD.

c. Hazardous waste

Around 5 MT of lubricant oils are used in a year. The spent oil generated which is classified as Hazardous waste is 0.10 MT/month. The spent oil is mixed with Bagasse and Burnt in the Boiler.

d. Solid Waste

The total quantity of pressmud & sold as manure. Garbage waste is generated to the tune of 1 MT/M & used in composting.

5.6 Solid Waste Management

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E-Mail : klp.dattsssk@gmail.com

The total quantity of pressmud generated is estimated as 10,000 - 11,000 MT per month. The disposal fly ash generated shall be the responsibility of Urjankur Shree Datta Power Company Ltd. as they are operating cogeneration power plant on BOOT Principles. It is understood that they are disposing of fly ash for composting/manure/Brick manufacturing.

5.7 Power Requirement Supply / Source

The Industry obtains the power from Urjankur Shree Datta Power Company Ltd., which is set up on BOOT principles. The capacity of the Co-generation Power plant is 36 MW. The present power requirement is 7.60 MW and after expansion the Power requirement would be 11.20 MW. Thus there would not be any power extraction from MSEB Grid. At present, the Co-generation unit is exporting around 27 MW and after expansion; the unit would export around 25 MW.

6.0 REHABILITATION & RESETTLEMENT (R&R) PLAN

There is no rehabilitation (Displacement) of habitation or villages etc. Thus resettlements do not arise.

6.1 Policy to be adopted in respect of the project affected persons including home oustees, land oustees & landless labourers.

The sugar factory would be implemented in existing premises. There are no any rehabilitation & resettlement issues involved. Hence there would not be any policy to be adopted in respect of the project affected persons like home oustees, land oustees & landless labourers.

7.0 PROJECT SCHEDULE & COST ESTIMATES

7.1 Likely Date of start of construction & likely date of completion

The project shall be started as soon as environmental clearance is received. The time required for the date of six months from the receipt of the environmental clearance obtains.

7.2 Estimated project cost along with analysis in terms of economics viability of the project

The estimated cost towards expansion activities would be Rs. 1484/-Lacs.

7.3 Proposed Schedule of Implementation

After all the clearances from the State and Central Governments are received, expected time of commissioning of shall be in November 2016.

8.0 ANALYSIS OF PROPOSAL

8.1 Financial & social benefits with special emphasis on benefits to the local people including tribal population.

The steam requirement for cane crushing is 36%. The Bagasse available is 28.5% on cane. From 7500 TCD, Bagasse available is 89.06 T/hr. The actual requirement is only 72.0 T/hr, taking into consideration Bagasse to steam ratio as 1:2.5. At present, the saving is 17.06 T/hr. The Bagasse availability after expansion would be 106.875 T/hr., whereas the Bagasse requirement to generate 180 T/hr steam would remain the same. The effective saving of Bagasse would be $106.875 - 72 = 34.875$ T/hr. taking into consideration, the existing saving of Bagasse of 17.06 T/hr, the net saving of Bagasse would be $34.875 - 17.06 = 17.815$ T/hr. The present cost of Bagasse can be taken as Rs.2000=00. Thus the net gain would be $17.815 \times 24 \times 2000 = \text{Rs.}8,55,120=00$ per day as against the loss of revenue of sale of power of 1.52 MW which is required for expansion. Taking into consideration, the present cost of power as Rs. 6.07 per unit, the revenue loss would be $1.52 \times 1000 \times 24 \times 6.07 = \text{Rs.}2,21,433.60$. Thus the net gain in terms of fuel saving would be $\text{Rs } 8,55,120=00 - \text{Rs } 2,21,433.60 = \text{Rs } 6,33,686.40$ (Six lakh thirty three thousand six hundred eight six rupees and paise forty) only per day. This additional benefit can be transferred to farmers as cane price. Besides the direct benefit, the expansion would help to crush cane intime so that the high recovery due to timely crushing would further improve the economy of the farmers.

Table No. 2.4

A. STANDRAD TERMS OF REFERENCE		
Sr. No.	TOR Condition	Compliance
1.	Executive Summary of the project.	Pg 3-4
2.	Introduction. i. Details of the EIA Consultant including NABET accreditation. ii. Information about the project proponent. iii. Importance and benefits of the project.	Pg 1-2 Pg 5-10 Pg 8-9
3.	Project Description. i. Cost of project and time of compliance. ii. Products with capacities for the proposed project. iii. If expansion project, details of existing product with capacities and whether adequate land is available for expansion, reference of earlier EC if any. iv. List of raw materials required and their source along with mode of transportation. v. Other chemicals and materials required with quantities and storage capacities. vi. Details of Emission, effluents, hazardous waste generation and their management. vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract). viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided. ix. Hazard identification and details of proposed safety systems. x. Expansion/ modernization proposals. a. Copy of all the environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances of Consent to Operate for the ongoing existing operation of the project from SPCB shall be attached with the EIA-EMP report. b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/ or EIA Notification 2006 shall be provided. Copies of Consent to Establish /No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consent from the SPCB shall be submitted.	i. Pg 3-4 6months, after EC ii. Pg 19-20 iii. Pg 19-20, Yes Existing unit, EC- 23 rd March 2000 iv. Pg 19 v. Pg 19 vi. ETP-240, ESP-91, Spent oil. vii. Pg 21-24, Panchaga nga River, approved, No viii. Pg 16-18 ix. Pg 205- 225 x. A.EC is enclosed. B.Enclosed
4.	Site Details: Location of the project site covering village, Taluk/Tehsil, District and State, Justification for selecting the site whether other sites were considered. i. A toposheet of the study area of radius of 10Km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places) ii. Details w.r.t. option analysis for selection of site. iii. Co-ordinates (lat-long) of all four corners of the site.	i. Pg 14 ii. NA –Existing Unit iii. Pg 11

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E-Mail : klp.dattsssk@gmail.com

	iv. Google map-Earth downloaded of the project site. v. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area /Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/ Estate. vi. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular. vii. Landuse break-up of total land of the project site (identified and acquired), government/private-agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area) viii. A list of major industries with name and type within study area (10Km radius) shall be incorporated. Land use details of the study area. ix. Geological feature and Geo-hydrological status of the study area shall be included. x. Details of Drainage of the project upto 5Km radius of study area. If the site is within 1Km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects) xi. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land. xii. R & R details in respect of land in line with state Government policy.	iv. Pg 107-108 v. Pg 15 vi. Pg 15, 226-227 vii. Pg 29 viii. NA ix. Pg 92-96 x. Pg 92-96, River is 3 kms away xi. NA xii. NA
5.	Forest and wildlife related issue (if applicable): i) Permission and approval for the use of forest land (forestry clearance), if any and recommendations of the State Forest Department. (if applicable) ii) Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha) iii) Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted. iv) The projects to be located within 10 Km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden thereon. v) Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area. vi) Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife.	i. NA ii. NA iii. NA iv. NA v. NA vi. NA
6.	Environmental Status: i) Determination of atmospheric inversion level at the project site and site-specific micrometeorological data using temperature, relative humidity, hourly wind speed and direction and rainfall. ii) AAQ data (except monsoon) at 8 location level for PM₁₀, PM_{2.5}, SO₂, NOX,	i. Data is taken as per AEROMOD version 7.4

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E-Mail : klp.dattsssk@gmail.com

	CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the predominant wind direction, population zone and sensitive receptors including reserved forests. iii) Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQPM Notification of Nov.2009 along with – min, max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as annexure to the EIA Report. iv) Surface water quality of nearby River (100m upstream and downstream of discharge point) and others surface drains at eight locations as per CPCB/MoEF & CC guidelines. v) Whether the site falls near to pollution stretch of river identified by the CPCB/MoEF & CC if yes give details. vi) Ground water monitoring at minimum at 8 locations shall be included. vii) Noise levels monitoring at 8 locations within the study area. viii) Soil characteristic as per CPCB guidelines. ix) Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc. x) Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule- I fauna within the study area, a Wildlife Conservation Plan shall be prepared and furnished. xi) Socio-economic status of the study area.	ii. Annexure - 24 Tables iii. Annexures- VIII-24 Tables iv. Pg 79-80 v. NO vi. Pg 78 vii. Pg 89-90 viii. Pg 81-88 ix. Annexure x. Pg 112-140 xi. Pg 141-175
7.	Impact and Environment Management Plan: i) Assessment of ground level concentration of pollutants from the stack emission based onsite-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modeling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used and the input data used for modeling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any. ii) Water Quality modeling – in case of discharge in water body. iii) Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail-cum road transport or conveyor cum-rail transport shall be examined. iv) A note on treatment of wastewater from different plant operations, extent recycled and reused for different purpose shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules. v) Details of stack emission and action plan for control of emissions to meet standards. vi) Measures for fugitive emissions control.	i. Pg 40-49 ii. NA iii. No significant increase in traffic vehicles iv. Pg-239 v. Mainly PM; APC-ESP vi. Sprinkling of water and dust collector

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PO : DATTANAGAR 416 120 TALUKA-SHIROL, DIST.KOLHAPUR, (MS) India
E-Mail : klp.dattsssk@gmail.com

	vii) Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation. viii) Proper utilization of fly ash shall be ensured as per fly Ash Notification 2009. A detailed plan of action shall be provided. ix) Action plan for the green belt development plan in 33% area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc, shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated. x) Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources. xi) Total capital cost and recurring cost/annum for environmental pollution control measures shall be included. xii) Action plan for post-project environmental monitoring shall be submitted. xiii) Onsite and Offsite Disaster (Natural and Man-made) Preparedness and Emergency Management plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.	vii. Spent oil-only HW, Pg 186-206 viii. Fly Ash is used in Composting and sold to brick manufacturers ix. 80% completed x. Complied xi. Capital Cost-2 Cr Recurring Cost-50 lakhs xii. Pg 186-206 xiii. Onsite Plan is prepared and offsite plan is to be implemented, 207-225.
8.	Occupational Health: i) Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers. ii) Details of exposure specific health status evaluation of worker. If the worker's health is being evaluated by pre designed format, chest x-rays, Audiometry, Spirometry, Vision testing (Far & Near vision, color vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise. iii) Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the workers can be preserved. iv) Annual report of health status of workers with special reference to Occupational Health and Safety.	i. Pg 203 ii. Pg 202-203 iii. Pg 202-203 iv. 202-203
9.	Corporate Environment Policy i) Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report. ii) Does the Environment Policy prescribe for standard operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/conditions? If so, it may be detailed in the EIA. iii) What is the hierarchical system or Administrative order of the company to deal with the environmental clearance conditions? Details of this system may be given. iv) Does the company have system of reporting of non compliances/violations of environmental norms to the Board of Directors of the company and /or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.	i. Pg-176 & 204 ii. Pg-204 iii. Pg-208 iv. Pg-206
10.	Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided	Existing facilities

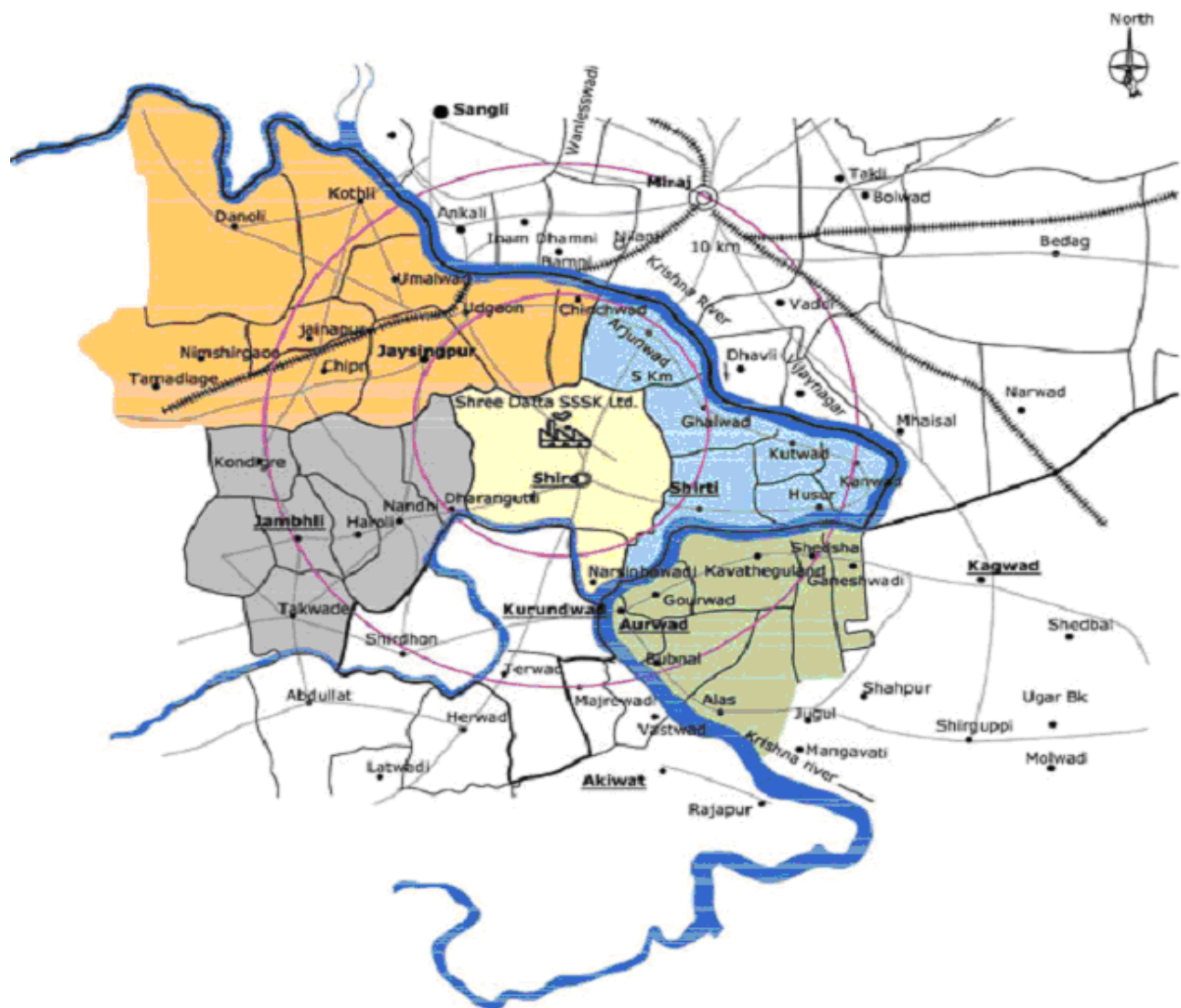
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E-Mail : klp.dattsssk@gmail.com

	to the labor force during construction as well as to the casual workers including truck drivers during operation phase.	are adequate
11.	Enterprise Social Commitment (ESC) adequate funds (at least 2.5% of the Project cost) shall be earmarked towards the Enterprise Social Commitment based on public hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.	Yes, Earmarked Public Hearing yet to conducted
12.	Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.	NO
13.	A tabular chart with index for point wise compliance of above TOR	YES

B.SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR SUGAR INDUSTRY & THERMAL PLANTS		
1.	Complete process flow diagram describing each unit, its processes and operations in production of sugar, along with material and energy inputs and outputs (material and energy balance).	Included
2.	Details on water balance including quantity of effluent generated, recycled & reused. Efforts to minimize effluent is charge and to maintain quality of receiving water body.	Included
3.	Details of effluent treatment plant, inlet and treated water quality with specific efficiency of each treatment unit in reduction in respect to fall concerned/regulated environmental parameters.	Included
4.	Number of working days of the sugar production unit.	180 Days
5.	Details of the use of steam from the boiler.	128 T/h
6.	Details of proposed source-specific pollution control schemes and equipments to meet the national standards.	
7.	Collection, storage, handling and transportation of molasses.	Steel tanks
8.	Collection, storage and handling of bagasse and Pressmud.	Closed Sys.
9.	Fly ash management plan for coal based and bagasse and action plan.	Brk&cmpst.
10.	Details on water quality parameter such as Temperature, Colour, pH, BOD, COD, Total Kjeldhal Nitrogen, Phosphates, Oil & Grease, Total Suspended Solids and Total Coli form bacteria etc.	Enclosed
11.	Details on existing ambient air quality and expected, stack and fugitive emissions for PM10, PM2.5, SO2*, NOx*, etc., and evaluation of the adequacy of the proposed pollution control devise to meet standards for point sources and to meet AQ standards. (*-As applicable)	Enclosed

Additional TORs for EIA studies:

1.	For the EIA report the prescriptions of Model ToR by MoEF published in April, 2015 shall be adopted.	Complied
2.	Detail analysis of fuel requirement for the boiler may be made to prove that additional fuel will not be required.	Already Covered
3.	Details of emissions inventory may be given w.r.t. steam generation and effluent.	Already Covered
4.	The PP shall achieve an outlet TPM of less than 100 mg/Nm3.	Complied
5.	In consonance with the Notification of CPCB the PP shall not exceed quantum of final treated effluent discharge beyond 100 lit/tonnes of cane crushed. Similarly quantum of waste water from spray pond / cooling towers blow down shall not exceed 100 lit/tonnes of cane crushed. These may be shown through precise calculations.	Complied
6.	Details of ash management including storage facility and disposal of ash to brick manufacturers ensuring there is no generation of air pollutants in the entire process of handling of ash may be described.	Complied
7.	Public consultation will be required.	To be Held



3.1 Introduction

Shree Datta Shetkari SSK Limited (SDSSSKL) is located at Dattanagar, Taluka Shirol, District Kolhapur in the state of Maharashtra. The sugar factory has installed capacity of 7500 TCD and proposes to modernize the sugar factory capacity to 9000 TCD by improving the efficiency steam consumption from the existing 39% to 34 % per ton of cane crushed.

The factory established 36 MW bagasse based cogeneration plant based on BOOT principle . The major fuel envisaged for the cogeneration plant during season is Bagasse and during off-season, saved Bagasse, imported coal and agro waste/biomass. The steam is generated from 180 TPH Boiler with the outlet steam parameters of 110 kg/sq. cm (g) and 540 deg. C.

3.2 Location and plant layout

The Co-gen Project was located in the sugar factory complex. The Project Site is conveniently located for development of the Project.

- 45 km away from Kolhapur town, which is on Mumbai –Bangalore National Highway No. 4
- km off the Kolhapur - Sangli State Highway

3.3 Fuel used

During season operation, the boiler will consume 72 TPH bagasse for 180 days of operation, whereas the excess bagasse available will be 36.75 TPH which can be used during off-season operation, for 90 days. Thus the Power plant can operate for 270 days with bagasse as fuel. The unit may further operate with imported coal of 25 TPH.

3.4 Stack Height Calculations

The main operating fuels for the boilers will be bagasse and imported coal. The stack height for the boiler shall be decided based on the operation with bagasse and imported coal, considering both the particulate and SO₂ emissions. The calculated stack height shall be about 95 m. The stack shall be of Reinforced Cement Concrete (RCC) construction, with internal firebrick lining for the entire height of the stack. The air gap between the lining and the RCC shall be properly maintained with adequate air inlet and vent holes in the shell. The stack shall be provided with lightning protection and aviation warning lights, as per acceptable standards.

3.4.1 Stack Height Calculation Based on SO₂ Emission

Stack height is calculated using following formula

$$H = 14 (Q)^{0.3}$$

H is height of Chimney

$$Q = \frac{\text{Quantity of fuel (kg/hr)} \times \text{sulphur content (\%)} \times 2}{100}$$

The sulphur content in the bagasse is negligible (around 0.1 %) as compared to coal (around 1%). Therefore the stack height will be calculated on the basis of coal.

Bagasse will be mainly used in the off-season operation also. However maximum quantity of coal that will be burnt is 24.49 TPH. The SO₂ emission = $24.49 \times 0.01 \times 2 \times 1000 = 489.80 \text{ kg/hr}$

$$H = 14 (489.80)^{0.3}$$

$$= 89.8 \text{ meters}$$

Based on Ash Emissions

Stack height is calculated using following formula

$$H = 74 (Q)^{0.27}$$

H is height of Chimney

$$Q = \text{Quantity of fuel (MT/hr)} \times \text{Ash content (\%)} \times 70\% \text{ (in flue gas)}$$

The ash content in the coal is (around 10 %) as compared to 1.83 % in Bagasse. Therefore the stack height will be calculated on the basis of coal.

Therefore provide the stack height of 95 meters.

3.5 Air quality estimation

Air quality estimations is done based on AERMOD version 7.4. The required meteorological data is monitored at the site and the data for AERMOD model was obtained from Envitrans Gaziabad, UP based on the model studies the Isoplethes were drawn. It is observed that the maximum concentration in Study area as below which are well within the NAAQS standards.

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD., SHIROL
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E-Mail : klp.dattsssk@gmail.com

Table No. 3.1

Sr. No.		SO x	NO x	PM 10	PM2.5	CO
1	CONCENTRATIONS	19.28	41.82	76.45	48.45	***
2	NAAQS	80	80	100	60	2

AMBIENT AIR QUALITY STANDARDS :(Prescribed by CPCB) Table No. 3.2

Pollutants	Time weighted average	Concentration in Ambient Air (µg/m ³)		
		Industrial Areas	Residential, Rural & other areas	Sensitive Areas
Sulphur Dioxide (SO ₂)	Annual Average*	80	60	15
	24 hours **	120	80	30
Oxides of Nitrogen as NO ₂	Annual Average*	80	60	15
	24 hours **	120	80	30
Suspended Particulate Matter (SPM)	Annual Average*	360	140	70
	24 hours **	500	200	100
Respirable Particulate Matter (RPM)	Annual Average*	120	60	50
	24 hours **	150	100	75

Sr. No.	Location	Maximum Concentrations (in µg/m ³)				
		March				
		SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	PM 10 (µg/m ³)	PM2.5 (µg/m ³)	CO (mg/m ³)
1	Main Gate	11	28	65	28	0.2
2	Shirol	15	38	74	45	0.3
3	Arjunwad	15	28	65	35	0.15
4	Chipri	13	18	60	26	0.4
5	Jaysingpur	18	38	76	48	0.28
6	Kondigiri	14	24	68	40	0.3
7	Kanwad	14	30	50	36	0.16
8	Kurundwad	15	30	48	30	0.197
Maximum Concentrations (in µg/m ³)						

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Sr. No.	Location	April				
		SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	PM 10 (µg/m ³)	PM2.5 (µg/m ³)	CO (mg/m ³)
1	Main Gate	13	27	62	29	0.15
2	Shirol	15	40	72	42	0.16
3	Arjunwad	12	26	66	38	0.17
4	Chipri	12	18	58	28	0.19
5	Jaysingpur	18	32	76	46	0.34
6	Kondigiri	14	26	65	35	0.24
7	Kanwad	15	28	48	36	0.245
8	Kurundwad	15	30	46	32	0.186

Maximum Concentrations (in µg/m³)

Sr. No.	Location	May				
		SO x	NO x	PM 10	PM2.5	CO
1	Main Gate	12	26	60	29	0.16
2	Shirol	15	31	73	45	0.2
3	Arjunwad	13	28	68	28	0.16
4	Chipri	12	22	58	28	0.15
5	Jaysingpur	18	36	74	46	0.34
6	Kondigire	15	26	65	38	0.212
7	Kanwad	14	32	50	38	0.252
8	Kurundwad	15	29	55	32	0.205

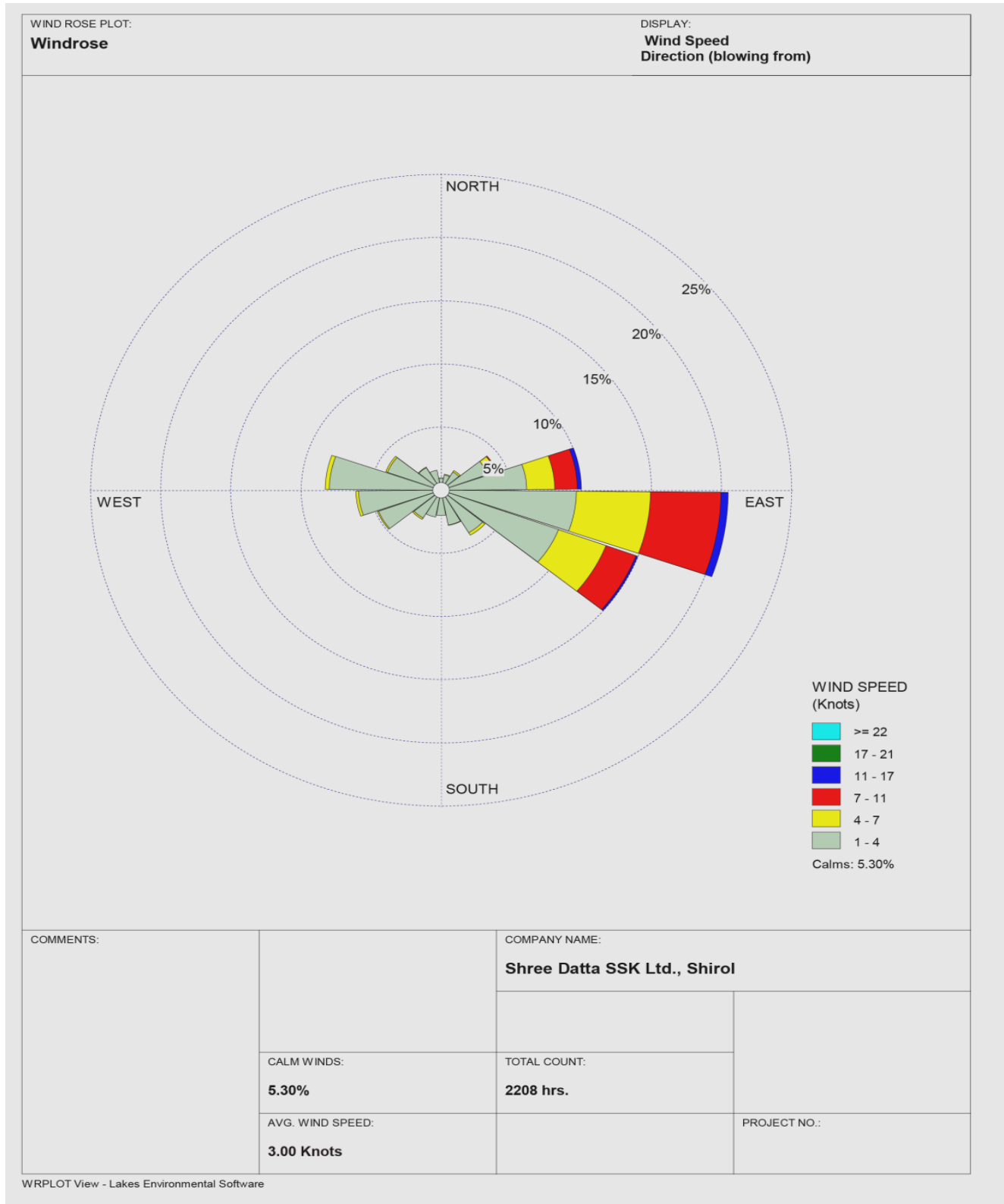
MAXIMUM	18	40	76	48
IMPACT DUE TO THE EXPANSION OF SUGAR FACTORY UNIT AT 9000 TCD CAPACITY	1.28	1.82	0.45	0.45
TOTAL MAXIMUM CONCENTRATIONS AT ANY POINT IN STUDY AREA	19.3	41.8	76.5	48.5

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD., SHIROL

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WIND ROSE DIAGRAM (AERMET) Fig.3.2

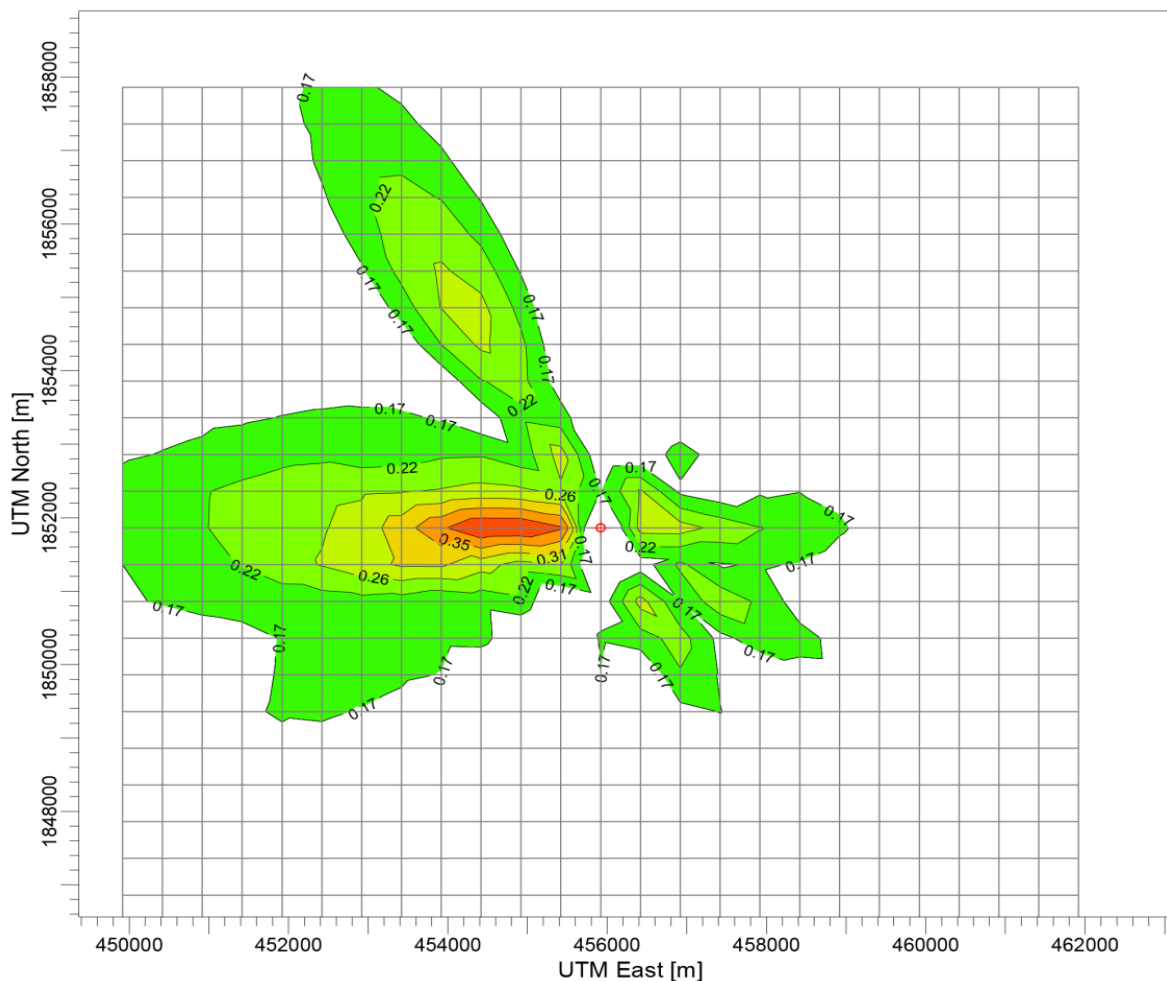


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ISOPHELETES FOR PM 10 (AERMOD) Fig.3.3

PROJECT TITLE:

C:\Lakes\AERMOD View\datta sssk ltd\datta sssk ltd.isc



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

ug/m³



COMMENTS:	SOURCES:	COMPANY NAME:	
	1	Shree Datta SSSK Ltd., Shirol	
	RECEPTORS:		
	625		
	OUTPUT TYPE:	SCALE:	1:87,000
	Concentration	0  3 km	
	MAX:	DATE:	PROJECT NO.:
	0.44462 ug/m³	8/17/2016	

AERMOD View - Lakes Environmental Software

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD., SHIROL

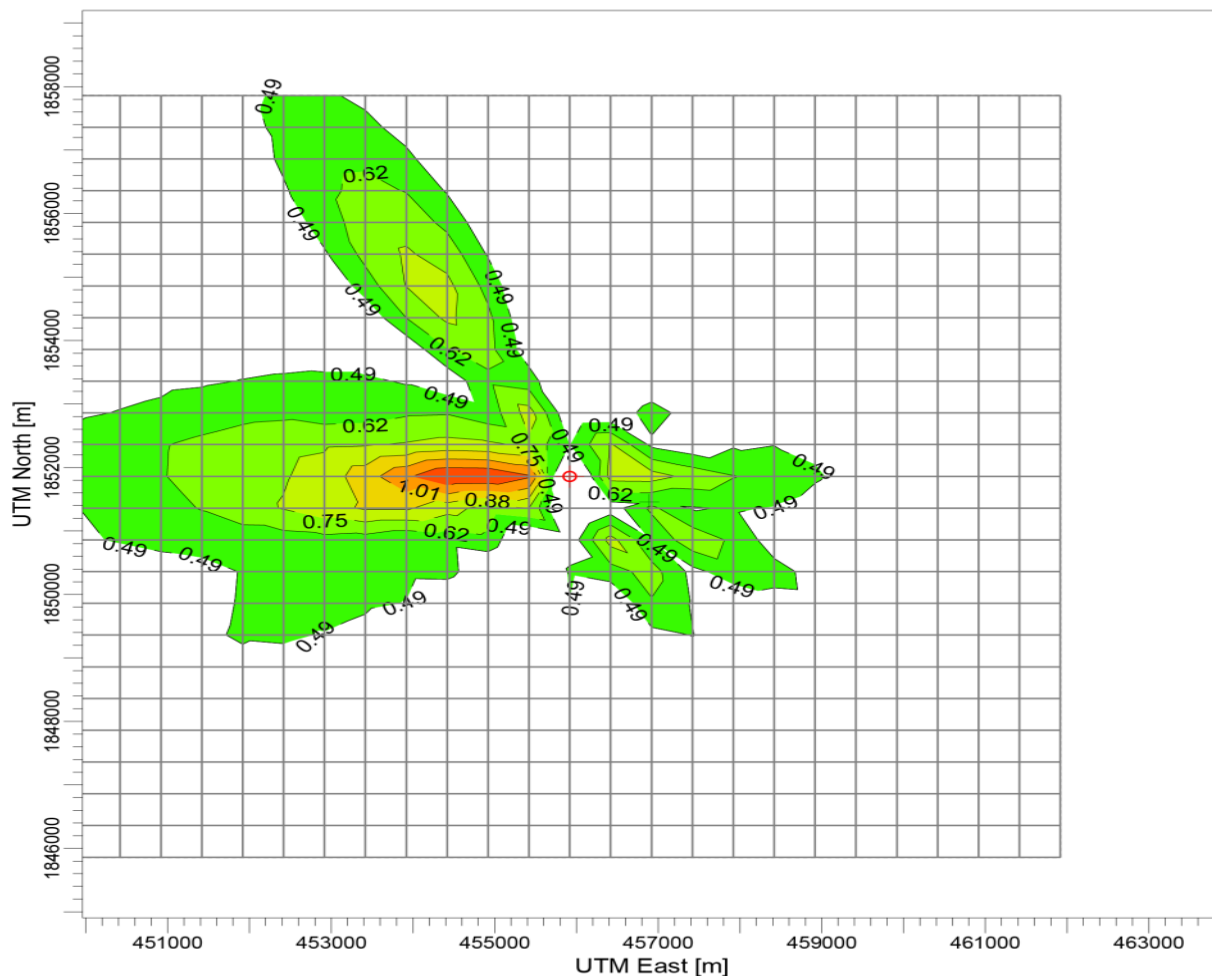
PO : DATTANAGAR 416 120 TALUKA-SHIROL, DIST.KOLHAPUR, (MS) India

E-Mail : klp.dattsssk@gmail.com

ISOPHELETES FOR SO_x (AERMOD) Fig.3.4

PROJECT TITLE:

C:\Lakes\AERMOD View\datta sssk ltd\datta sssk ltd.isc



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

ug/m³



COMMENTS:

SOURCES:

1

COMPANY NAME:

Shree Datta SSSK Ltd., Shirol

RECEPTORS:

626

OUTPUT TYPE:

Concentration

SCALE:

1:90,000

0 3 km

MAX:

1.27306 ug/m³

DATE:

8/17/2016

PROJECT NO.:

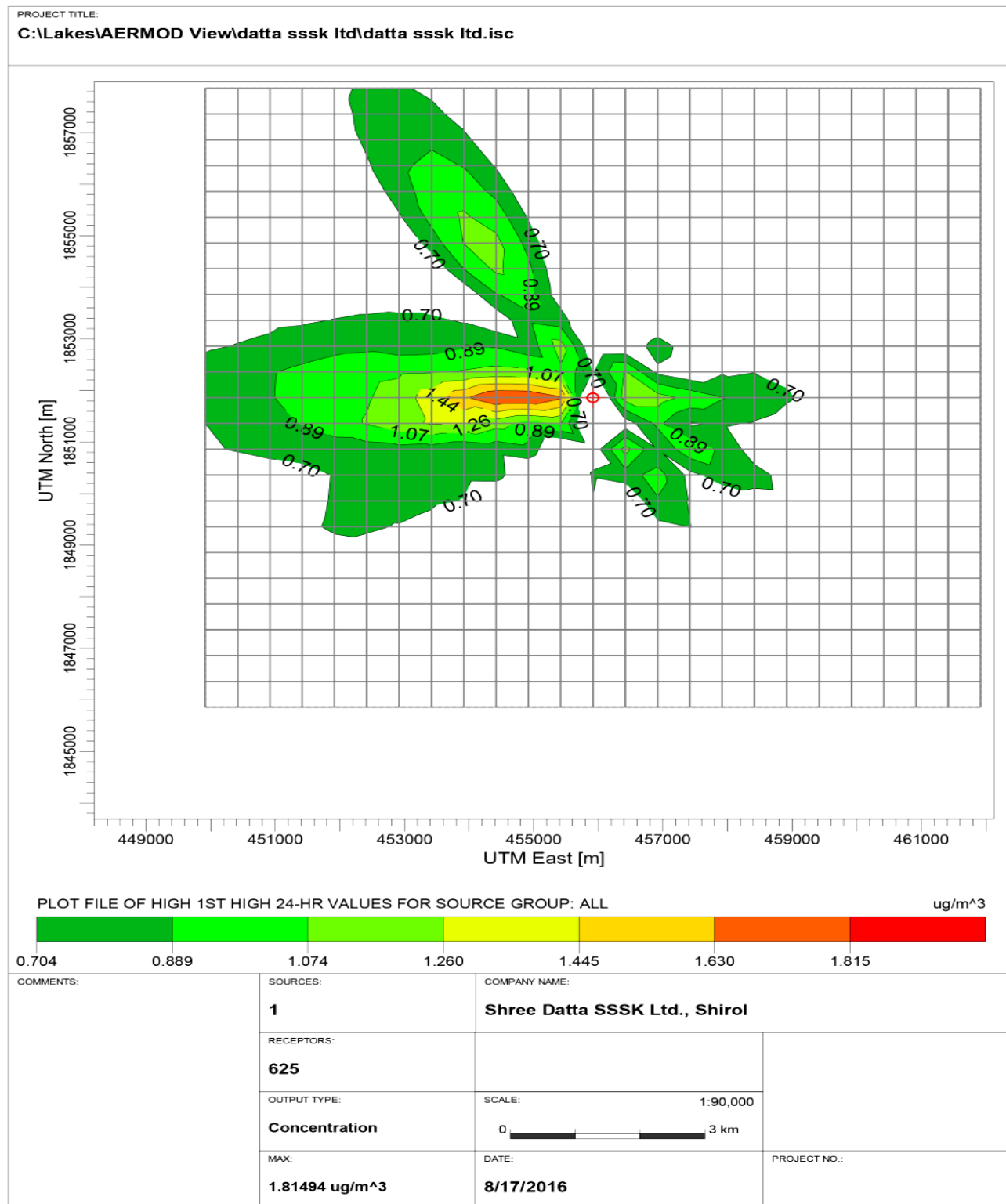
AERMOD View - Lakes Environmental Software

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD., SHIROL

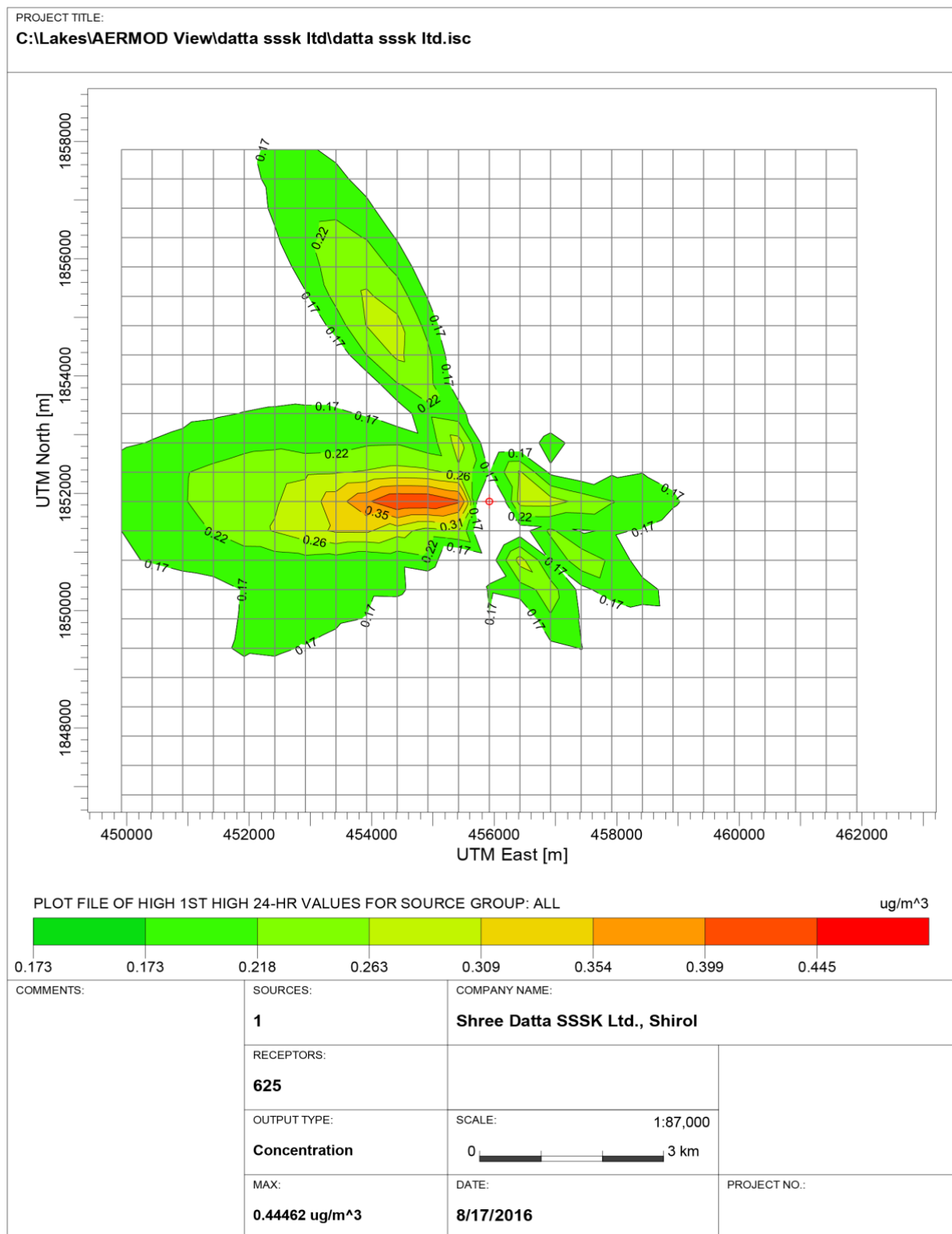
PO : DATTANAGAR 416 120 TALUKA-SHIROL, DIST.KOLHAPUR, (MS) India

E-Mail : klp.dattsssk@gmail.com

ISOPHELETES FOR NO_x (AERMOD) Fig.3.5



ISOPHELETES FOR PM 2.5 (AERMOD) Fig.3.6

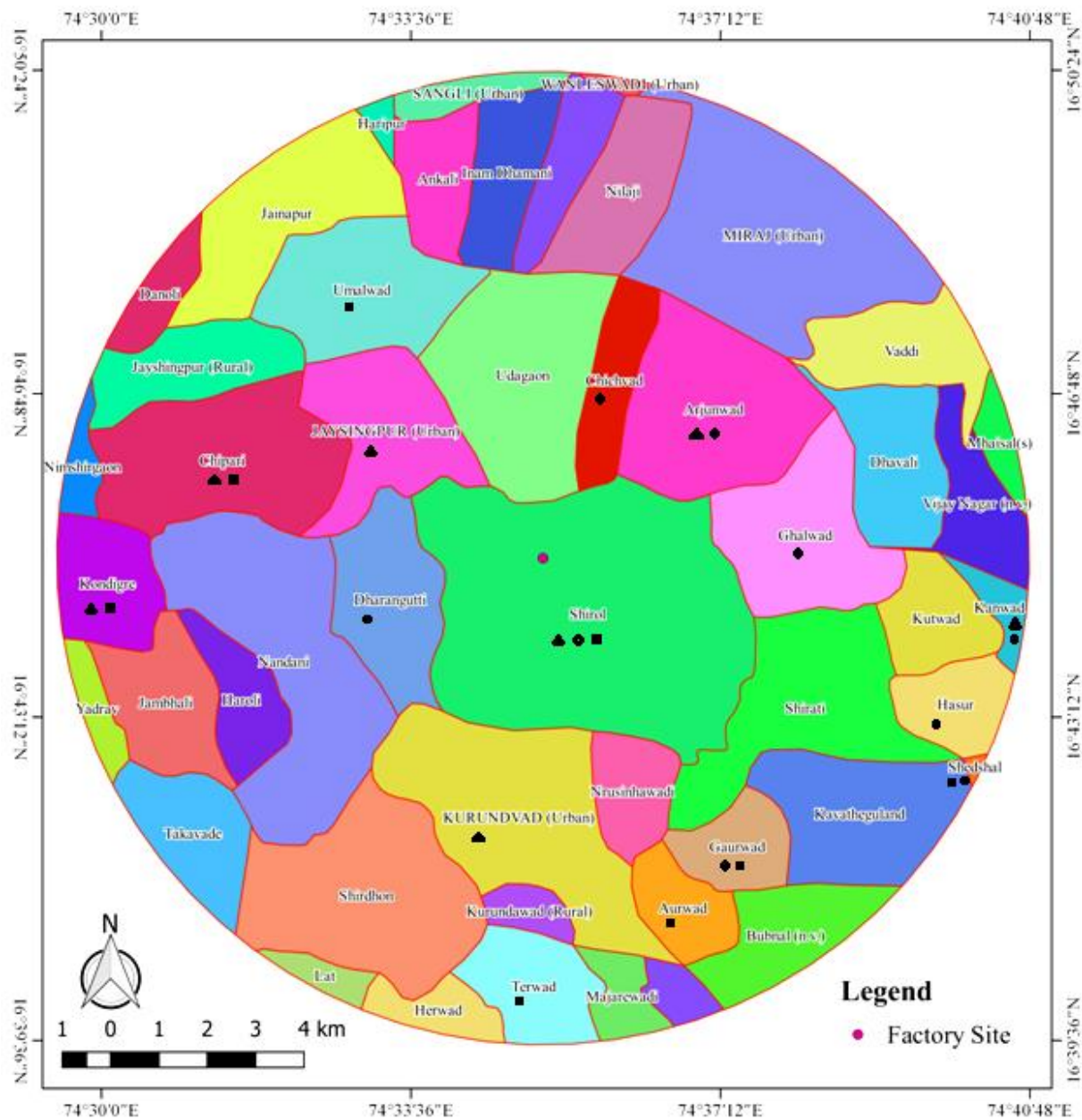


AERMOD View - Lakes Environmental Software

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ENVIRONMENTAL STATUS

Fig.4.1



Index:

	Ambient Air Quality & Noise Level Sample
	Bore well Sample
	Soil Sample

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD., SHIROL
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E-Mail : klp.dattsssk@gmail.com

Table No. 4.1

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Bapu Rama Ghatge, Arjunwad road Chinchwad.
Location : NL- 16°51'21", EL- 74°35'49"

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Result	Unit	Limit	Test Method
1.	Color	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.68	-	--	IS:3025(P-11)1983
4.	Turbidity	3.4	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	850	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	983	µmhos/cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	662	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	605	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	57	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	242	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	14	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	215	mg/l	--	IS:3025(P-23)1986

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Bapu Rama Ghatge, Arjunwad road Chinchwad.

Location : NL- 16°51'21", EL- 74°35'49"

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
13.	Chlorides (as Cl)	235	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	38	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	2.12	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 0.45	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.092	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.1	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.1	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	0.13	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.34	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.01	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.05	mg/l	--	AAS

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Bapu Rama Ghatge, Arjunwad road Chinchwad.

Location : NL- 16°51'21", EL- 74°35'49"

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.1	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.03	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.01	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.02	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.005	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	70	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	0.5	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	26	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Biroba Maal Mandir, Arjunwad.

Location : NL- 16°46'48", EL- 74°36'45"

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Result	Unit	Limit	Test Method
1.	Color	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.80	-	--	IS:3025(P-11)1983
4.	Turbidity	0.3	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	920	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	333	µmhos/cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	157	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	95	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	62	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	38	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	15	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	125	mg/l	--	IS:3025(P-23)1986

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Biroba Maal Mandir, Arjunwad.

Location : NL- 16°46'48", EL- 74°36'45"

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
13.	Chlorides (as Cl)	71	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	24	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	2.12	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 0.5	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.08	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.1	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.1	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	0.12	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.28	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.03	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.05	mg/l	--	AAS

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Biroba Maal Mandir, Arjunwad.

Location : NL- 16°46'48", EL- 74°36'45"

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.5	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.03	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.005	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.02	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.005	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	52.9	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	3.9	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	21	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Rajendra Dattatray Patil, Raygound Galli, Dharangutti.
Location : NL- 16°43'51'', EL- 74°33'52''
Sample Quantity : 2000ml
Date of Collection:- 04/03/2016

Sr. No.	Parameter	Result	Unit	Limit	Test Method
1.	Color	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.63	-	--	IS:3025(P-11)1983
4.	Turbidity	0.8	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	2000	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	1895	µmhos/cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	1123	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	983	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	62	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	141	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	34	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	385	mg/l	--	IS:3025(P-23)1986

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Prakash Ramchandra Mahadik, Arjunwad.

Location : NL- 16°44'45'', EL- 74°36'10''

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
13.	Chlorides (as Cl)	342	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	74	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	3.47	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 0.4	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.1	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.02	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.05	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	0.09	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.42	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.04	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.5	mg/l	--	AAS

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Prakash Ramchandra Mahadik, Arjunwad.

Location : NL- 16°44'45'', EL- 74°36'10''

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.2	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.02	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.05	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.01	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.005	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	272	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	1.6	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	20	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Manohar Nana Thorvat, Ghalwad

Location : NL- 16°44'48'', EL- 74°37'44''

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Result	Unit	Limit	Test Method
1.	Color	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.71	-	--	IS:3025(P-11)1983
4.	Turbidity	1.8	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	950	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	882	µmhos/cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	587	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	500	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	87	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	200	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	21	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	300	mg/l	--	IS:3025(P-23)1986

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Manohar Nana Thorvat, Ghalwad

Location : NL- 16°44'48'', EL- 74°37'44''

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
13.	Chlorides (as Cl)	152	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	38	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	2.56	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 0.8	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.01	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.05	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.05	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	< 0.1	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.2	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.04	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.5	mg/l	--	AAS

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Manohar Nana Thorvat, Ghalwad

Location : NL- 16°44'48'', EL- 74°37'44''

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.5	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.03	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.005	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.02	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.005	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	69	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	1.1	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	18	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Ahmadiya Majid, Kanwad.
Location : NL- 16°44'5'', EL- 74°41'28''

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Result	Unit	Limit	Test Method
1.	Color	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.62	-	--	IS:3025(P-11)1983
4.	Turbidity	0.2	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	920	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	766	µmhos/cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	272	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	200	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	72	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	80	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	18	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	500	mg/l	--	IS:3025(P-23)1986

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Ahmadiya Majid, Kanwad.
Location : NL- 16°44'5'', EL- 74°41'28''

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
13.	Chlorides (as Cl)	64	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	18	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	1.42	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.01	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.02	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.05	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	0.05	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.18	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.01	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.05	mg/l	--	AAS

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Ahmadiya Majid, Kanwad.

Location : NL- 16°44'5'', EL- 74°41'28''

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.1	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.02	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.005	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.01	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.01	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	170.3	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	0.9	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	14	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Jain Mandir, Hasur.
Location : NL- 16°43'1", EL- 74°40'28"
Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Result	Unit	Limit	Test Method
1.	Color	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.52	-	--	IS:3025(P-11)1983
4.	Turbidity	3.0	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	1700	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	1875	µmhos/cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	1193	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	555	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	638	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	222	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	156	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	380	mg/l	--	IS:3025(P-23)1986

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Jain Mandir, Hasur.

Location : NL- 16°43'1", EL- 74°40'28"

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
13.	Chlorides (as Cl)	660	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	62	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	2.36	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 0.5	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.01	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 0.01	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.02	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.05	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	0.1	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.24	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.01	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.05	mg/l	--	AAS

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Jain Mandir, Hasur.
Location : NL- 16°43'1", EL- 74°40'28"
Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.05	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.04	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.05	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.01	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.05	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	215.6	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	0.9	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	22	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Hanuman Mandir, Nurshihwadi road, Shirol.

Location : NL- 16°42'48", EL- 74°36'6"

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Result	Unit	Limit	Test Method
1.	Color	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.86	-	--	IS:3025(P-11)1983
4.	Turbidity	0.3	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	2400	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	2860	µmhos/cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	2366	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	1203	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	1164	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	481	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	284	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	215	mg/l	--	IS:3025(P-23)1986

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Hanuman Mandir, Nurshihwadi road, Shirol.
Location : NL- 16°42'48'', EL- 74°36'6''

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
13.	Chlorides (as Cl)	1296	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	76	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	2.82	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.01	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.05	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.05	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	0.30	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.56	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.04	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.05	mg/l	--	AAS

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Hanuman Mandir, Nurshihwadi road, Shirol.

Location : NL- 16°42'48", EL- 74°36'6"

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.1	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.03	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.005	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.02	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.005	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	190.6	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	1.1	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	14	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Riyaj Gulab Bhendwade, Gourwad.

Location : NL- 16°42'1", EL- 74°37'37"

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Result	Unit	Limit	Test Method
1.	Color	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.95	-	--	IS:3025(P-11)1983
4.	Turbidity	4.2	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	960	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	1089	µmhos/cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	397	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	330	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	67	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	132	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	16	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	215	mg/l	--	IS:3025(P-23)1986

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Riyaj Gulab Bhendwade, Gourwad.

Location : NL- 16°42'1", EL- 74°37'37"

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
13.	Chlorides (as Cl)	294	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	34	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	1.40	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.01	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.02	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.05	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	0.25	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.32	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.03	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.1	mg/l	--	AAS

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Riyaj Gulab Bhendwade, Gourwad.

Location : NL- 16°42'1", EL- 74°37'37"

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.5	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.02	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.005	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.01	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.005	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	198.3	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	4.3	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	13	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Gunpaal Aanappa Shapure, Shedshal.

Location : NL- 16°44'45", EL- 74°40'12"

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Result	Unit	Limit	Test Method
1.	Color	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.88	-	--	IS:3025(P-11)1983
4.	Turbidity	0.3	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	890	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	998	µmhos/cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	527	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	440	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	87	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	176	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	21	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	345	mg/l	--	IS:3025(P-23)1986

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Gunpaal Aanappa Shapure, Shedshal.

Location : NL- 16°44'45", EL- 74°40'12"

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
13.	Chlorides (as Cl)	196	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	20	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	1.05	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 1.0	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.01	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 0.1	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.02	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.05	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	0.1	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.32	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.01	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.05	mg/l	--	AAS

Date:- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Borewell Water Sample
Sample Description : Gunpaal Aanappa Shapure, Shedshal.

Location : NL- 16°44'45", EL- 74°40'12"

Sample Quantity : 2000ml

Date of Collection :- 04/03/2016.

Sr. No.	Parameter	Result	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.2	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.03	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.005	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.01	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.005	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	122	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	4.3	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	13	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Ground Water Sample
Sample Description : Panchganga River

Location : NL- 16°41'35", EL- 74°36'6"

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Intake of Datta ssk	100m Up Stream	100m Down Stream	Unit	Limit	Test Method
1.	Color	< 5	< 5	< 5	Hazen	--	IS:3025(P-4)1983
2.	Odor	Odorless	Odorless	Odorless	--	--	IS:3025(P-5)1983
3.	pH	7.54	7.68	7.56	-	--	IS:3025(P-11)1983
4.	Turbidity	0.7	0.9	0.6	NTU	--	IS:3025(P-10)1984
5.	Total Dissolved Solids	700	712	710	mg/l	--	IS:3025(P-16)1984
6.	Electrical Conductivity	802	815	811	µmhos /cm	--	IS:3025(P-14)1984
7.	Total Hardness (as CaCO ₃)	454	470	460	mg/l	--	IS:3025(P-21)1983
8.	Calcium Hardness (as CaCO ₃)	395	405	385	mg/l	--	IS:3025(P-21)1983
9.	Magnesium Hardness (as CaCO ₃)	59	65	75	mg/l	--	IS:3025(P-21)1983
10.	Calcium (as Ca)	158	162	154	mg/l	--	IS:3025(P-40)1991
11.	Magnesium (as Mg)	14	16	18	mg/l	--	IS:3025(P-46)1994
12.	Total Alkalinity (as CaCO ₃)	308	312	296	mg/l	--	IS:3025(P-23)1986

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : River Water Sample
Sample Description : Panchganga River
Location : NL- 16°41'35", EL- 74°36'6"

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Intake of Datta ssk	100m Up Stream	100m Down Stream	Unit	Limit	Test Method
13.	Chlorides (as Cl)	158	162	152	mg/l	--	IS:3025(P-32)1988
14.	Sulphate (as SO ₄)	24	26	24	mg/l	--	IS:3025(P-24)1986
15.	Total Nitrate (as NO ₃)	1.26	1.38	1.26	mg/l	--	IS:3025(P-34)1988
16.	Total Nitrogen (as N)	< 0.5	< 0.5	< 0.5	mg/l	--	IS:3025(P-34)1983
17.	Total Phosphate (as PO ₄)	< 0.01	< 0.01	< 0.01	mg/l	--	IS:3025(P-31)1988
18.	Ammonical Nitrogen (as N)	< 1.0	< 1.0	< 1.0	mg/l	--	IS:3025(P-34)1988
19.	Copper (as Cu)	< 0.02	< 0.02	< 0.02	mg/l	--	IS:3025(P-42)1992
20.	Manganese (as Mn)	< 0.05	< 0.05	< 0.05	mg/l	--	IS:3025(P-59)2006
21.	Iron (as Fe)	0.1	0.1	0.1	mg/l	--	IS:3025(P-53)2003
22.	Fluoride (as F)	0.2	0.26	0.2	mg/l	--	APHA 22 ST EDITION 4500 FD
23.	Cyanide (as CN)	< 0.04	< 0.05	< 0.04	mg/l	--	IS:3025(P-27)1986
24.	Phenolic Compounds (as C ₆ H ₅ OH)	< 0.001	< 0.001	< 0.001	mg/l	--	IS:3025(P-43)1992
25.	Boron (as B)	< 0.5	< 0.5	< 0.5	mg/l	--	AAS

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : River Water Sample
Sample Description : Panchganga River

Location : NL- 16°41'35", EL- 74°36'6"

Sample Quantity : 2000ml

Date of Collection:- 04/03/2016

Sr. No.	Parameter	Intake of Datta ssk	100m Up Stream	100m Down Stream	Unit	Limit	Test Method
26.	Zinc (as Zn)	< 0.1	< 0.2	< 0.1	mg/l	--	IS:3025(P-49)1986
27.	Aluminium (as Al)	< 0.02	< 0.03	< 0.02	mg/l	--	IS:3025(P-55)2003
28.	Cadmium (as Cd)	< 0.002	< 0.002	< 0.002	mg/l	--	IS:3025(P-41)1992
29.	Lead (as Pb)	< 0.05	< 0.008	< 0.05	mg/l	--	IS:3025(P-47)1994
30.	Nickel (as Ni)	< 0.01	< 0.02	< 0.01	mg/l	--	IS:3025(P-54)2003
31.	Mercury (as Hg)	< 0.001	< 0.001	< 0.001	mg/l	--	IS:3025(P-48)1994
32.	Arsenic (as As)	< 0.001	< 0.001	< 0.001	mg/l	--	IS:3025(P-37)1988
33.	Selenium (as Se)	< 0.005	< 0.01	< 0.005	mg/l	--	IS:3025(P-56)1988
34.	Sodium (as Na)	70.3	72.2	71.7	mg/l	--	IS:3025(P-45)1993
35.	Potassium (as K)	1.6	1.9	1.4	mg/l	--	IS:3025(P-45)1993
36.	Chemical Oxygen Demand	15	16	15	mg/l	--	IS:3025(P-58)2006
37.	BOD 3 days at 27°C	< 2	< 2	< 2	mg/l	--	APHA 22 ST EDITION 4500 FD
38.	MPN (Coliform bacteria)	< 2	< 2	< 2	MPN/100ml	--	IS:1622-1981 (Reaffirmed2009)

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Soil Sample
Sample Description : Salim Mulla, Aurwad.

Location : NL- 16°41'45'', EL- 74°36'57''

Sample Quantity : 5 Kg

Date of Collection:- 04/03/2016

Sr. No.	Test Parameter	Result	Unit	Limit
1.	Percentage of different Components			
a.	Sand	42	%	--
b.	Silt	35	%	--
c.	Clay	23	%	--
2.	Water Holding Capacity	30	%	--
3.	pH	8.39	--	--
4.	E. Conductivity	0.100	(µmhos/cm)	--
5.	Available Nitrogen	196	%	--
6.	Available Phosphorus	44.33	%	--
7.	Available Potassium	430	%	--
8.	Organic Carbon	0.921	%	--
9.	Sodium as Na	14.4	%	--
10.	Calcium as Ca	1.953	%	--
11.	Magnesium as Mg	0.152	%	--
12.	Cation Exchange Capacity	67.22	meq/100g	--

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Soil Sample
Sample Description : Riyaj Gulab Bhendwade, Gourwad.

Location : NL- 16°42'1", EL- 74°37'37"

Sample Quantity : 5 Kg

Date of Collection:- 04/03/2016

Sr. No.	Test Parameter	Result	Unit	Limit
1.	Percentage of different Components			
a.	Sand	31	%	--
b.	Silt	42	%	--
c.	Clay	27	%	--
2.	Water Holding Capacity %	32	%	--
3.	pH	8.52	--	--
4.	E. Conductivity	0.708	(µmhos/cm)	--
5.	Available Nitrogen	185	%	--
6.	Available Phosphorus	53.83	%	--
7.	Available Potassium	600	%	--
8.	Organic Carbon	0.461	%	--
9.	Sodium as Na	69.9	%	--
10.	Calcium as Ca	1.553	%	--
11.	Magnesium as Mg	0.164	%	--
12.	Cation Exchange Capacity	64.17	meq/100g	--

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Soil Sample
Sample Description : Ballaso Guruprasad Keripale, Kagwad road Shedshal.
Location : NL- 16°41'34", EL- 74°40'10"
Sample Quantity : 5 Kg
Date of Collection:- 04/03/2016

Sr. No.	Test Parameter	Result	Unit	Limit
1.	Percentage of different Components			
a.	Sand	24	%	--
b.	Silt	36	%	--
c.	Clay	24	%	--
2.	Water Holding Capacity %	28	%	--
3.	pH	8.34	--	--
4.	E. Conductivity	0.482	(µmhos/cm)	--
5.	Available Nitrogen	154	%	--
6.	Available Phosphorus	47.5	%	--
7.	Available Potassium	490	%	--
8.	Organic Carbon	0.603	%	--
9.	Sodium as Na	41.1	%	--
10.	Calcium as Ca	2.05	%	--
11.	Magnesium as Mg	0.104	%	--
12.	Cation Exchange Capacity	60.08	meq/100g	--

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Soil Sample
Sample Description : Shankar Aanappa Parit,(Rajmane) Terwad.

Location : NL- 16°39'54", EL- 74°34'39"

Sample Quantity : 5 Kg

Date of Collection:- 04/03/2016

Sr. No.	Test Parameter	Result	Unit	Limit
1.	Percentage of different Components			
a.	Sand	32	%	--
b.	Silt	39	%	--
c.	Clay	29	%	--
2.	Water Holding Capacity %	30	%	--
3.	pH	8.41	--	--
4.	E. Conductivity	0.083	(µmhos/cm)	--
5.	Available Nitrogen	185	%	--
6.	Available Phosphorus	57	%	--
7.	Available Potassium	510	%	--
8.	Organic Carbon	0.178	%	--
9.	Sodium as Na	11.5	%	--
10.	Calcium as Ca	1.353	%	--
11.	Magnesium as Mg	0.055	%	--
12.	Cation Exchange Capacity	39.04	meq/100g	--

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Soil Sample
Sample Description : Mohan Raghunath Pujari, Near Jirge pump, Dattanagar, Shirol
Location : NL- 16°45'34", EL- 74°35'7"
Sample Quantity : 5 Kg Date of Collection:- 04/03/2016

Sr. No.	Test Parameter	Result	Unit	Limit
1.	Percentage of different Components			
a.	Sand	34	%	--
b.	Silt	37	%	--
c.	Clay	29	%	--
2.	Water Holding Capacity %	22	%	--
3.	pH	8.11	--	--
4.	E. Conductivity	0.366	(µmhos/cm)	--
5.	Available Nitrogen	182	%	--
6.	Available Phosphorus	28.5	%	--
7.	Available Potassium	2560	%	--
8.	Organic Carbon	0.2856	%	--
9.	Sodium as Na	0.079	%	--
10.	Calcium as Ca	2.285	%	--
11.	Magnesium as Mg	0.116	%	--
12.	Cation Exchange Capacity	60.61	meq/100g	--

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Soil Sample
Sample Description : Devendra Satappa Magdum, old Udhgaon road, Umalwad.
Location : NL- 16°48'1", EL- 74°32'54"

Sample Quantity : 5 Kg

Date of Collection:- 04/03/2016

Sr. No.	Test Parameter	Result	Unit	Limit
1.	Percentage of different Components			
a.	Sand	30	%	--
b.	Silt	37	%	--
c.	Clay	33	%	--
2.	Water Holding Capacity %	26	%	--
3.	pH	8.14	--	--
4.	E. Conductivity	0.343	(µmhos/cm)	--
5.	Available Nitrogen	175	%	--
6.	Available Phosphorus	38	%	--
7.	Available Potassium	600	%	--
8.	Organic Carbon	0.857	%	--
9.	Sodium as Na	0.097	%	--
10.	Calcium as Ca	1.653	%	--
11.	Magnesium as Mg	0.116	%	--
12.	Cation Exchange Capacity	43.48	meq/100g	--

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Soil Sample
Sample Description : Pandurang Balu Gavde, Near Star Chemical, Chipri.
Location : NL- 16°45'40'', EL- 74°30'45''
Sample Quantity : 5 Kg **Date of Collection:- 04/03/2016**

Sr. No.	Test Parameter	Result	Unit	Limit
1.	Percentage of different Components			
a.	Sand	35	%	--
b.	Silt	32	%	--
c.	Clay	33	%	--
2.	Water Holding Capacity %	30	%	--
3.	pH	8.08	--	--
4.	E. Conductivity	0.228	(µmhos/cm)	--
5.	Available Nitrogen	245	%	--
6.	Available Phosphorus	19	%	--
7.	Available Potassium	250	%	--
8.	Organic Carbon	0.842	%	--
9.	Sodium as Na	0.045	%	--
10.	Calcium as Ca	0.842	%	--
11.	Magnesium as Mg	0.122	%	--
12.	Cation Exchange Capacity	35.47	meq/100g	--

Date :- 14/03/2016

ANALYSIS REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Soil Sample
Sample Description : Vishnu Dadu Yadav, Near Balumama Temple, Kondigre.
Location : NL- 16°44'40'', EL- 74°30'5''
Sample Quantity : 5 Kg **Date of Collection:- 04/03/2016**

Sr. No.	Test Parameter	Result	Unit	Limit
1.	Percentage of different Components			
a.	Sand	29	%	--
b.	Silt	36	%	--
c.	Clay	35	%	--
2.	Water Holding Capacity %	28	%	--
3.	pH	7.82	--	--
4.	E. Conductivity	0.374	(µmhos/cm)	--
5.	Available Nitrogen	238	%	--
6.	Available Phosphorus	60.16	%	--
7.	Available Potassium	950	%	--
8.	Organic Carbon	0.711	%	--
9.	Sodium as Na	0.079	%	--
10.	Calcium as Ca	0.711	%	--
11.	Magnesium as Mg	0.146	%	--
12.	Cation Exchange Capacity	49.21	meq/100g	--

Date :- 14/03/2016

Table no. 4.2 NOISE LEVEL MEASUREMENT REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Noise Level Measurement
Date of Collection : 04/03/2016

Sr. No.	Monitoring Location	Time	Noise Level in dB-A	Standards Noise Level in dB-A
1.	Near ETP (NL- 16°44'58'' EL- 74°35'0'')	Day	64.7	75.0
		Night	53.4	70.0
2.	Factory Main Gate (NL- 16°44'57'' EL- 74°35'0'')	Day	59.4	75.0
		Night	40.9	70.0
3.	Shirol Telegram Kharedi Vikri Sangh, Ltd., Jayshingpur. (NL- 16°46'40'' EL- 74°33'5'')	Day	49.8	55.0
		Night	41.1	45.0
4.	Near Grampanchayat Office, Kondigre. (NL- 16°44'12'' EL- 74°29'50'')	Day	51.8	55.0
		Night	38.2	45.0

Date :- 14/03/2016

NOISE LEVEL MEASUREMENT REPORT

Name of Industry : Datta SSK
Address : Shirol.
Name of Sample : Noise Level Measurement
Date of Collection : 04/03/2016

Sr. No.	Monitoring Location	Time	Noise Level in dB-A	Standards Noise Level in dB-A
5.	Shri Datta Nagri Pathsanstha, Arjunwad. (NL- 16°44'48'' EL- 74°37'35'')	Day	52.2	55.0
		Night	40.8	45.0
6.	Grampanchayat Office, Kanwad. (NL- 16°43'59'' EL- 74°41'26'')	Day	50.7	55.0
		Night	41.6	45.0
7.	Shirol Telegram Agriculture Div. Kurundwad. (NL- 16°43'59'' EL- 74°41'26'')	Day	51.6	55.0
		Night	39.9	45.0
8.	Grampanchayat Office, Chipri (NL- 16°45'40'', EL- 74°30'45'')	Day	50.3	55.0
		Night	38.5	45.0

Table No. 4.3

ANALYSIS REPORT FOR STACK EMISSION

Report Date	14/03/2016
Name of Industry Address	Urjankur Shree Datta Power Company Ltd., Dattanagar, Shirol.
Date of Sampling	04/03/2016
<u>PARTICULARS OF STACK</u>	
Stack Attached to	Boiler
Stack Diameter (Meter)	4.0
Stack Height (Meter)	95.0
Stack Temperature(°C)	130
Stack Velocity of Flue Gases (m/s)	14.0
Stack Volume of Flue Gases (Nm ³ /hr)	633600
Type of Fuel	Bagasse

POLLUTION PARAMERS

Parameter	Result	Limit	Unit	Method
Total Particulate Matter (TPM)	80	150	mg/Nm ³	EPA Method – 17
SO ₂ conc.	N. D.	--	mg/Nm ³	IS- 11255 (Part 2) 1985 Reaffirmed 2009
NO _x conc.	70	--	mg/Nm ³	APHA (42603-01-70T)

Remark: Instrument used:- Envirotech APM 610
Calibration Due date :- 04-08-2017
N. D. – Not Detected.

CHAPTER 5

GEOMORPHOLOGICAL, GEOLOGICAL AND HYDROGEOLOGICAL STATUS OF SHIROL TALUKA, KOLHAPUR DISTRICT, MAHARASHTRA

5.1 Introduction-

Shirol is a major town in Ichalkaranji division of Kolhapur district and is also a major industrial zone and it is situated in the eastern part of the district. Shirol is one of the 12 talukas of the district and is bordering Karnataka in the east and south. The topography of Shirol is carved by the Krishna river which is a major river of Maharashtra. The major crops are sugarcane, groundnut and jawar. Most of the area around the Krishna river is well irrigated through a number of lift irrigation schemes.

The coordinates of the region are 16.44 N and 74.36 E.

There are 52 villages in the taluka and 2 municipal regions. The total population is 359,139 as per 2011 census.

Climatically, Shirol has a moderate climate in all seasons. The average rainfall in the area is 580 mm spread over 48 rainy days. The temperature ranges between 40 to 25 degree Celsius on an average.



Fig5.1)- Map of Maharashtra and Kolhapur District



Fig5.2)-Flat topography of the region

The major villages in 10 km radius of the Datta sugar factory are Jambhali, ,Nandani, Shirdhon, Kurundwad, Nrusinhwadi, Ghalwad, Arjunwad, Chichwad etc.

5.2 Geomorphology-

The area under study mostly consists of a flat topography. The region mostly consists of vast plain area sloping eastwards and bounded by Krishna and Panchaganga rivers. The topography is unlike the rest of the deccan trap region with average height of 600 mts. Of which 92 % is below 540 mts. This has been mainly due to the presence of Krishna river and its tributaries developing extensive alluvial tract.. At some places particularly towards the western part of the taluka a locally rugged topography can be observed

5.3 Drainage-

The term drainage describes the river system of the area. The streams within a drainage basin form certain patterns depending upon the slope of land underlying rock structure as well as the climatic conditions of the area. The Krishna river has carved a neatly developed drainage in the region. The dendritic to sub dendritic drainage pattern develops where the river channel follows the general slope of terrain. Most streams are first to third order streams and prominently show semi dendritic drainage pattern which is typical of the Deccan Trap terrain. The drainage density in the region is low as compared to the rest of the deccan trap region. Krishna river flows for a length of 63 km. in the taluka and drains 20153 hectares of land while the river Panchganga flows for a length of 27 kms and drains 17636 hectares of land .



Fig5.3) Krishna basin map

5.4 Soil-

The area typically shows of different soil types The coarse shallow soils light brown in colour and loamy to sandy in nature. This type of soil covers 29 % of the area. The medium black variety of soil occurs mainly in the central and northern part of the taluka that covers 22 % of the area. However the most dominant soil type of the region is the deep black soil which is highly fertile and productive. It covers about 47% of the region.

In addition to these types saline soil also occurs at isolated locations.



Fig5.4) Deep black soil near river bed

5.5 Geology-

The geological formation in the region consist of the Deccan Trap Basalts (Cretaceous-Eocene) and the recent alluvium of Krishna. Basalts occupy about 95% of the region and are overlain by alluvium. Basalts normally occur with a horizontal disposition and as sequential layers or flows with thickness ranging from 15 to 40 m. Two main types of basalts occur in the region, vesicular and non vesicular. The vesicular variety consists of small to large vesicles which are formed due to escape of gases during cooling of the lava. The non vesicular variety often is compact and jointed in nature and show vertical, horizontal or oblique joints. Deccan Trap Basalts of the region are dark grey to greenish grey in colour and contains augite and plagioclase as the essential minerals. At many places zeolitic basalt also can be seen with infillings of quartz and calcite.

5.6 Seismicity and Tectonics-

The area has not experienced any seismicity in the recent past nor there any historical records of any kind of tectonic activity. There are no major marked lineaments in the region thus can be regarded as shield region.

5.7 Hydrogeology-

The main aquifers in the region are the inter-trappean beds or decomposed zones of the deccan traps. At places the presence of joints yield sufficient quantity of ground water. The depth of water table is variable, between 8 to 12 meters. Shirol taluka receives an average rainfall of 580 mm. with 48 rainy days on an average.

Since most of the area is occupied by extensive alluvium which is at places 10 meters thick and the area is irrigated by a network of lift irrigation schemes there are less number of wells in the area surrounding the sugar

5.8 Ground water related issues and problems-

The major problem in the area is the quality of ground water, at places the water is brackish and can not be used for domestic purposes. The concentration of nitrate and total hardness is much above the permissible limits. Another major problem in the area is the increasing number of wells and bore wells.

Also due to excess irrigation over a prolonged period of time, soil salinity has acquired alarming dimension. A total of 3164 hectare land has turned saline and another 6238 hectares is partially saline. Thus a total of 9402 hectares of precious land resource has been saline in nature.

Water is intermittently released in the Krishna River from the reservoirs in the upstream side which is heavily used for irrigation purpose resulting into drying up of the river. Once the river dries up the region suffers acute shortage of groundwater.

CHAPTER 6

LANDUSE (LU)

6.1 Introduction

The land use / land cover analysis is of relationship between people and land. Man is using the land for various purposes like grazing, agriculture, urban, mining and many more. According to Mayer (1995) *land use* is the way in which, and the purposes for which, human beings employ the land and its resources e.g. farming, mining, lumbering, etc. The detail information of land use and land cover is essential for all developmental activities, land resource evaluation, management and planning as well as environmental assessment. Accessing land use and land cover is essential to understand both the positive and negative aspects of a project on the respective region. In this section an attempt is made to understand the landuse condition within 10 km radius from factory site.

6.2 Data

Generally the study of landuse and landcover is carried out on different levels i.e. general landuse / landcover, urban land use, agriculture land use, etc. The data is most essential component in analysis and decision making process. The data for landuse study is depend on the site and level on which it is being implementing. The landuse data published in census is one of the authentic data which is useful for different analysis. The census data is quantification of land under forest, agriculture uses, fallow land, etc. which is made available for different kinds of users. The general landuse dataset of year 2011 is tabulated from census 2011 and systematically utilized in present study.

The computer aided digital image analysis is essential to utilize the capabilities of remote sensing data. The Landsat satellite dataset of ETM (Enhance Thematic Mapper) sensors is used to check the Landuse / Landcover conditions.

6.3 Methodology

The general landuse data from 2011 census is tabulated and arranged using spreadsheet. The graphical representation of important aspects is carries out. The review of landuse status is complied with statistical tables, graphs and its interpretation is made. The landuse / landcover condition due to natural and human activities can be well understood using remote sensing satellite dataset. In second phase digital landuse / landcover mapping is carried out with the help of Landsat satellite images. The supervised image classification technique is used for mapping landuse / landcover of the study area.

6.4 Study Area

Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol district Kolhapur (Maharashtra) is one of the reputed sugar factory in South-Western Maharashtra. The study area for environmental impact assessment is 10 km from respective factory site. In present study area of 10 km radius from Datta sugar factory is considered.

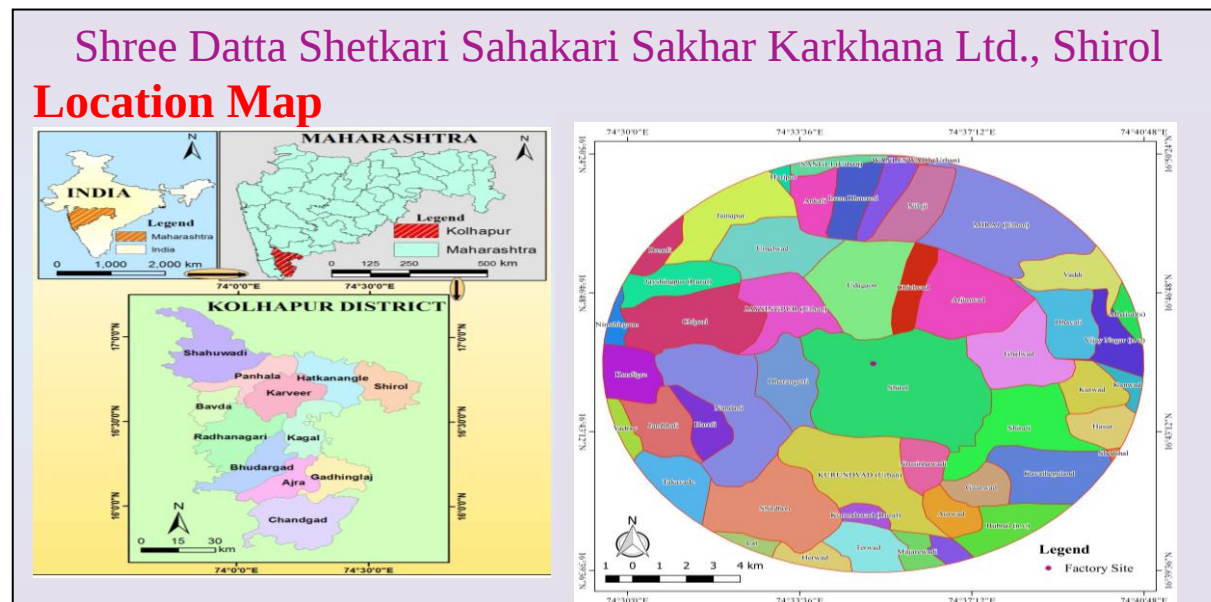


Fig. XXX

The study area of 10 km radius is covering 2 two different tahsils i.e. Shirol and Miraj from Kolhapur and Sangli districts respectively. There are total 49 localities out of which 5 are urban centres (2 from Kolhapur and 1 from Sangli district which is parts of Municipal Corporation) and 44 are villages. There are 9 villages from Sangli district 35 villages from Kolhapur district occupying more or less area. Its details are given in table no.XXX.

Table – 6.1 : Villages Within 10Km Radius from Factory Site Fig. 6.1

Villages / City	Tahsil - District	Area (in Ha.)	Population	Household	Settlement Type	Occupancy Type
Arjunwad	Shirol - Kolhapur	919	5641	1151	Rural	100
Aurwad	Shirol - Kolhapur	476	4540	836	Rural	100
Bastawad	Shirol - Kolhapur	379.3	2321	527	Rural	30
Bubnal	Shirol - Kolhapur	668	3154	614	Rural	40
Chichvad	Shirol - Kolhapur	396.3	4285	879	Rural	100
Chipari	Shirol - Kolhapur	878.4	7876	1710	Rural	100
Danoli	Shirol - Kolhapur	2717.9	14075	3059	Rural	10
Dharangutti	Shirol - Kolhapur	1009	7233	1562	Rural	100
Gaurwad	Shirol - Kolhapur	249	2631	547	Rural	100
Ghalwad	Shirol - Kolhapur	681.8	3535	735	Rural	100
Haroli	Shirol - Kolhapur	430	3280	672	Rural	100
Hasur	Shirol - Kolhapur	566.1	4045	827	Rural	40

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Herwad	Shirol - Kolhapur	1235.5	7165	1454	Rural	10
Jainapur	Shirol - Kolhapur	701	2358	506	Rural	30
Jambhali	Shirol - Kolhapur	622	4963	1020	Rural	100
Jayshingpur (Rural)	Shirol - Kolhapur	235	4796	1115	Rural	90
Kanwad	Shirol - Kolhapur	562	3280	672	Rural	15
Kavathegulang	Shirol - Kolhapur	903.7	3685	736	Rural	70
Kondigre	Shirol - Kolhapur	685.8	3245	700	Rural	25
Kurundawad (R)	Shirol - Kolhapur	1797	694	144	Rural	100
Kutwad	Shirol - Kolhapur	368	2271	457	Rural	100
Lat	Shirol - Kolhapur	2253	16271	3340	Rural	10
Majarewadi	Shirol - Kolhapur	350	2273	528	Rural	20
Nandani	Shirol - Kolhapur	1692	15093	3312	Rural	100
Nimshirgaon	Shirol - Kolhapur	1064.3	4851	1081	Rural	10
Nrusinhawadi	Shirol - Kolhapur	416.7	4168	930	Rural	100
Shedshal	Shirol - Kolhapur	803.8	4866	1020	Rural	5
Shirati	Shirol - Kolhapur	1173.1	5640	1238	Rural	100
Shirdhon	Shirol - Kolhapur	1883.9	9486	2080	Rural	95
Shirol	Shirol - Kolhapur	6028	21	13	Rural	100
Takavade	Shirol - Kolhapur	1026.3	8735	1859	Rural	30
Terwad	Shirol - Kolhapur	1043.8	5986	1244	Rural	20
Udagaon	Shirol - Kolhapur	1746	14513	3136	Rural	100
Umalwad	Shirol - Kolhapur	506.6	5024	1061	Rural	100
Yadrav	Shirol - Kolhapur	846.5	10530	2338	Rural	15
Ankali	Miraj - Sangli	450.8	5255	1129	Rural	100
Bamani	Miraj - Sangli	410.1	793	159	Rural	100
Dhawali	Miraj - Sangli	649	2969	646	Rural	100
Haripur	Miraj - Sangli	561	7595	1643	Rural	10
Inam Dhamani	Miraj - Sangli	514	5424	1128	Rural	100
Mhaisal(s)	Miraj - Sangli	3552	14922	3156	Rural	10
Nilaji	Miraj - Sangli	542.1	729	166	Rural	100
Vaddi	Miraj - Sangli	1287	4252	862	Rural	40
Vijay Nagar	Miraj - Sangli	330	3474	739	Rural	40
SANGLI (Urban)	Miraj - Sangli				Urban	10
MIRAJ (Urban)	Miraj - Sangli				Urban	30
WANLESWADI (Urban)	Miraj - Sangli				Urban	10
KURUNDVAD (Urban)	Shirol - Kolhapur				Urban	100
JAYSINGPUR (Urban)	Shirol - Kolhapur				Urban	100

Source : Census of India, 2011

6.5 General Landuse

The categories of general landuse may vary as per nature of study. The landuse categories considered in this study are from census. Table No XXX represents these categories of landuse and total area under it.

Table –6.2 : Summary of General Landuse of Study Area

Sr No	Category	Area in Ha.	Percentage to Total Area
1	Forests	362.20	0.48
2	Area Under Non-Agricultural Uses	1577.10	2.08
3	Barren and Un-Cultivable land	1998.90	2.64
4	Permanent Pastures and Other Grazing Lands	1085.90	1.43
5	Land Under Miscellaneous Tree Crops etc.	148.70	0.20
6	Cultivable Waste Land	3057.20	4.03
7	Fallow Lands Other Than Current Fallows	3135.50	4.13
8	Current Fallows	1878.00	2.48
9	Net Area Sown	32094.50	42.32
10	Total Irrigated Land Area	19255.30	25.39
11	Total Un-Irrigated Land Area	11239.40	14.82
	Total	75832.70	100.00

Source: District Census of Indian (Soft Copy in CD form)

The total area under and of study area is 75832.70 ha. (it is total 100% area of all 49 localities). The general landuse classes are ranging from minimum 148.70 ha. (0.20) i.e. land under miscellaneous tree crops on the contrary maximum is 32094.50 ha (42.32%) which is net sown area. The area under non-agricultural uses occupies 2.08% and barren and uncultivable land covered 2.64% land. The proportion of cultivable waste land is 4.03% (3057.20 ha) and fallow lands other than current fallow is 4.13% i.e. 4.13% to total area of 49 villages. Total irrigated land is 19255.30 ha which becomes 25.39% to total and total un-irrigated area is 11239.40 ha which become 14.82%.

Fig.6.2

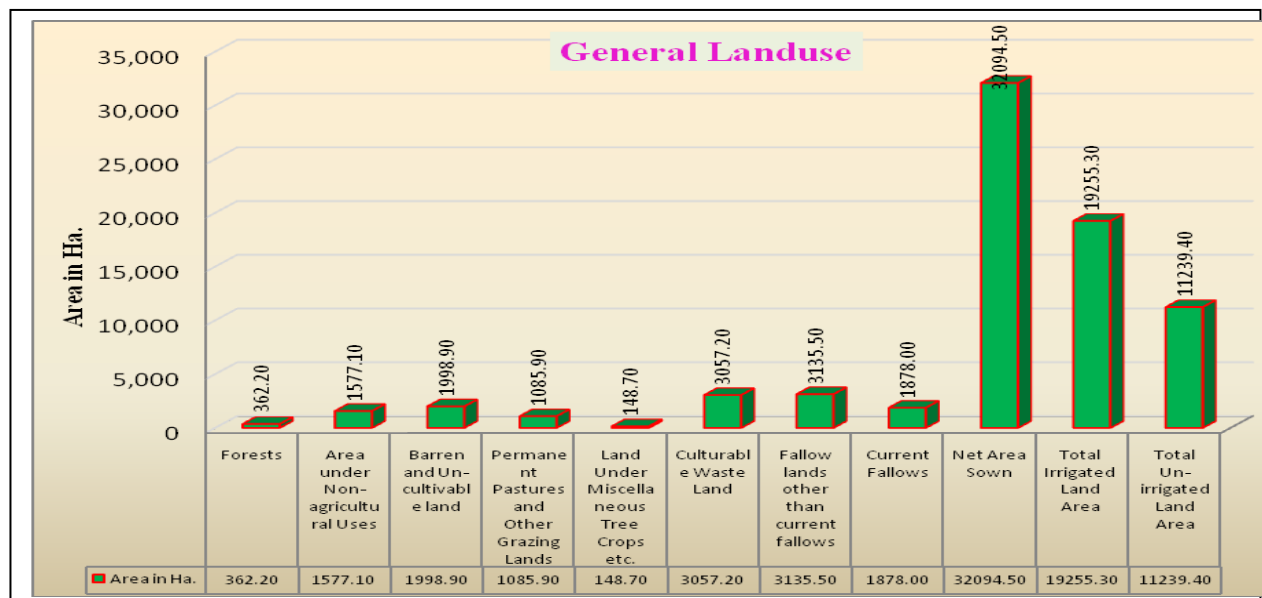


Fig. XXX

6.6 Village wise General Landuse of Study Area

The village wise condition of general landuse is comprehended and presented in table no.XXX. There are total 49 villages coming in 10 km radius, out of which half i.e.24 villages are laying completely within this radius and rest 25 villages have occupied land from 5% to 95% area. The statistical landuse data for 44 villages are available but it is not available for rest 5 urban centres.

Table –6.3 : Village wise General Landuse of Study Area

Villages / City	Forests	Area under Non-agricultural Uses	Barren and Uncultivable land	Permanent Pastures & Other Grazing Lands	Miscellaneous Tree Crops etc.	Culturable Waste Land	Fallow lands other than current fallows	Current Fallows	Net Area Sown	Total Irrigated Land Area	Total Un-irrigated Land Area
Arjunwad	0	2	221.4	2.2	0	50	0	0	643.4	424	219.4
Aurwad	0	4.6	0	0	0	44.6	11.5	76.6	338.8	203	135.8
Bastawad	0	26.2	0	0	0	58.6	2	0	292.4	0	292.4
Bubnal	0	5	23	0	0	73	0	0	567	567	0
Chichvad	0	31.7	10	0	0	10	10	0	334.6	294.6	40
Chipari	0	3.1	52.3	25.2	72.8	14.2	4.2	50	656.6	121.9	534.8
Danoli	236.4	36.4	350	71	0	0	3.2	313	1708	1395	313
Dharangutti	0	73.7	0	0	0	457.4	0	0	477.9	140	337.9

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Gaurwad	0	2.7	0	0	8.1	0	6.1	31.7	200.4	125.2	75.2
Ghalwad	0	6.2	170.1	5.8	0	0	0	0	499.7	499.7	0
Haroli	0	15	25	30	5	19	17	9	310	210	100
Hasur	0	22.4	22.2	8.4	0	47.8	11.1	9.1	445.1	268.3	176.8
Herwad	0	2	171	51.4	0	280	43.2	0	688	450	238
Jainapur	0	96.8	22.1	53.9	0	46.2	0	0	482	122	360
Jambhali	0	47.6	0	0	0	55.2	0	0	519.2	62	457.2
Jayshingpur (R.)	0	91.8	0	0	0	0	6.7	0	136.5	48.5	88
Kanwad	0	54	0	0	0	80	0	0	428	219	209
Kavathegulang	0	8.3	0	0	0	16	0	12.4	867	867	0
Kondigre	0	2.7	25.2	26.6	45.8	30.9	17.7	78.7	458.1	150	308.1
Kurundawad (R)	0	159.8	0	0	0	267.8	0	0	1369.4	922.7	446.7
Kutwad	0	1	14	0	0	15	28	78	232	160	72
Lat	0	3	100	46	2	260	170	64	1608	579	1029
Majarewadi	0	16	0	0	0	99.1	0	0	234.9	152.3	82.6
Nandani	0	150.6	0	0	0	180.7	0	0	1360.7	528	832.7
Nimshirgaon	125.8	1.3	71.1	67.6	15	130.9	36.6	158.6	457.4	288.1	169.4
Nrusinhawadi	0	26.5	0	0	0	61.5	0	8.2	320.5	320.5	0
Shedshal	0	36.9	167	8.5	0	115.5	0	5.1	470.8	413.6	57.2
Shirati	0	2.3	37.2	0	0	0	0	24.5	1109.1	1109.1	0
Shirdhon	0	5	40.1	8.3	0	0	41.7	0	1788.8	1788.8	0
Shirol	0	0	0	579	0	0	2588	759	1829	0	229
Takavade	0	1.7	18.9	0	0	105	0	29.7	871	871	0
Terwad	0	6.4	134	40	0	22.7	25.7	40	775	625	150
Udagaon	0	2	180	45	0	260	0	0	1259	960	299
Umalwad	0	52.5	20.8	17	0	180.3	0	0	236	185	51
Yadrav	0	64.7	0	0	0	0	0	0	781.8	152.9	628.9
Ankali	0	1.4	54.4	0	0	0	0	0	394.9	394.9	0
Bamani	0	2	21.1	0	0	0	0	57.2	329.8	251.7	78.1
Dhawali	0	31.2	0	0	0	0	0	0	617.8	568.3	49.4
Haripur	0	103.7	0	0	0	0	0	0	457.3	220	237.3
Inam Dhamani	0	1.5	48	0	0	0	0	0	464.6	464.6	0
Mhaisal (s)	0	218.4	0	0	0	52.9	62.8	50.2	3167.7	1194.6	1973.2
Nilaji	0	6	0	0	0	22.9	50	23	440.3	357	83.3
Vaddi	0	111	0	0	0	0	0	0	1176	445	731
Vijay Nagar	0	40	0	0	0	0	0	0	290	136	154
Total	362.2	1577.1	1998.9	1085.9	148.7	3057.2	3135.5	1878	32094.5	19255.3	11239.4

Source: District Census Handbook

6.7 IRRIGATION AND LANDUSE

The irrigation is most vital element of socio-economic and overall transformation for particular region. The study area is situated in well developed watershed of Krishna river particularly on the bank of Panchganga river. Due the various sources of irrigation land is been irrigated in which different types of cash crops are cultivated. Sugarcane is one of the important crop been cultivated which is raw material for sugar factory.

There is very close relationship between irrigation and landuse. Generally when irrigation sources are developed that time several transformations are automatically taking place in that area. As a result the economic status of farmer is seems changing. The river passing through study area is providing source of water for the agriculture. During conducted field visit it is observed that the agriculture is well developed in all villages except urban centres and mining patches around Jaysingpur. Due to surrounding urban patches employment opportunities have generated same time datta sugar factory have provided jobs.

Table – 6.4 : Summary of Irrigated and Un-Irrigated Land

Sr No	Category	Area in Ha.	Percentage
1	Total Irrigated Land Area	19785.2	63.77
2	Total Un-irrigated Land Area	11239.40	36.23

Source: District Census of Indian (Soft Copy in CD form)

Table – XXX represents the summary of total irrigated and un-irrigated land of 49 villages of study area. Total land of study area is 31024.6 ha. out of which total irrigated land is 19785.2 ha. In other words out of total area 57% land is un-irrigated and rest 43% land is irrigated (Figure XXX).

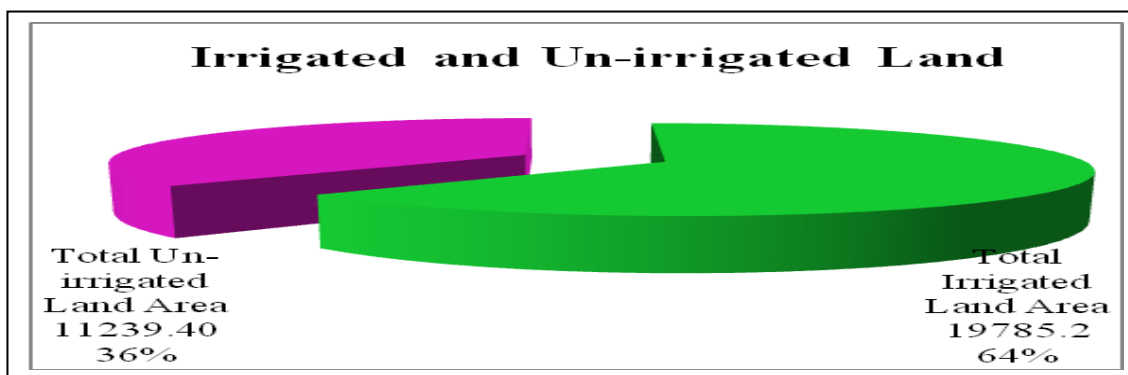


Fig. 6.3

6.8 Source of Irrigation

The India is agriculture based country but most of the agricultural land is giving proper returns. The agriculture of an area will develop if irrigation facilities are well developed. Unfortunately most of agriculture is un-irrigated hence it is essential to comprehend the status of irrigation in study area. Because the irrigation facilities can change the landuse as well as socio-economic condition of study area. The irrigation system of Krishna and Panchganga river is well developed.

Table – 6.5 : Source of Irrigation

Category	Area in Ha.	Percentage to Total Irrigated Area
Canals (C)	2981	15.07
Wells/Tube-wells (W/TW)	7244.8	36.62
Tanks/Lakes (T/L)	726.6	3.67
Water Falls (WF)	0	0.00
Others (O)	8832.8	44.64
Total	19785.2	100.00

Source: District Census handbook

There are different sources of irrigation like canal, well/tube well, tank, river, etc.

The total irrigated area is 19785.2 ha by various sources of irrigation i.e. canal, well/tube well, tank, etc. The highest land is irrigated by other sources of irrigation (8832.8 ha.) which is 44.64% to total irrigated area. The river irrigation is main source of irrigation in study area. The second highest category is wells and tube wells is 7244.8 ha (36.63%). The proportion of tanks and lakes is 3.67% (726.6 ha) and this area is of plane topography hence water fall are not available hence no irrigation is developed on waterfall.

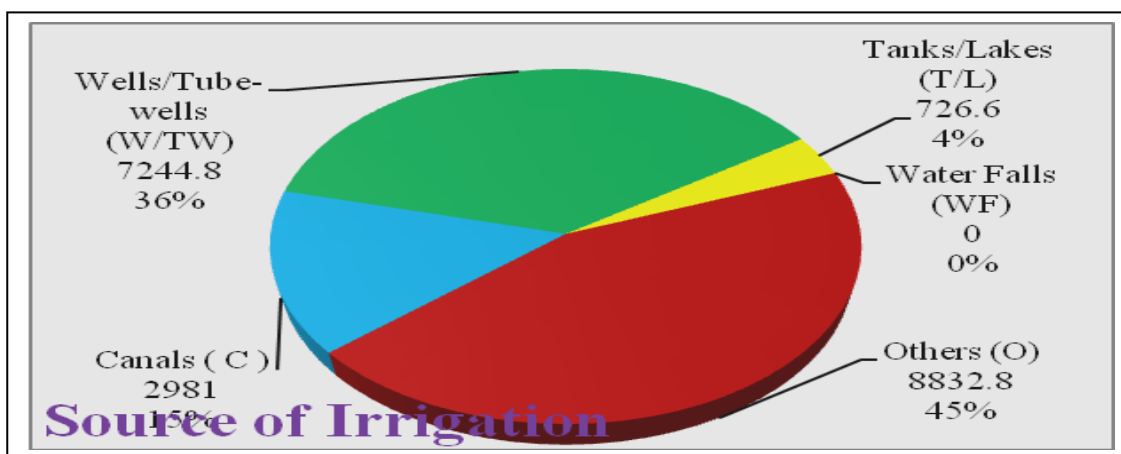


Fig.6.4

6.9 Village wise Irrigation

The general irrigation pattern of study is discussed in above section. But to understand clear condition up to local level village wise irrigation condition is represented in below given table. In this table irrigation status of urban areas the data is not given as it is not available. The villages near to river are having quite good share of irrigated land whereas in villages in urban fringe areas un-irrigated land is more. There are few villages like Chichvad, Chipari, Haroli, Hasur, Herwad, etc. Villages like Nandni, Kurundwad, Kondigre, etc. are having share

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of wells and tube wells is more. Villages like Danoli, Shirati, Udgaon, Mhaisal, etc. are having river irrigation share more. The share of waterfall is nothing.

Table No – 6.6: Village-wise Irrigation Status of Study Area

Villages / City	Canals (C)	Wells/Tube-wells (W/TW)	Tanks/Lakes (T/L)	Water Falls (WF)	Others (O)
Arjunwad	0	0	0	0	424
Aurwad	0	0	0	0	203
Bastawad	0	0	0	0	0
Bubnal	0	567	0	0	0
Chichvad	250.6	44	0	0	0
Chipari	52.2	69.7	0	0	0
Danoli	0	0	7.8	0	1387.2
Dharangutti	0	140	0	0	0
Gaurwad	0	0	0	0	125.2
Ghalwad	0	50	0	0	449.7
Haroli	73	107	0	0	30
Hasur	223.2	45.1	0	0	0
Herwad	325	125	0	0	0
Jainapur	0	122	0	0	0
Jambhali	0	20.4	0	0	41.6
Jayshingpur (R.)	0	48.5	0	0	0
Kanwad	0	219	0	0	0
Kavathegulang	867	0	0	0	0
Kondigre	26.5	123.5	0	0	0
Kurundawad (R)	0	922.7	0	0	0
Kutwad	0	0	0	0	160
Lat	0	187	0	0	392
Majarewadi	0	152.3	0	0	0
Nandani	0	238.9	0	0	289.1
Nimshirgaon	208	80.1	0	0	0
Nrusinhawadi	320.5	0	0	0	0
Shedshal	0	0	0	0	413.6
Shirati	0	9	0	0	1100.1
Shirdhon	0	1600	188.8	0	0
Shirol	0	0	0	0	530
Takavade	0	871	0	0	0
Terwad	530	95	0	0	0
Udagaon	0	60	0	0	900

Umalswad	105	80	0	0	0
Yadrav	0	152.9	0	0	0
Ankali	0	44.8	0	0	350.1
Bamani	0	251.7	0	0	0
Dhawali	0	0	0	0	568.3
Haripur	0	75	0	0	145
Inam Dhamani	0	0	0	0	464.6
Mhaisal (s)	0	557.2	0	0	637.3
Nilaji	0	0	0	0	357
Vaddi	0	50	0	0	395
Vijay Nagar	0	136	0	0	0
Total	2981	7244.8	726.6	0	8832.8

Source : District Census handbook

6.10 LANDUSE STUDY WITH SATELLITE DATA

The first thing people ever used to meet their basic needs was land – to feed themselves, to move around and to settle. Hence, the relationship of people with land is as old as man. When the users of land decided to utilize it for different purposes, land use / land cover change occurs producing both desirable and undesirable impacts.

The analysis of land use / land cover change is essentially the analysis of changing relationship between people and land. The use to which we put land could be grazing, agriculture, urban development, and mining among many others. *Land use* is the way in which, and the purposes for which, human beings employ the land and its resources e.g. farming, mining, lumbering, etc. *Land cover* describes the physical state of the land surface i.e. cropland, forests, wetland, water bodies among others (Meyer, 1995). In this section landuse condition is studied with help of satellite image digital image processing.

Figure XXX is represents the study area in true colour satellite image. In below given figure the 10 km boundary of study area is overlaid on 1 meter spatial resolution satellite image dataset. Figure XXX represents the village wise status of study area on 1M spatial resolution. The roads, river, land parcel, crop land and other features are clearly visible in this image. The landuse classification of NRSC is used to represent the condition in study area. The yellow patch is agriculture land and read patches are built-up. The image classification work is carried out on the dataset which is acquired from Enhanced Thematic Mapper (ETM+) sensor (Fig. XXX). The green patches are agriculture land, read are settlement patches and blue is the water body. The last figure represents the road network of study area.

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Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol Satellite Image View

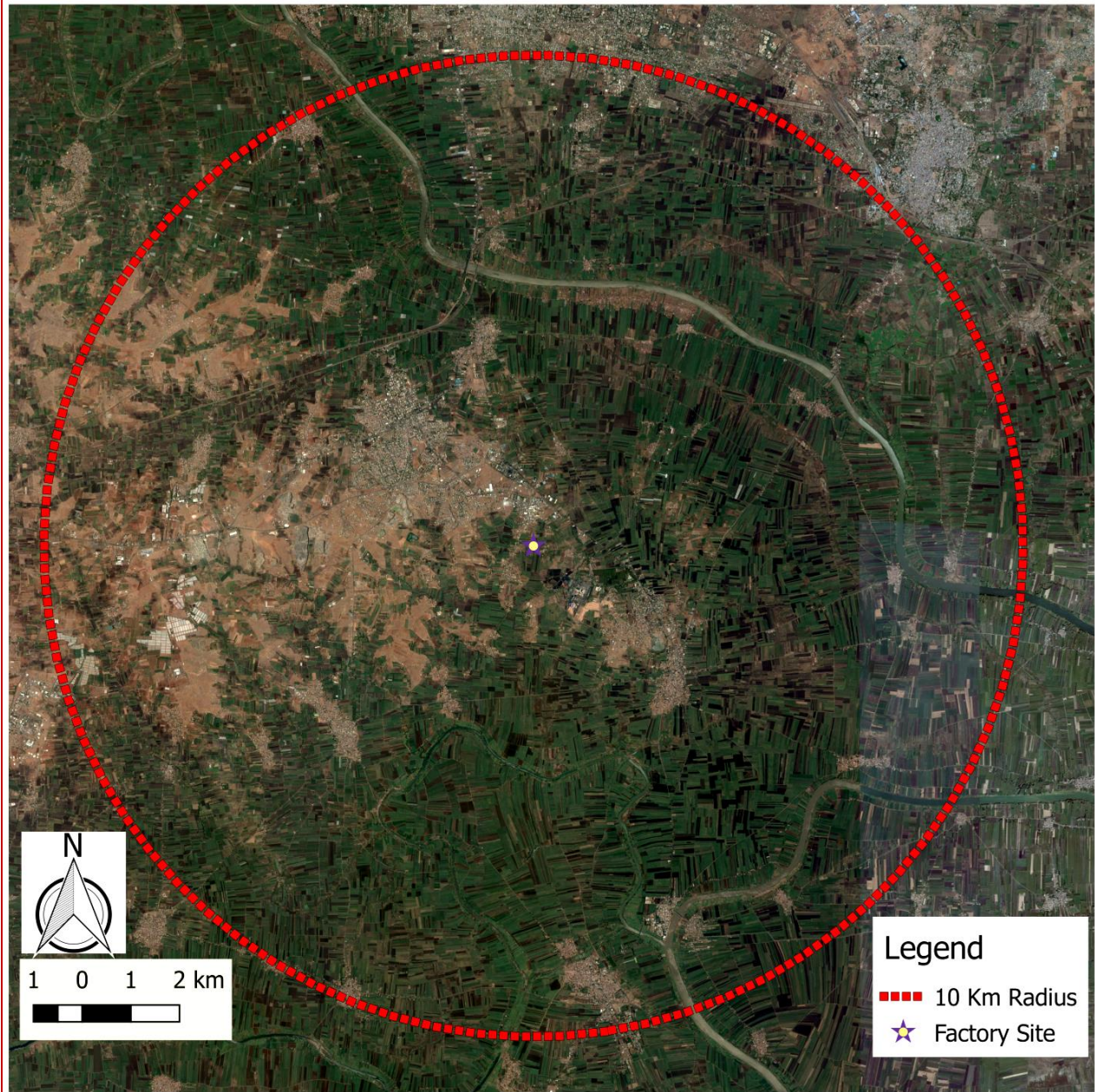


Fig. 6.5

Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol Village Map

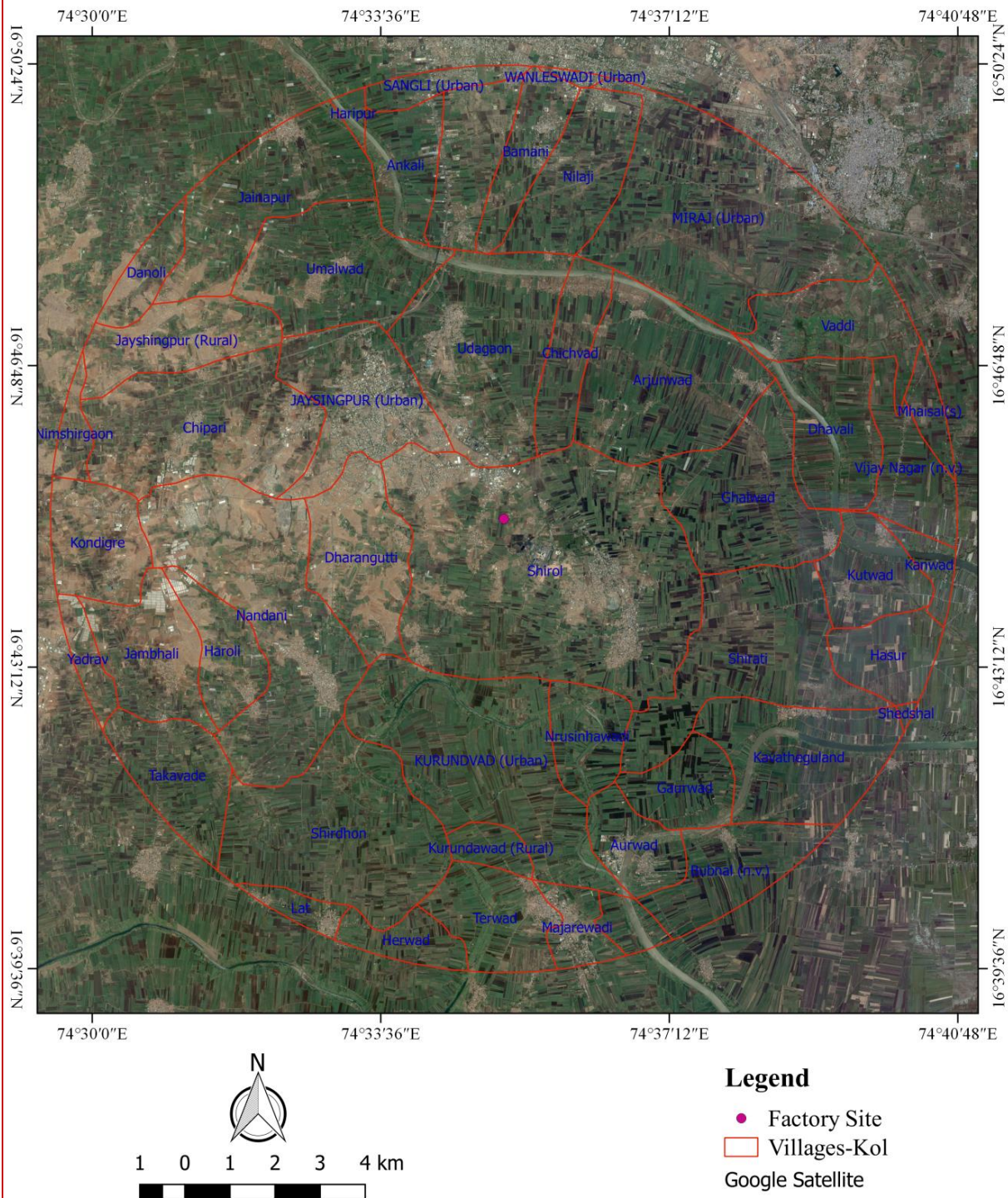
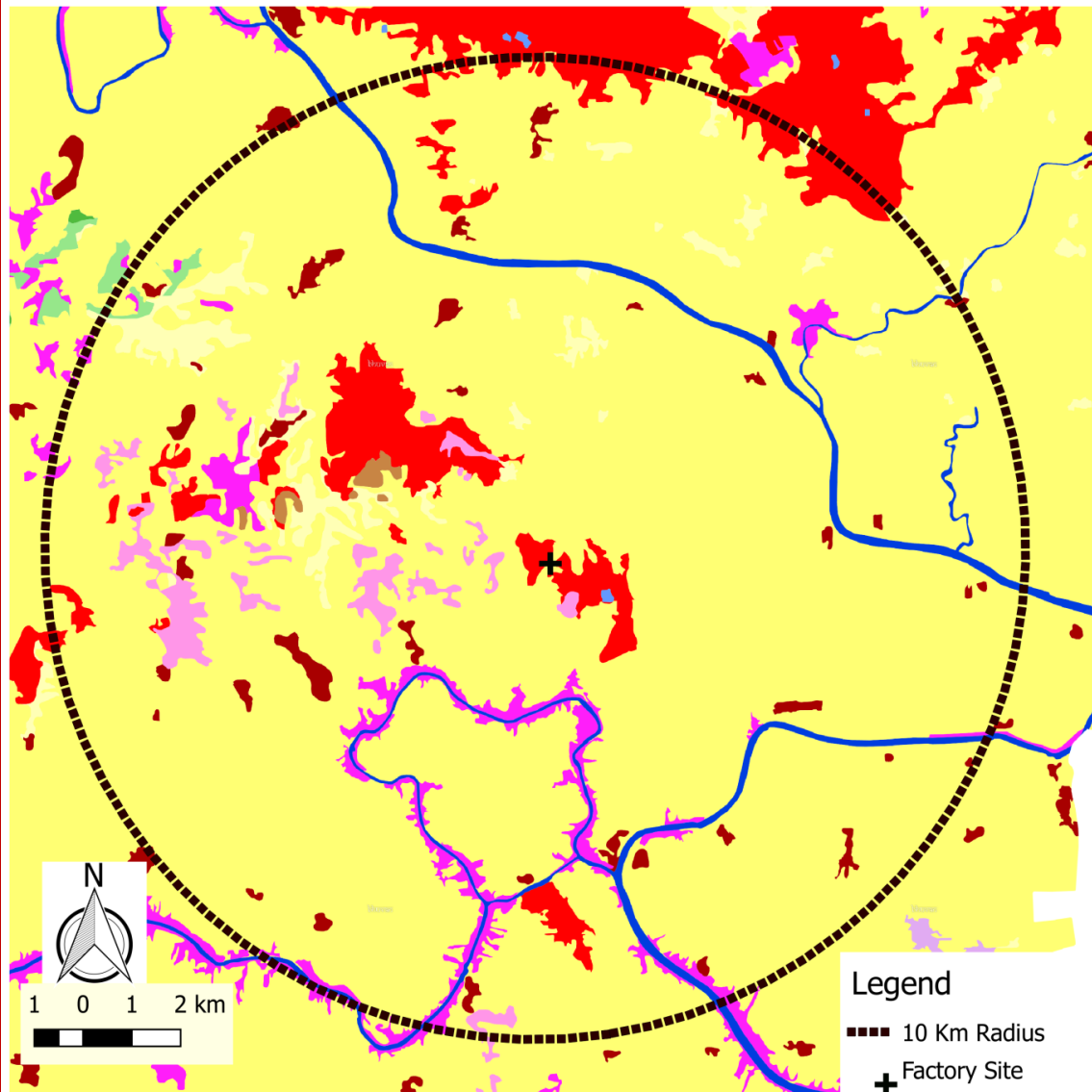


Fig. 6.6

Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol Landuse - Landcover Map



Source: Based on Bhuvan.nrsc

Key :

Built Up:

- Urban
- Rural
- Mining

Water Body :

- Rivers / Streams
- Lakes / Tanks

Barren Land :

- Gullied / Ravinous Land
- Barren Rocky

Agriculture :

- Crop Land
- Fallow Land

Forest :

- Deciduous
- Scrubs

Fig. 6.7

Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol
Landuse / Land Cover Map
 (Satellite Image)

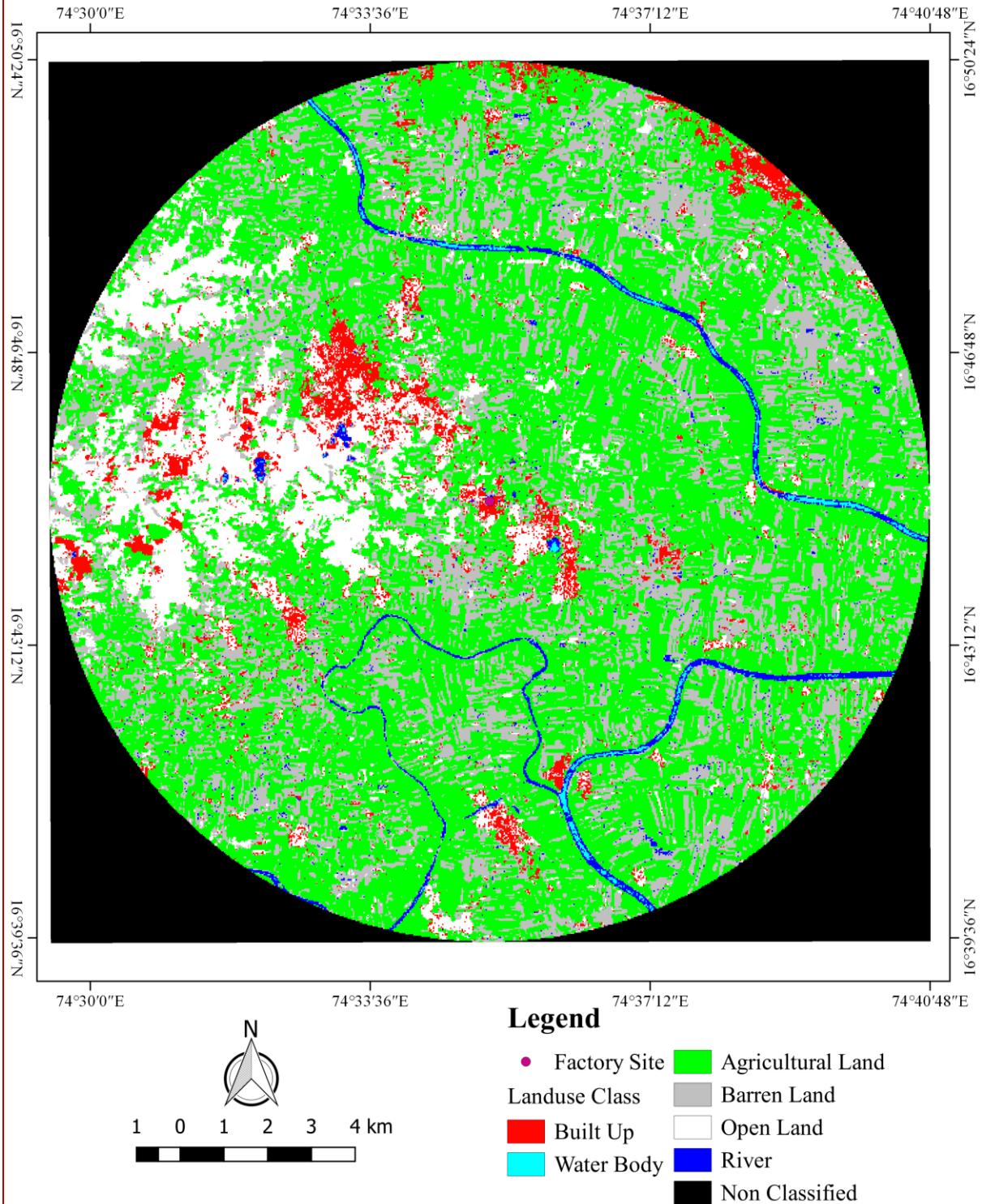
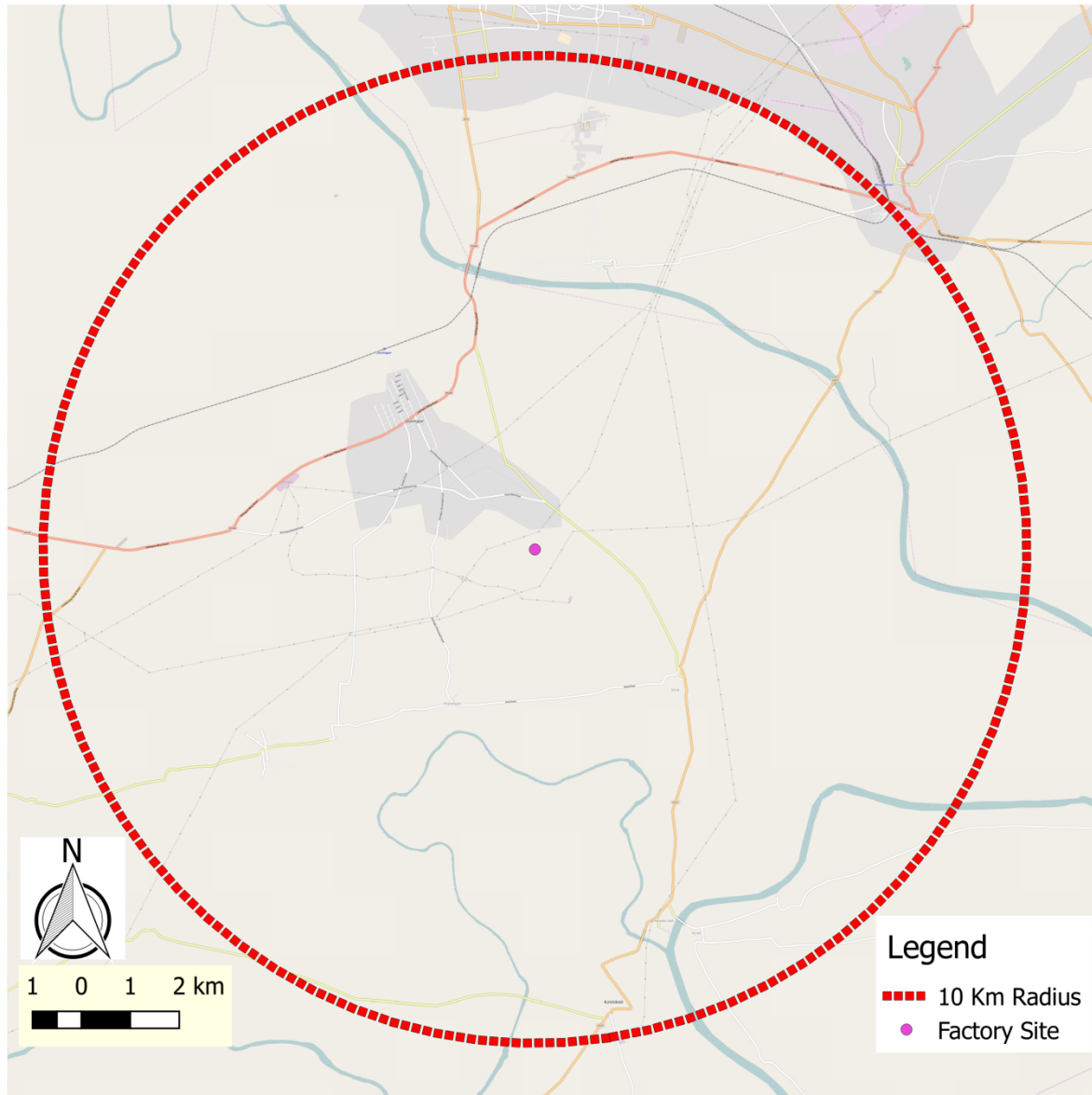


Fig. 6.8

Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd., Shirol Road Map



6.11 Limitation Fig.6.9

There are total 49 villages / urban centres but these all are not fully 100% inside 10 km limit; rather the coverage area is varying from 5% to 95%. In calculation and tables the area of village is considered as 100% for analysis; not as per its proportion. The spectral signature of satellite image is having problem which put limitation on image classification process.

CHAPTER - 7

ECOLOGY AND BIODIVERSITY

7.1 Introduction:

An ecosystem is a natural unit consisting of all plants, animals and micro-organisms in an area functioning together with all of the non-living or physical factors of the environment. Services derived from ecosystems are referred to as ecosystem services. They may include facilitating the enjoyment of nature, which may generate many forms of income and employment, water retention, thus facilitating a more evenly distributed release of water, soil protection, open-air laboratory for scientific research, etc. Critical processes at the ecosystem level influence plant productivity, soil fertility, water quality, atmospheric chemistry, and many other local and global environmental conditions that ultimately affect human welfare. These ecosystem processes are controlled by diversity and identity of the plant, animal and microbial species living within a community. Human modifications to the living community in an ecosystem as well as to the collective biodiversity of the earth can therefore alter ecological functions and life support services that are vital to the well being of human societies. Ecosystem functioning reflects the collective life activities of plants, animals and the effect of their activities on feeding, growing, moving, excreting waste etc. have on the physical and chemical conditions of the environment.

An ecological study becomes an important tool for decision making. It gives us an idea about the losses or benefits to the environment due to upcoming projects in the area. The changes taking over the time can be quantified and related to the existing environmental conditions and can be used for monitoring the biological environment of the proposed establishment or expansion of the unit. The area considered for study is 10 kilometres of periphery around the project site.

7.2 Objectives of the ecological studies:

Following are the specific objectives to conduct ecology and biodiversity study to understand status of an ecosystem.

- i. To identify and finalize ecological sampling sites of the study area.
- ii. To study types of forests if any in the study area.

- iii. To prepare checklist of floral components like herbs, shrubs and trees.
- iv. To identify rare and endangered species in the study area.
- v. To prepare check list of phytoplankton and zooplankton of the study area.
- vi. To study ecologically sensitive areas like national parks or wildlife sanctuaries in the study area.
- vii. To study specific flora and fauna for their species richness and diversity by biodiversity indices.

7.3 Survey Methodology:

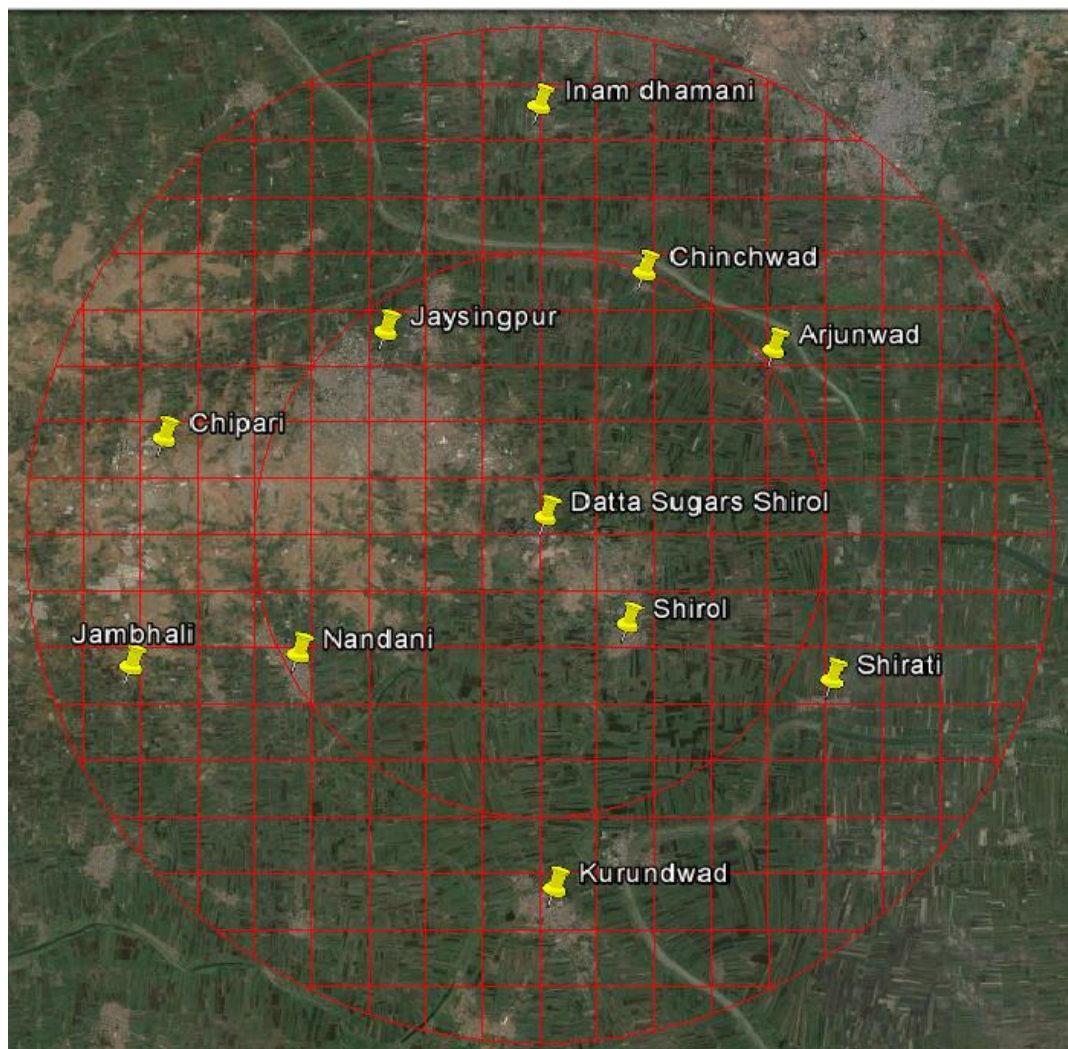
The survey for ecology and biodiversity study was conducted around 10 km radius of the sugar factory unit. Before stating actual survey the toposheets, land use maps and goggle satellite images were used. The field study was conducted during June - July, 2016. The visit to the study sites were carried out during the morning and evening time when maximum movements of birds and animals can be seen.

The study area was divided in to two zones namely Core Zone within 5 km. radius and Buffer Zone from 5 km. to 10 km. radius from the distillery site. The core zone is a area under immediate impact and buffer zone is comparatively having less impact. The total study area is divided in to grids of 1 sq. km. The stratified random sampling method was adopted for complete study. The 6 grids were studied from the core zone and 5 grids were studied from the buffer zone were studied. Within each of these sites according to habitat type the quadrates and line transects were laid down. For the floral component study quadrates of 100 m x 100 m were used in each grid. The bird life was studied by line transect of 1 km. in the grid. This methodology is useful to understand species richness and diversity of plants. The other floral and faunal components were studied by visual encounter survey, secondary data including Government Gazettes and published literature, and discussion with local people. The aquatic planktons were studied Krishna river on East and Panchganga river on South in the study area. There is no National Park, Wildlife Sanctuary, Biosphere Reserve, Wildlife corridor, Tiger / Elephant Reserves within

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E-Mail : klp.dattsssk@gmail.com

the study area, which has been confirmed with Forest Department and with available literature.

Map of study sites with grids :



7.4 Assessment of flora : Fig.7.1

The sugar factory site is located on plain area about 540 below mean sea level and the rainfall in this area is 600 mm and lasts for a span of four months. The soil of this area is deep black cotton soil. It is supposed to be very fertile soil and the cash crops like sugarcane, jowar, maize, cotton and commercially important vegetables like brinjal are grown in this area. Mainly the vegetation observed in the factory area and its 10 km radius is cultivated and mostly agricultural crops. The factory has very good and well maintained nursery supplying plantlets to the nearby area people. Due to water logging

formation of saline soil is the main problem. The natural vegetation is mainly dominated by Acacia sps. like Babhul, Gulmohar, Neem, Mango, Jambhul. The factory had grown supari (areca nut), coconut trees in large numbers which is also giving good amount of yield .

7.4.1 Agricultural and Commercial Crops :

Agricultural activity is mainly confined to South West monsoon months of July to September. In some areas during post monsoon months agricultural crops are depending on the irrigation from river Krishna and Panchganga. The dominant agricultural crops of the project area consist of Sugarcane (*Sacchaum officinarum*), Jawar (*Sorghum vulgare*), Maize (*Zea mays*), Grape, Brinjal (*Solanum melongena*) whereas some other commercial crops are also grown in the area.

Table 7.1 List of Agricultural and Commercial Crops :

Sr. No.	Crop variety	Family	Botanical	Trade/ Vernacular name
I	Cereals	Poaceae	<i>Sorghum vulgare</i>	Jawar
		Poaceae	<i>Zea mays</i>	Maige
II	Sugarcane	Poaceae	<i>Saccharum officinarum</i>	Sugarcane
III	Vegetables	Malvaceae	<i>Abellmotchus escnlentns</i>	Bhendi
		Cucurbitaceae	<i>Momordica charantia</i>	Karela
		Cucurbitaceae	<i>Cucumis sativus</i>	Kakadi
		Cucurbitaceae	<i>Citrullus lanatus</i>	Tarbuj
		Solanaceae	<i>Capicum annum</i>	Mirchi
		Solanaceae	<i>Solanum melongena</i>	Brinjal
		Amaryllidaceae	<i>Allium cepa</i>	Onion
		Brassicaceae	<i>Brassica oleracea var. capitata</i>	Cabbage
		Brassicaceae	<i>Raphanus sativus</i>	Radish
		Convolvulaceae	<i>Ipomoea batatas</i>	Sweet Potato
		Apiaceae	<i>Daucus carota subsp. sativus</i>	Carrot
		Solanaceae	<i>Solanum lycopersicum</i>	Tomato
IV	Pulses	Fabaceae	<i>Trigonella foenum-graecum</i>	Fenugreek
		Fabaceae	<i>Cajanus cajan</i>	Piegon Pea
		Fabaceae	<i>Cicer arietinum</i>	Chick Pea
		Fabaceae	<i>Vigna unguiculata</i>	Cow Pea

		Fabaceae	<i>Lablab purpureus</i>	Pavata
		Fabaceae	<i>Glycine max</i>	Soybean
		Fabaceae	<i>Vigna mungo</i>	Udid
		Fabaceae	<i>Vigna radiate</i>	Moong
		Fabaceae	<i>Pisum sativum</i>	Watana
		Fabaceae	<i>Macrotyloma uniflorum</i>	Kulliith
V	Fruits	Anacardiaceae	<i>Mangifera indica</i>	Mango
		Vitaceae	<i>Vitis vinifera</i>	Grapes
		Musaceae	<i>Musa Linnaeus</i>	Banana
		Sapotaceae	<i>Manilkara zapota</i>	Chiku
		Rhamnaceae	<i>Ziziphus mauritiana,</i>	Bor / Ber
		Myrtaceae	<i>Psidium guajava</i>	Gauva
		Caricaceae	<i>Carica papaya</i>	Papaya
VI	Oil crops	Legumes	<i>Arachis hypogaea</i>	Groundnut
		Asteraceae	<i>Helianthus annuus</i>	Sunflower
		Pedaliaceae	<i>Sesame indicum</i>	Javas
VII	Fiber crops	Malvaceae	Hibiscus cannabinus	Ambadi
		Malvaceae	<i>Gossypium herbaceum</i>	Cotton

7.4.2 Ornamental Plants:

The Sugar factory has its own nursery of 72 acres of area and variety of ornamental as well as commercially important horticulture plants are grown and distributed to farmers. Lawn on 14 acres is also a good sign of carbon sequestration. There are also number of 'Green Houses' in the 10 km radius of distillery site which grow some ornamental plants, roses and even some vegetables. The following species have been grown in nursery, gardens and at public places.

Table 7.2List of Ornamental Plants

Sr. No.	Common Name	Scientific Name	Family
1	Chafa	<i>Plumeria rubra</i>	Apocynaceae
2	Cycas	<i>Cycas revoluta</i>	Cycadaceae
3	Ficus	<i>Ficus benamina</i>	Moraceae
4	Idlimbu	<i>Citrus maxima L.</i>	Rutaceae
5	Jaswand	<i>Hibiscus rosa sinensis</i>	Malvaceae
6	Kaneri	<i>Nerium oleander</i>	Apocynaceae

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7	Mehandi	<i>Lawsonia inermis</i>	Lythraceae
8	Parijatak	<i>Nyctanthes arbor-tristis</i>	Oleaceae
9	Royal Palm	<i>Roystonea regia</i>	Arecaceae
10	Sadaphuli	<i>Vinca rosea</i>	Apocynaceae
11	Satavari	<i>Asparagus racemosus</i>	Asparagaceae
12	Zendu	<i>Tagetes erecta</i>	Asteraceae
13	Bogunvel	<i>Bougainvillea glabra</i>	Nyctaginaceae
14	Rain tree	<i>Albizia saman</i>	Fabaceae
15	Kamal	<i>Nelumbo nucifera</i>	Nelumbonaceae
16	Duranda	<i>Duranta erecta</i>	Verbenaceae
17	Lili	<i>Lilium candidum</i>	Liliaceae
18	Kham suru	<i>Casuarina equisetifolia</i>	Casuarinaceae
19	Dresina	<i>Dracaena draco</i>	Asparagaceae
20	Song of Indian	<i>Dracaena reflexa</i>	Asparagaceae
21	Fern	<i>Asplenium bulbiferum</i>	Aspleniaceae
22	Hydrangea	<i>Hydrangea macrophylla</i>	Hydrangeaceae
23	Mogara	<i>Jasminum sambac</i>	Oleaceae
24	Bottle palm	<i>Hyophorbe lagenicaulis</i>	Arecaceae
25	Exora	<i>Ixora coccinea</i>	Rubiaceae
26	Suru	<i>Casuarina equisetifolia</i>	Casuarinaceae
27	Kunda	<i>Jasminum multiflorum</i>	Oleaceae
28	Gulab	<i>Rosa chinensis</i>	Rosaceae
29	Asclepias	<i>Asclepias syriaca</i>	Apocynaceae
30	Kamini	<i>Murraya paniculata</i>	Rutaceae
31	Galanda	<i>Gaillardia pulchella</i>	Asteraceae
32	Silver oak	<i>Grevillea robusta</i>	Proteaceae
33	Limbu	<i>Citrus aurantifolia</i>	Rutaceae
34	Umbrella	<i>Cyperus involucratis</i>	Cyperaceae
35	Fan palm	<i>Washingtonia filifera,</i>	Arecaceae
36	Bottle Brush	<i>Callistemon viminalis</i>	Myrtaceae
37	Aralia	<i>Aralia elata</i>	Araliaceae
38	Croton	<i>Codiaeum variegatum.</i>	Euphorbiaceae
39	Beloperone	<i>Justicia californica</i>	Acantheceae
40	Dieffenbachia	<i>Dieffenbachia bowmannii</i>	Araceae
41	Asparagus	<i>Asparagus officinalis,</i>	Asparagaceae
42	Jam	<i>Randia formosa</i>	Rubiaceae
43	Star fruit	<i>Averrhoa carambola</i>	Oxalidaceae
44	Geranium	<i>Geranium endressii</i>	Geraniaceae
45	Money Plant	<i>Pachira aquatica</i>	Malvaceae

46	Kardali	<i>Canna indica</i>	Cannaceae
47	Blasom	<i>Impatiens balsamina</i>	Balsaminaceae
48	Cactus	<i>Acanthocereus tetragonus</i>	Cactaceae

7.4.3 Natural vegetation:

Natural vegetation in the study area is predominant with 78 species including herbs, shrubs and trees. The barren area is not seen in this area as the entire area is irrigated. There are some water logged areas where mainly the population of babhul and vedi babhul which are tolerant to water are growing. Some land under cultivation is also becoming saline due to excessive irrigation. During the study following 78 species i.e. 13 herb species, 16 shrub species and 49 trees were observed.

Table 7.3 Herb vegetation:

HERBS			
Sr. No.	Local Name	Scientific Name	Family
1	Agada	<i>Achyranthes aspera</i>	Amaranthaceae
2	Dagadi pala	<i>Tridax procumbens</i> ,	Asteraceae
3	Gokarna	<i>Clitoria ternatea L.</i>	Fabaceae
5	Harali	<i>Cynodon Dactylon</i>	Poaceae
6	Kombada	<i>Celosia argentea L.</i>	Amaranthaceae
7	Kongress	<i>Parthenium hysterophorus</i>	Asteraceae
8	Pankanis	<i>Typha Elephantina</i>	Typhaceae
9	Rangavi	<i>Solanum anguivi Lam.</i>	Solanaceae
10	Reshim Kata	<i>Alteranthera triandra</i>	Amaranthaceae
11	Sarata	<i>Tribulus terrestris Linn</i>	Zygophyllaceae
12	Agada	<i>Achyranthes aspera</i>	Amaranthaceae
13	Lavhala	<i>Pandanus tectorius</i>	Pandanaceae

Table No. 7.4 Shrub vegetation:

SHRUBS			
Sr. No.	Local Name	Scientific Name	Family
1	Besharmi	<i>Ipomoea Carnea</i>	Convolvulaceae
2	Bor	<i>Ziziphus mauritiana</i>	Rhamnaceae
3	Dhotara	<i>Datura wrightii</i>	Solanaceae
4	Earand	<i>Ricinus communis</i>	Euphorbiaceae
5	Ghaneri	<i>Lantana Camara</i>	Verbenaceae
6	Kanheri	<i>Nerium oleander</i>	Apocynaceae

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7	Kekatatad	<i>Agave</i>	Asparagaceae
8	Koranty	<i>Barleria cristata</i>	Acanthaceae
9	Korphad	<i>Aloe vera</i>	Asphodelaceae
10	Lajalu	<i>Mimosa pudica L.</i>	Leguminoceae
11	Niragudi	<i>Vitex negundo</i>	Lamiaceae
12	Rui	<i>Calotropis gigantea</i>	Apocynaceae
13	Sher	<i>Euphorbia tirucalli</i>	Euphorbiaceae
14	Taravad	<i>Prosopis juliflora</i>	Fabaceae
15	Tuti	<i>Morus alba</i>	Moraceae
16	Mogali Erand	<i>Jatropha curcas</i>	Euphorbiaceae

Table 7.5 Tree vegetation:

TREE			
1	Aamba	<i>Mangifera Indica</i>	Anacardiaceae
2	Ashoka	<i>Polyalthia Longifolia</i>	Annonaceae
3	Babhul	<i>Acacia nilotica</i>	Fabaceae
4	Badam	<i>Terminalia catappa</i>	Combretaceae
5	Bahava	<i>Cassia fistula</i>	Fabaceae
6	Bamboo	<i>Bambusa vulgaris</i>	Poaceae
7	Chafa	<i>Plumaria obtusa</i>	Apocynaceae
8	Chandan	<i>Santalum album</i>	Santalaceae
9	Chiku	<i>Achras sapota</i>	Sapotaceae
10	Chinch	<i>Tamarindus indica</i>	Fabaceae
11	Coconut	<i>Cocos nucifera L.</i>	Arecaceae
12	Cycus	<i>Cycas revoluta</i>	Cycadaceae
13	Gulamohar	<i>Delonix regia</i>	Fabaceae
14	Hinganbet	<i>Balanites aegyptiaca</i>	Balanitaceae
15	Jambhul	<i>Syzygium cumini</i>	Myrtaceae
16	Kadipata	<i>Murraya koenigii</i>	Rutaceae
17	Kadunimb	<i>Azadirachta indica</i>	Meliaceae
18	Karanj	<i>Pongamia pinnata</i>	Fabaceae
19	Keli	<i>Musa paradisiun</i>	Musaceae
20	Nilgiri	<i>Eucalyptus obliqua</i>	Myrtaceae
21	Palas	<i>Butea monosperma Kuntze</i>	Fabaceae
22	Palm	<i>Roystonea regia</i>	Arecaceae
23	Papaya	<i>Carica papaya</i>	Caricaceae
24	Peru	<i>Psidium guajava</i>	Myrtaceae
25	Pimpal	<i>Ficus religiosa</i>	Moraceae
26	Ramfal	<i>Annona reticulata</i>	Annonaceae
27	Sagavan	<i>Tectona grandis</i>	Lamiaceae
28	Shevaga	<i>Moringa oleifera</i>	Moringaceae

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29	Shitafal	<i>Annona squamosa</i>	Annonaceae
30	Umbar	<i>Ficus racemosa</i>	Moraceae
31	Vad	<i>Ficus Benghalensis</i>	Moraceae
32	Vedi Babhul	<i>Prosopis juliflora</i>	Fabaceae
33	Vilayati Chinch	<i>Pithecellobium dulce</i>	Fabaceae
34	Supari	<i>Areca catechu</i>	Arecaceae
35	Aapata	<i>Bauhinia racemosa</i>	Fabaceae
36	Kanchan	<i>Phanera variegata</i>	Fabaceae
37	Aavala	<i>Phyllanthus emblica,</i>	Phyllanthaceae
38	Tamalpatri	<i>Cinnamomum tamala,</i>	Lauraceae
39	Cherry	<i>Prunus cerasus</i>	Rosaceae
40	Jaiphal	<i>Myristica fragrans</i>	Myristicaceae
41	Rain tree	<i>Albizia saman</i>	Fabaceae
42	Anjir	<i>Ficus carica</i>	Moraceae
43	Shampen Palm	<i>Hyophorbe lagenicaulis</i>	Arecaceae
44	Morpanki	<i>Platycladus orientalis</i>	Cupressaceae
45	Khrismas tree	<i>Araucaria columnaris</i>	Araucariaceae
46	Traveller Plam	<i>Ravenala madagascariensis</i>	Strelitziaceae
47	Rubber	<i>Ficus elastica</i>	Moraceae
48	Ficus	<i>Ficus carica</i>	Moraceae
49	Umbrella	<i>Cyperus alternifolius</i>	Cyperaceae



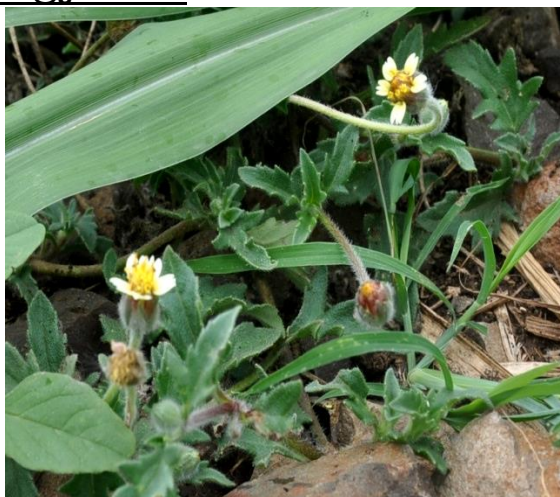
Cyperus rotundus



Oleracea portulaca



Alternanthera triandra

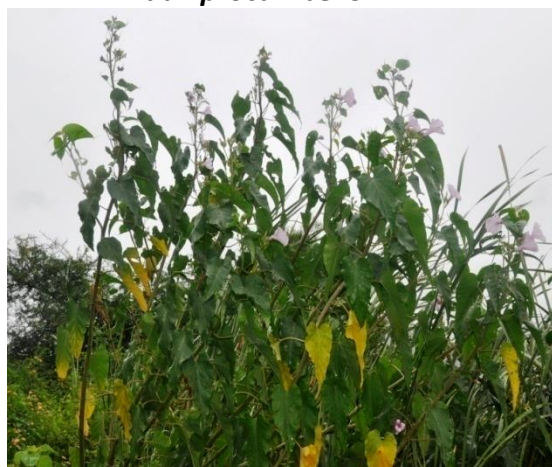


Tridax procumbens



Arachis hypogaea

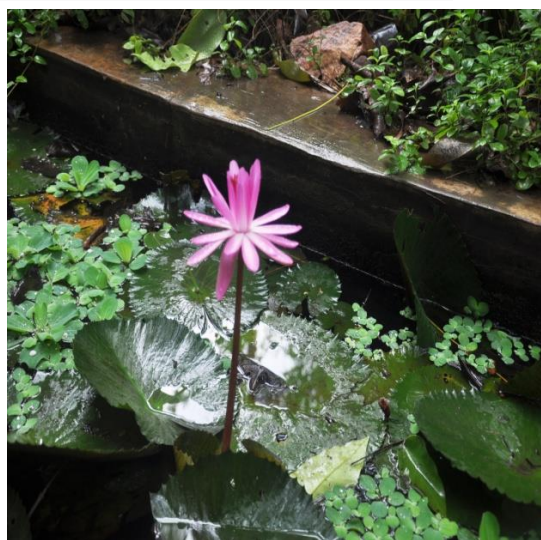
Fig.7.2



Ipomea carnea



Syzygium cumuni



Nelumbo nucifera



Delonix regia



Duranta repens



Roystonea regia



Cocos nucifera



Phyllostachys aurea



Musa acuminata



Mix cropping



Calendula officinalis

7.5 Species diversity index and species richness of plant population

Biodiversity refers to the number and variety of organisms within a particular area. It is always used as a measure of the health of biological system. Species diversity is a characteristic unique to the community level of biological organization. Higher species diversity is generally thought to indicate a more complex and healthier community because a greater variety of species allows for more species interactions. Hence, a greater system stability indicates good environmental conditions. Species richness is the number of different species present in an area. The more species present in a sample area the 'richer' the area.

In the present study "Shannon – Weiner Index" and "Species Richness" is calculated for the natural vegetation occurring in the study area. The study area was divided in to grids of 1 sq. km. The stratified random sampling method was adopted for the study. The herbs, shrubs and trees were studied by quadrature method. One quadrature taken for study was of 100 m x 100 m. The 6 grids from the core zone and 5 grids from the buffer zone were studied.

Table No.7.6 the sites studied for plant and bird indices

Site No	Region	Village	Latitude	Longitude
1	Core	Sugar Factory premises	16°45'01.32"N	74°35'11.88"E
2		Shirol	16°43'40.01"N	74°35'54.38"E
3		Nandani	16°43'33.76"N	74°32'35.89"E
4		Jaysinghpur	16°46'59.58"N	74°33'31.05"E
5		Chinchwad	16°47'37.46"N	74°36'14.18"E
6		Arjunwad	16°46'47.87"N	74°37'35.67"E

7	Buffer	Inam Dhamani	16°49'23.55"N	74°35'07.95"E
8		Jambhali	16°43'26.01"N	74°30'50.42"E
9		Kutwad	16°44'32.07"N	74°40'06.31"E
10		Jainapur	16°47'10.29"N	74°30'51.93"E
11		Terwad	16°40'11.98"N	74°34'56.21"E

Table 7.7 Shannon Weiner Index and Species richness of plant population in study area.

Site No	SW Index	Sp. Richness
1	2.76	109
2	3.17	57
3	3.41	47
4	3.38	61
5	3.40	56
6	3.37	61
7	3.01	52
8	3.35	54
9	3.55	62
10	3.33	60
11	3.32	50

Table 7.8 Category wise Index of total study area:

Type of vegetation	SWI	Species Richness
Tree	2.54	50
Herb	2.16	17
Shrub	2.26	17

From the above tables it can be stated that the Site No. 9 i.e. Kutwad is located near Krishna river shows highest 'Shannon Weiner Index' suggesting maximum species diversity. Species richness i.e. number of species is maximum at sugar factory site where maximum plantation is found as well as the factory has its own nursery with variety of plant species grown for distribution to the farmers. Therefore, it is worth to mention that the organisation should take care of all these species in this area.

7.6 Faunal study:

Fauna includes all invertebrate and vertebrate animals. With plants these animals maintain balance of the ecosystem and therefore, fauna of a particular region indicates environmental conditions and the well being of the population residing in the area. As the animals are very sensitive and have capacity to move from one place to another, any change or modification in the ecosystem may lead to death or migration from the region and

therefore, they are considered as best indicators of the ecosystem function. It helps to understand pollution level, biological richness, habitat change as well as to quantify any change in species composition.

Following methodology is being used to prepare a comprehensive list of fauna of the study area.

- i. Secondary sources like Government Gazettes, news articles and published literature.
- ii. Interviews of local people.
- iii. Sighting of animals during survey visits.
- iv. Bird and animal calls.
- v. Nesting and roosting.
- vi. Line transects for birds.

The study area has very rich fauna. During the study visits 7 molluscs, 16 insect species, 14 Butterfly species, 8 Dragon fly species, 1 crab, 10 fish species, 3 Amphibian species, 16 Reptile species and 21 Mammalian species were spotted and they are listed in the table. There are 10 species are predominant in the rivers and streams of this area which have been taken from the available literature and information from local people and fisherman.

An exhaustive list of birds have been prepared by line transect as well as spotting of birds during movement of team during visit. 59 bird species belonging to 16 orders are spotted and most of them are included in Schedule IV and V and 5 are in Schedule I of Wildlife Protection Act, 1972. With literature survey and information from the Forest Department reveals that the study area is not having any scheduled animal.

Table 7.9 the list of mammals, amphibians, reptiles, butterflies, fishes, insects and dragonflies found in the study area.

	Sr. No.	Common Name	Scientific Name
Mammals	1	Fruit Eating Bat	<i>Rousettus spp.</i>
	2	Indian gray mongoose	<i>Herpestes edwardsi</i>
	3	Stripped Squirrel	<i>Funambulus palmarum</i>
	4	Sasa	<i>Lepus reevesi</i>
	5	Kolha	<i>Canis aureus</i>
	6	Landaga	<i>Canis pallipes</i>
	7	Ox	<i>Bos indicus</i>
	8	Donkey	<i>Equus asinus</i>
	9	Sheep	<i>Ovis aries</i>
	10	Dukkar	<i>Sus scrofa davidi</i>
	11	Cow	<i>Bos primigenius</i>
	12	Goat	<i>Capra hircus aegagrus</i>
	13	Common House Rat	<i>Rattus rattus</i>
	14	Indian Field Mouse	<i>Mus booduga</i>
	15	House Mouse	<i>Mus musculus</i>
	16	Cat	<i>Felis silvestris catus</i>
	17	Dog	<i>Canis lupus familiaris</i>
	18	Domestic Buffalo	<i>Bubalus bubalis</i>
	19	Chinkara	<i>Gazella gazelle bennetti</i>
	20	Common Langur	<i>Simia entellus</i>
	21	Indian Hare	<i>Lepus nigricollis</i>
Amphibians	1	Common Frog	<i>Polypedates eucomystax</i>
	2	Indian Bull frog	<i>Rana tigrina</i>
	3	Common Indian Toad	<i>Bufo melanostictus</i>
Mollusc	1	Terrestrial snail	<i>Macrochlamys indica</i>
	2	Common Snail	<i>Cryptozona bistrilis</i>
	3	Land Snail	<i>Glossula sp</i>
	4	Brown Slug	<i>Mariaella dussumieri</i>
	5	Freshwater Snail	<i>Physella acuta</i>
	6	Quilted melania	<i>Tarebia granifera</i>
	7	Mussel	<i>Margaritifera margaritifera</i>
Arthropod	1	Crab	<i>Paratelphusa jaquemontii</i>
Reptiles	1	Mugger	<i>Crocodylus palustris</i>
	2	House gecko	<i>Hemidactylus brooki</i>
	3	Common Garden Lizards	<i>Calotes versicolor</i>

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	4	Rock Lizzard	<i>Psmmophilus blanfordanus</i>
	5	Monitor lizzard	<i>Varanus benghalensis</i>
	6	Skink	<i>Lampropholis guichenoti</i>
	7	Rat Snake	<i>Ptyas mucosa</i>
	8	Checkered keel back	<i>Xernochrophis piscator</i>
	9	Nag	<i>Naja naja</i>
	10	Ghonas	<i>Vipera russellii</i>
	11	Saw-scaled viper	<i>Echis carinatus</i>
	12	Banded racer	<i>Argyrogena fasciolata</i>
	13	Banded krait	<i>Bangarus caeruleus</i>
	14	Russel Viper	<i>Viperarusseli</i>
	15	Trinket	<i>Coelognathus helena</i>
	16	Indian Flap shell Turtle	<i>Lissemys punctata</i>
Butterfly	1	Common Rose	<i>Pachliopta aristolochae</i>
	2	Zebra Blue	<i>Leptotes plinius</i>
	3	Chocklate Pancy	<i>Junonia iphita</i>
	4	Common Evening Brown	<i>Melanitis leda</i>
	5	Common Emigrant	<i>Catopsilia pyranthe</i>
	6	Stripped Tiger	<i>Danaus genutia</i>
	7	Common grass yellow	<i>Eurema hecabe</i>
	8	Common Indian crow	<i>Euploea core</i>
	9	Red Pierrot	<i>Talicauda nyseus</i>
	10	Laser grass blue	<i>Zizina otis</i>
	11	Psyche	<i>Leptosia nina</i>
	12	Denaïd Eggfly	<i>Hypolimnys misippus</i>
	13	Plain Tiger	<i>Danaus chrysippus</i>
	14	Plain Cupid	<i>Chilades pandava</i>
Fishes	1	Katla	<i>Katla katla</i>
	2	Kolshi	<i>Puntius kolus</i>
	3	Rohu	<i>Labeco rohita</i>
	4	Mrigal	<i>Cirrhinus cirrhosus</i>
	5	Murrel	<i>Channa marulius</i>
	6	Wam	<i>Mastacembelus armatus</i>
	7	Loach	<i>Bhavana australis</i>
	8	Silver Carp	<i>Hypophthalmichthys molitrix</i>
	9	Grass Carp	<i>Ctenopharyngodon idella</i>
	10	Tilapia	<i>Oreochromis mossambica</i>
Insect	1	Dung fly	<i>Leptocera caenosa</i>
	2	Jwell Bug	<i>chrysocoris stoll</i>
	3	Earwig	<i>Forficula auricularia,</i>

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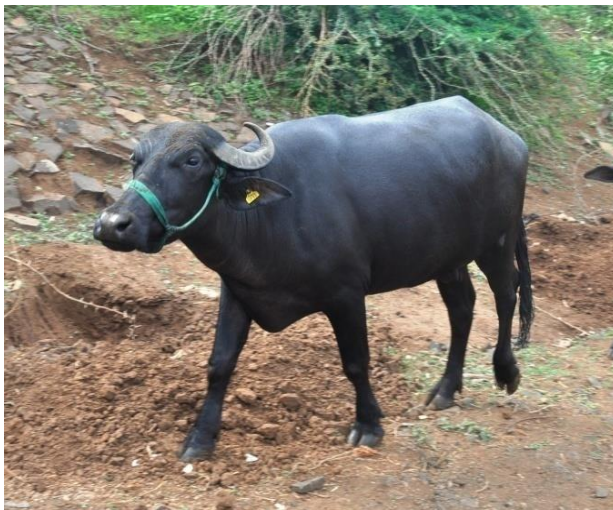
	4	Grass hopper	<i>Cyrtacanthacris tatarica</i>
	5	Honey bee	<i>Apis dorsata</i>
	6	Common black ground beetle	<i>Pterostichus melanarius</i>
	7	Cow dung Beetle	<i>Onthophagus catta</i>
	8	House Cricket	<i>Acheta domestica</i>
	9	Termites	<i>Odontotermes wallonensis</i>
	10	Stick insect	<i>Carausius morosus</i>
	11	Emerald cockroach wasp	<i>Ampulex compressa</i>
	12	Hover fly	<i>Mesembrius insignis</i>
	13	Carpenter bee	<i>Xylocopa micans</i>
	14	Millipede	<i>Narceus americanus</i>
	15	Wolf Spider	<i>Hogna lenta</i>
	16	Mantis	<i>Euantissa pulchra</i>
Dragon fly	1	Long leged marsh skimmer	<i>Trithemis Pallidinerries</i>
	2	Ditch Jewel	<i>Brachythemis contaminata</i>
	3	Damcel Fly	<i>Pseudagrion decorum</i>
	4	Senegal golden dartlet	<i>Ischnura senegalensis</i>
	5	Yellow bush dart	<i>Copera marginipus</i>
	6	Crimson marsh glidder	<i>Trithemis aurora</i>
	7	Ruddy marsh skimmer	<i>Crocothemis servilia</i>
	8	Ground skimmer	<i>Diplacodes trivialis</i>



Ptyas mucosa Fig.7.3



Mugger observed in study area



Bubalus bubalis



Canis lupus familiaris

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Sr. No	Order	Family	Common Name	Scientific Name	Schedule
1	Accipitriformes	Accipitridae	Black winged Kite	<i>Elanus caeruleus</i>	I
			Brahminy Kite	<i>Haliastur Indus</i>	I
			Black Kite	<i>Milvus migrans</i>	I
2	Anseriformes	Antidae	Indian spotbilled duck	<i>Anas Poecileorhyncha</i>	IV
4	Ciconiiformes	ciconiidae	Painted Stork	<i>Mycteria leucocephala</i>	IV
			Wooly necked Stork	<i>Ciconia episcopus</i>	---
5	Columbiformes	Columbidae	Rock Pigeon	<i>Columba livia</i>	---
			Laughing Dove	<i>Spilopelia senegalensis</i>	IV
			Eurasian collard Dove	<i>Streptopelia decaocto</i>	IV
			Spotted Dove	<i>Stigmatopelia chinensis</i>	IV
6	Charadriiformes	Scolopacidae	Common Sandpiper	<i>Actitis hypoleucos</i>	IV
		Charadriidae	Red wattled Lapwing	<i>Vanellus Indicus</i>	IV
		Sternidae	River tern	<i>Sterna aurantia</i>	---
		Recurvirostrida	Black winged stilt	<i>Himantopus</i>	IV
7	Coraciiformes	Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>	IV
			White throated Kingfisher	<i>Halcyon smyrnensis</i>	IV
		Meropidae	Green bee Eater	<i>Merops orientalis</i>	---
8	Cuculiformes	Cuculidae	Southern Coucal	<i>Centropus (sinensis) parrotia</i>	IV
			Asian Koel	<i>Eudynamys scolopaceus</i>	IV
			House Crow	<i>Corvus splendens</i>	V
	Passeriformes	Corvidae	Jungle Crow	<i>Corvus macrorhynchos</i>	V
			Black Drongo	<i>Dicrurus macrocercus</i>	IV
		Passeridae	House Sparrow	<i>Passer domesticus</i>	IV
		Cisticolidae	Plain Prinia	<i>Prinia inornata</i>	IV
			Jungle Prinia	<i>Prinia sylvatica</i>	IV
			Ashy Prinia	<i>Prinia socialis</i>	IV
		Muscicapidae	Oriental Magpie Robin	<i>Copsychus saularis</i>	IV
			Indian Robin	<i>Saxicoloides</i>	IV

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				<i>fulicatus</i>	
			Pied Bushchat	<i>Saxicola caprata</i>	IV
		Pycnonotidae	Red vented Bulbul	<i>Pycnonotus cafer</i>	IV
		Motacillidae	White browed Wagtail	<i>Motacilla maderaspatensis</i>	IV
		Paridae	Great tit	<i>Parus major</i>	
		Nectariniidae	Purple Sunbird	<i>Cinnyris asiaticus</i>	IV
			Purple rumped Sunbird	<i>Leptocoma zeylonica</i>	IV
		Sturnidae	Common Myna	<i>Acridotheres tristis</i>	IV
			Jungle Myna	<i>Acridotheres fuscus</i>	IV
			brahmny starling	<i>Sturnia pagodarum</i>	IV
		Estrildidae	Indian Silverbill	<i>Euodice malabarica</i>	IV
			Scaly breasted Munia	<i>Lonchura Punctulata</i>	IV
			Tri-Coloured Munia	<i>Lonchura malacca</i>	
		Ploceidae	Baya, Weaver	<i>Ploceus philippinus</i>	IV
		Hirundinidae	Wire tailed Swallow	<i>Hirundo smithi</i>	---
			Red rumped Swallow	<i>Cecropis daurica</i>	---
		Leiothrichidae	Large grey Babbler	<i>Turdoides malcolmi</i>	IV
		Laniidae	Bay Backed Shrike	<i>Lanius vittatus</i>	---
10	Pelecaniformes	Ardeidae	Indian pond Heron	<i>Ardeola grayii</i>	IV
			Grey Heron	<i>Ardea cinerea</i>	IV
			Great Egret	<i>Ardea alba</i>	
			Intermediate Egret	<i>Egretta intermedia</i>	IV
			Little Egret	<i>Egretta garzetta</i>	IV
		Threskiornithidae	Red- naped Ibis	<i>Threskiornis melanocephalus</i>	IV
11	Psittaciformes	Psittacidae	Rose ringed Parakeet	<i>Psittacula krameri</i>	IV
13	Podicipediformes	Podicipedidae	Little Grebe	<i>Tachybaptus ruficollis</i>	IV
14	Galliformes	Phasianidae	Common Quail	<i>Coturnix coturnix</i>	IV
			Grey Francolin	<i>Francolinus pondicerianus</i>	IV
			Indian Peafowl	<i>Pavo cristatus</i>	I

15	Gruiformes	Accipitridae	Shikra	<i>Accipiter badius</i>	I
		Rallidae	White breasted waterhen	<i>Amaurornis phoenicurus</i>	
			Purple Swampphen	<i>Porphyrio porphyrio</i>	
16	Suliformes	Phalacrocoraci dae	Little Cormorant	<i>Phalacrocorax niger</i>	IV

Table No. 7.10 the list of bird species found in the study area.



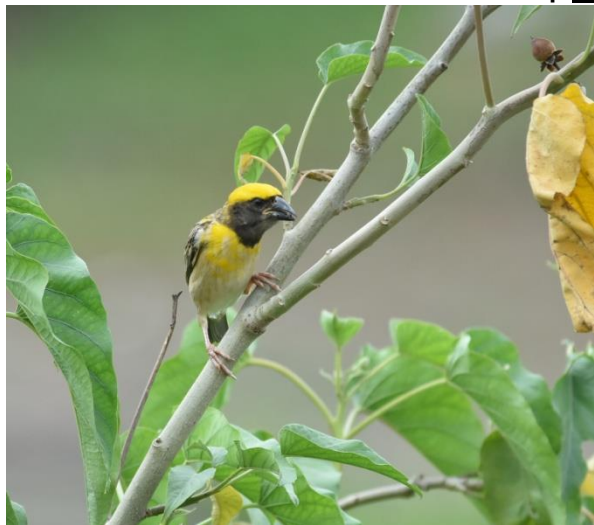
Zizina otis



Himatopous himantopous Fig.7.4



Merops orientalis



Ploceus philippinus



Ardea cinerea



Lanius vittatus



Saxicola caprata



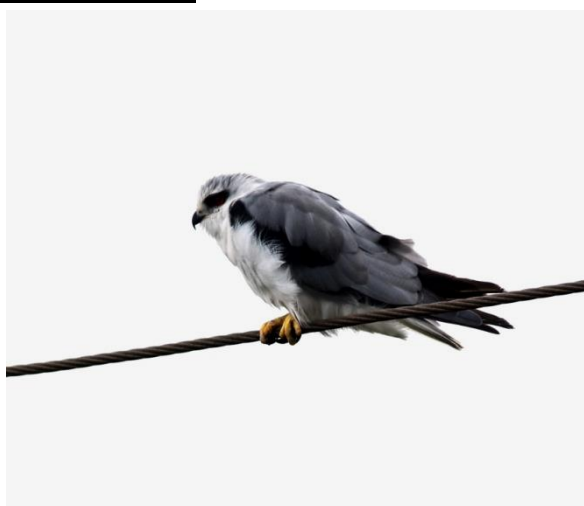
Amaurornis phoenicurus



Anas Poecileorhyncha



Ciconia episcopus



Elanus caeruleus



Ardea alba



Lonchura malacca

7.7 Species diversity index and species richness of bird population :

In the present study “Shannon – Weiner Index” and “Species Richness” is calculated for the bird population in the study area. The study area was divided in to grids of 1 sq. km. The stratified random sampling method was adopted for the study. The 6 grids from the core zone and 5 grids from the buffer zone were studied. In these grids line transects of 1 km. length were taken and by standard protocol of line transect birds were listed. The calculations were carried out for “Shannon – Weiner Index” i. e. species diversity and “Species Richness”. It is found that the site no. 1 and 6 Andhalgaon is showing maximum diversity and site no. 1 is showing maximum richness of bird species. The area is fertile and therefore, the bird population is good due to availability of food in the area.

Table 7.11 Shannon Weiner Index and Species richness study of bird population in study area.

Site No	SW Index	Sp. Richness
1	2.66	48
2	2.12	20
3	2.15	42
4	2.05	43
5	2.21	18
6	2.66	34
7	1.63	14
8	1.87	14
9	2.24	34
10	2.29	40
11	2.21	18

7.8 Aquatic ecosystem :

Life evolved in aquatic environment and therefore it is not surprising that aquatic ecosystem contain areas of high biodiversity and abundance. The sugar factory site is located on plain area about 540 mean sea level and the average rainfall in this area is 600 mm and lasts for a span of four months. The aquatic planktons were studied from Krishna River on East and Panchganga River on South in the study area. During the visits to the study area the team has collected samples of water mainly from river by plankton net with mesh size = 625 is equal to 625 holes in 1.25cm. The references and cross references from the study area are also being used to confirm plankton.

a. Diatoms and Dinoflagellates :

Diatoms and Dinoflagellates are single celled eukaryotic algae. Diatom cells are encased in glass like silica and resemble like petridish. They contain chlorophyll and are producers. Dinoflagellates are eukaryotic cells covered by theca or sheath and usually with two flagella. They also have capacity to produce their own food. Presence of Diatoms and Dinoflagellates in aquatic ecosystem becomes support to zooplanktons.

b. Phytoplankton :

Phytoplankton as primary producers used as direct source of food by other aquatic plants and animals to maintain energy flow. Composition and development of phytoplankton get influenced by short and long term environmental changes in the aquatic ecosystem. Phytoplanktons are primary producers and very useful tools for the biomonitoring of water body with regard to its pollution status. Following families are represented viz. Cyanophyceae, Bacillophyceae, Chlorophyceae, Desmidiaceae and Acanthocystidae. Some of the genera such as Oscillate, Chroococcus, Cyclotella, Scenedesmus, Navicula etc were bioindicators of pollution.

c. Zooplankton :

The zooplankton community reflects the nature and potential of aquatic ecosystem. The composition depends on physico-chemical characteristics of the water. The zooplankton is the main food of fish population of the aquatic ecosystem. The major groups of zooplankton observed during study were Cladocera, Rotifera, Protozoa, Nematoda, Aostraca, Schizopyrenida and Copepoda.

Zooplankton List: Table No.7.12

Sr. No.	Group	Family	Scientific Name
1.	Cladocera	Sididae	<i>Diaphanosoma excisum.</i>
			<i>Diaphanosoma sarsi.</i>
		Moinidae	<i>Moina brachiata.</i>
			<i>Moina macrocopa.</i>
			<i>Moina rectirostris.</i>
			<i>Moina micrura.</i>
			<i>Moina oryzae.</i>
		Bosminidae	<i>Bosminopsis deitersi.</i>
		Macrothricidae	<i>Macrothrix goeldi.</i>
			<i>Macrothrix laticornis.</i>
		Chydoridae	<i>Leydiga acanthocercoides.</i>
			<i>Alona monocantha monocantha.</i>
			<i>Alona cambouei.</i>
			<i>Alona pulchella.</i>
			<i>Biapertura karua.</i>
			<i>Pleuroxus trigonellus.</i>
			<i>Pleuroxus denticulatus.</i>
			<i>Chydorus sphaericus.</i>
			<i>Chydorus barroisi barroisi.</i>
			<i>Chydorus reticulatus.</i>
2.	Copepoda	Diaptomidae	<i>Rhinediaptomus indicus.</i>
			<i>Heliodiaptomus viduus.</i>
			<i>Neodiaptomus stregilipes.</i>
		Cyclopidae	<i>Tropocyclops prasinus.</i>
			<i>Paracyclops fimbriatus.</i>
			<i>Mesocyclops leuckarti.</i>
	Rotifera		<i>Mesocyclops hyalinus.</i>
			<i>Brachionus angularis.</i>
			<i>Brachionus bidentata.</i>
			<i>Brachionus caudatus.</i>

3.		Brachionidae	<i>Brachionus falcatus.</i>
			<i>Brachionus calyciflorus.</i>
			<i>Brachionus forficula.</i>
			<i>Brachionus bennini.</i>
			<i>Brachionus quadridentatus.</i>
			<i>Brachionus rubens</i>
			<i>Brachionus plicatilis</i>
			<i>Brachionus urceolaris</i>
			<i>Brachionus diversicornis</i>
			<i>Platyias quadricornis</i>
			<i>Platyias putulus.</i>
			<i>Keratella tropica.</i>
			<i>Keratella cochlearis</i>
			<i>Keratella quadrata.</i>
			<i>Platyias quadricornis</i>
		Lecanidae	<i>Lecane leontina.</i>
			<i>Lecane luna.</i>
			<i>Monostyla bulla.</i>
		Euchlanidae	<i>Euchlanis dilatata.</i>
			<i>Euchlanis triquetra.</i>
		Testudinella	<i>Testudinella patina.</i>
			<i>Pompholyx sulcata.</i>
		Notommatidae	<i>Cephalodella gibba.</i>
		Asplanchnidae	<i>Asplanchna priodanta.</i>
			<i>Asplanchna brightwelli.</i>
		Mytilinidae	<i>Mytilina acanthophora</i>
			<i>Mytilina ventralis.</i>
		Colurellidae	<i>Lepadella rhomboids.</i>
		Trichoceridae	<i>Trichocera similes.</i>
		Filinidae	<i>Filinia opoliensis.</i>
			<i>Filinia longiseta.</i>
		Philodinidae	<i>Callidina bidens</i>
			<i>Rotifer tardus.</i>
			<i>Rotatoria neptunia</i>
		Meliceratidae	<i>Lacinularia socialis.</i>
		Trochospharidae	<i>Horella brehmi.</i>
4.	Ostracoda	Cypridae	<i>Hemicypris fossulata.</i>
		Ilyocypridae	<i>Ilyocypris gibba.</i>
		Darwinulidae	<i>Darwinula sp.</i>
		Stenocyprinae	<i>Stenocypris hislopi</i>

Phytoplankton List: Table No. 7.13

Sr. No.	Family	Name
1.	Cyanophyceae	Gomphosphaeria
		Anacystis
		Geotrichum
		Botryococcus
		Phormidi
		Oscillate
		Rivularia
		Gloeotrichia
		Synechocystis
		Chroococcus
2.	Bacillariophyceae	Synedra
		Suriella
		Tabellaria
		Stauroneis
		Amphore
		Navicula
		Diatoma
		Fradilaria
		Asterionella
		Cyclotella
		Cymbella
3.	Chlorophyceae	Spirogyra
		Chlorella
		Ankistrodesmus
		Pediastrum
		simplex
		Tetraspora
		Scenedesmus
		Nitella
		Microspora
		Zygnema
		Ulothrix
		Mougeotia
		Coelastrum
		Cosmarium
		Tetrahedron

		Treubaria
		Micractinium
		Pochycladon
		Anthrodesmus
		Volvex
		Sphaerocystis
		Gonatozygon
		Netrium
4.	Hydrocharitaceae	Hydrilla
5.	Desmidiaceae	Closterium



Krishna River



Plankton Sampling in Krishna River

Fig.7.5



Margaritifera margaritifera

7.9 Pollutants absorbing and Carbon sequestering plants :

Shree Datta Shetkari SSK Ltd., Shirol District Kolhapur is a sugar factory . During production of the factory is releasing air pollutants like smoke consisting particulate matter and various gases produced during the process. Therefore, there is a need to grow plants which can grow well in this area and also absorb air pollutants and toxins in the environment. Though the factory premises are having nursery and good plantation, following is the list of selected plants and trees which can be grown in the surrounding area of the factory.

Table No. 7.14

Sr. No.	Local Name	Scientific Name	Family
1	Nandaruk	<i>Ficus benjamina</i>	Moraceae
2	Neem	<i>Azadirachta indica</i>	Meliaceae
3	Pimpal	<i>Ficus religiosa</i>	Moraceae
4	Gulmohor	<i>Delaonix regia</i>	Fabaceae
5	Vilayati chinch	<i>Pithecolobium dulce</i>	Fabaceae
6	Sitafal	<i>Annona squamosa</i>	Annonaceae
7	Tulas	<i>Ocimum tenuifolium</i>	Lamiaceae

CHAPTER -8

SOCI-ECONOMIC PROFILE OF THE PROJECT AREA

8.1 Introduction

Socio-economic livelihood in the project villages is of great concern while introducing an expanding the existing unit. Such project may carry both positive and negative impact on the society as a whole. Industries are required for the development, but not at cost of ecological and environmental degradation. Obviously, a tradeoff between the strong and the weak sustainability is essential. Environmentalists support the strong sustainability, while the economists support the weak sustainability. A combination of both is essential. It can be attained by minimizing the negative values and maximising the positive values, which ought to be the best practice of the management. A project would bring the positive impact on the socio-economic life of the people settled in the area without harming the sustainability provided it is well planned and managed. The tradeoff between the strong sustainability (environmentalist's approach to serve the ecology and environment) and weak sustainability (economist's approach to serve the society and the economy) can only be obtained through this method. Hence, a social impact assessment (SIA) becomes an integral part of the project.

Environmental Impact Assessment and Social Impact Assessment (SIA) extend the impact of the project on the livelihood of the natives in the study area. This chapter is devoted to assess the socio-economic impact of the expansion of the Datta Cooperative Sugar on the livelihood of the Shirol taluka.

SIA is a process in the project cycle. It is an attempt to identify and quantify the impacts of both positive and negative on the society and the environment as a whole. It is an attempt to make a project more beneficial, and convert those affected as project beneficiaries. It helps in planning for mitigation measures against any adverse impacts. It helps in evolving alternative participatory approach. However, it recognizes that all impacts (like social, cultural, and psychological) cannot be measured in a given short period. Participatory experience provides the real facts and the figures about the project impact on

the area in general and the livelihood in particular. Hence, methodology for SIA and EIA is essential.

8.2 Methodology

Charlie P. Wolf, the father of social impact assessment defines the social impacts as the “people impacts”, which analyses and evaluates the conditions, causes and consequences of a change on the people; they live in a locality due to an industrial project. Making the best possible decision using the best available information in a systematic and proper manner is in fact the impact assessment. The SIA can be classified as economic impact, social and cultural impact and psychological impacts.

a. Field survey

The field survey is proposed to,

- identify all structures within the impact zone
- identify all families with in the impact zone
- provide some identification token for having covered under the survey
- identify family members by age, education and skill levels
- assess type and extent of loss to each family
- categorize families as per the type and extent of loss
- identify and quantify loss of infrastructure

b.Socio - economic study of Project Affected Persons (PAPs)

The socio - economic study of Project Affected Persons (PAPs) (sample) covers;

- demography details - family size, sex ratio, literacy, dependency ratio,
- operational holding - include lands leased in/out and encroached and cropping pattern
- other economic activities - skill base
- employment status and migration pattern
- household income by sources
- type and amount of household expenditure
- health and nutritional status

- social organization and leadership

c.Outcome of the survey

The expected outcome from the sample survey would be;

- an understanding of the socio-economic conditions of the affected and host population
- provide input to the preparation of RAP
- help identify relocation sites
- identify alternatives for economic rehabilitation
- types of social organizations and leadership available for community mobilization
- mechanism to resolve conflicts between displaced and host populationeffectiveness of implementing agencies

d. Steps of the SIA/EIA

The SIA/EIA includes the following steps;

- Social Screening
- Baseline Socio-Economic Survey
- Consultations
- Resettlement Action Plan (RAP)
- Tribal/Community Development Plan
- Income Restoration Plan
- Follow up Consultation
- Monitoring Mechanism
- Grievance Redress Mechanism

e.Study area

Every industrial project has its operational area. The Datta Sugar Cooperative is a multi-state cooperative sugar factory established as an agro-industrial enterprise in Shirol taluka. Its operational area covers 115 villages around the radius of 25 km covering the Karnataka (28 villages from Athani and Chikkodi talukas of the state) and 37 villages from Hatakangale, Kagal and Karveer talukas of the Kolhapur district. There are other sugar

factories around the Datta Sugar. The Shirol taluka covers 54 villages, of which 16 villages fall under the radius of 15 km around the Datta Suga .Theywere Shirol,Udagaon,Arjunwad,Ghalwad,Shirati,Nrusinhawadi,Aurwad, Dharangutti,Chipari,Jambhali, Nandani,Kondigre,Jaysingpur (rural),Haroli,Umalwad andAgar bhag.All villages were selected for conducting the SIA study.

f.Objectives

The objectives are adopted in the assessment of socio-economic condition as given below.

1. To evaluate parameters defining socio-economic condition of the population.
2. Analysis of the identified socio attributes like, population distribution, availability of public utilities, socio-economic livelihood etc. through literature like District Census Handbook, Agricultural Census, N S S study rounds etc.
3. Primary household survey to assess the present socio-economic status of the families settled around the sugar factory.
4. Public opinion for industrial expansion in the study area. And the social impact on the general livelihood of the population after the industrial project.

g.Sources of information

As per the scope of the study, the information on socio-economic aspects has been gathered and compiled from several secondary sources. These include Taluka Office, district Collectorate, Agriculture Department, Irrigation Department, Central Ground Water Board, Department of Mines and Geology etc. The demographic data has mainly been compiled from the 'District Census Handbook, 2011' for Kolhapur District and the Socio-Economic Survey Report on the Kolhapur District, as these documents are comprehensive and authentic.

h.Sampling

Census survey is not essential when the samples are systematically selected to represent the universe.Using the Yamne's formula, the number of sampling is derived with the help of the formula given as under;

$$n = N / 1 + N (e)^2$$

Where,

n = Sample size

N = Population size

e = Sampling error (0.052)

The (e) value is fixed at 0.052. Population size of the selected households in the study area (N) is 24815. Of which we are expected to make sample size (n) by using the formula as above. The actual figure we arrived at is 364, but the field response to it was 388, with the help of which we come to the conclusion about the project SIA.

$$n = 24815 / 1 + 24815 (0.052)^2$$

$$n = 24815 / 1 + 24815 (0.002704)$$

$$n = 24815 / 1 + 67.0005$$

$$n = 24815 / 68.0005$$

$$n = 364$$

(Actually field response was 388)

The sampling has no stratification since the households are assumed to be the homogeneous groups of the society representing the social impact of the project. Even we have not derived the Kth sample for conducting the impact study. It would be very difficult to prepare the list of the households in the selected locality of 16 villages. We used the free-lance offer with first come first interviewed method to assess the impact. We used the structured questionnaire for conducting the interviews. The collected data information is processed and tabulated as per the social and economic parameters identified for measuring the impact of the project on the households.

Table No 8.1 Name of the Villages within the Radius of 15 KM

Sr. No.	Names of the villages	No. of households	Sample families selected for field survey
1	Shirol	6028	54
2	Udagaon	3136	20
3	Arjunwad	1151	47
4	Ghalwad	735	43
5	Shirati	1238	53

6	Nrusinhawadi	930	25
7	Aurwad	836	30
8	Dharangutti	1562	18
9	Chipari	1710	11
10	Nandani	3312	19
11	Jambhali	1020	15
12	Kondigre	700	02
13	Jaysingpur	1115	09
14	Haroli	672	04
15	Umalwad	1061	18
16	Agar bhag	1145	20
Total		24815	388

8.3 Geography and Climate

The Datta Sugar is located in the Shirol village, which is also a taluka place. This taluka is one of the developing talukas in Kolhapur district, situated in the eastern 16.370 and 16.520 north latitudes and 74.270 and 74.420 east longitudes. It has 507.9 sq. km. land constituting 6.15 percent of geographical area of the Kolhapur district. As per Census 2011, the population is 3,20,133. The estimated mid-term population of the taluka is 3,27,897 as on Jan. 2014. Among these, male population is 1,64,223 and female population is 1,55,910. The sex ratio is 949. The population density is 666 sq. km. as per the census of 2011. There are 54 villages and 02 municipalities. The total urban area is only 27.20 sq. km. and the total rural area is 480.70 sq. km. The large number of population stays in rural area. The number of total household is 68681. The main occupation of Shirol taluka is agriculture.

Shirol taluka comes within the boundaries of Sangli district to its north, Belgaum district of Karnataka state to its south and east and Hatkanangale taluka to its west. Shirol taluka has a vast plain area slopping eastward and surrounded by the Krishna, the Panchganga, the Dudhganga and Warana rivers. Shirol taluka is located in plain area at an average height of 600 meters above the sea level. The river Krishna and its tributaries have

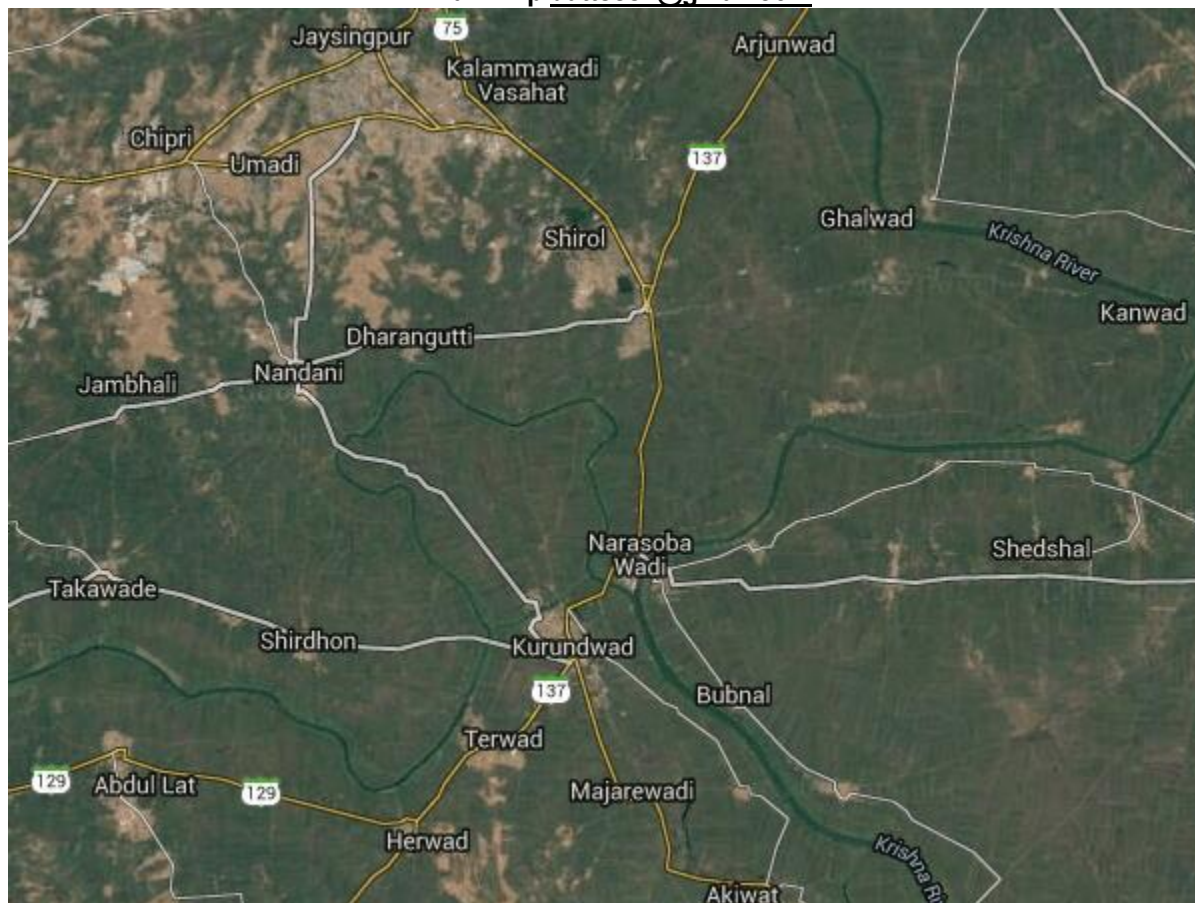
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E-Mail : klp.dattsssk@gmail.com

made this area an extensive alluvial tract. The medium and alluvial soils and moderate levelled land are mostly suitable for irrigation. Therefore, the plain area has tremendously increased under irrigation and largely affected by salinisation.

The foothill found in the North West and central southern part of the region. The height of foothill zone is 750 meter in Jaysingpur city, the highest area in Shirol taluka. The hilly area found in the North West part of the region. This hill range limits to the boundary of Shirol and Hatakangale taluka. The height of this hill area is 788 metres. The climate is one of the important factors, which determine the agricultural development. The climate of the Shirol taluka is typically monsoonal in character with four seasons.

- a) Hot weather period – March to May
- b) South west monsoon period – June to September
- c) Post monsoon period – October to mid-December
- d) The cold weather period – mid December to February

It is Hot in summer. Shirol summer highest day temperature is in between 33 ° C to 41° C
Average temperatures of January is 25 ° C , February is 26 ° C , March is 29 ° C , April is 31 ° C, May is 31 ° C .



Source: Google Map Fig.8.1

8.4 Rainfall

During the summer particularly in April and May, thunder storms are common feature all over the region. The rainfall in this season is accompanied by thunder storms and it is about 20 mm in April and 50 mm in May. This period accounts for about 11 percent of the total annual rainfall. The first week of June provides south west monsoon rainfall to the taluka. This accounts for 74 percent of the annual rainfall. A major portion of this taluka lies in rain shadow zone of the Sahyadri hills. The average annual rainfall is around 600mm in Shirol taluka. October to mid-December is the post monsoon period, which provides 14 percent of the annual rainfall. This rainfall is very useful for rabbit crops. However, this rainfall is not sufficient for agriculture. The average days of raining remained around 40 days. It was 38 in 2013-14 and 40 days in 2014-15.

Table No. 8.2 Average Rainfall in Shirol Taluka (mm)

Sr. No.	Year	Average rainfall
1	1960-61	595
2	1970-71	585
3	1980-81	587
4	1994-95	610
5	2006-07	647
6	2010-11	486
7	2013-14	382
8	2014-15	480

Source: Socio Economic Survey Report of Kolhapur District

8.5 Size of the land holding

The total area of cultivable land is 43,900 hectares. Total number of cultivators is around 50,000. The average size of land holding was 1.14 hectares as per census of 1991 and land-man ratio was 0.3 hectares as per census of 2001. The current size of holding is averaged to 0.64 hectare per family.

8.6 Land use pattern

The land use pattern accounts how the available land resources are used for productive purpose. Shirol tehsil is one of the densely irrigated areas. Hence, the uncultivable land has been brought up under cultivation since last 3-4 decades. The cultivable waste has been become minus during the last 50 years. The average net sown area remained minus due to the high amount of land area under sugarcane area.

Table 8.3 Land Use Pattern

Sr. No.	Items	1960-61	1980-81	2010-11	Percentage
1	Area under forest	902 (1.77)	896 (1.76)	1267 (2.59)	40.46
2	Land put non-agriculture use	339 (0.66)	2662 (5.24)	1220 (2.43)	259.88
3	Barren and	3439	1152	-	-

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	Cultivable Land	(6.77)	(2.27)		
4	Cultivable Waste Land	2178 (4.28)	1896 (3.73)	693 (1.38)	- 68.18
5	Permanent Pastured and Other Grazing Land	1134 (2.25)	1114 (2.9)	1491 (2.96)	31.48
6	Land under Misc. Tree Crop etc. not including Area Sown	-	-	624 (1.24)	-
7	Current Fallow Land	48 (0.09)	576 (1.13)	3404 (6.77)	6991.67
8	Other Fallow Land	01 (0.01)	208 (0.40)	1162 (2.31)	116100
9	Net Area Sown	42823	42289	35258	- 17.66
10	Area Sown More than Once	372 (0.86)	5834 (13.79)	1548 (4.39)	316
11	Gross Cropped Area	43195	48123	38806	- 10.16
12	Cropping Intensity	100.86	113.78	110.06	-

Source: Socio Economic Survey Report of Kolhapur District

Note : Figures in parenthesis shows percentage to total geographical area and in case of area sown more than once percent to net area sown
Cropping Intensity = (Gross Cropped Area/Net Area Sown) x 100

8.7 Demographic features

1. Agar is a large village located in Shirol taluka with total 1145 families residing. The Agar village has population of 5412 of which 2770 are males while 2642 are females as per Population. In Agar village population of children with age 0-6 is 571, which make up 10.55 % of total population of village. Average Sex Ratio of Agar village is 954, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Agar as per census is 903, higher than Maharashtra average of 894. Agar village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Agar village was 86.49 % compared to 82.34 % of Maharashtra. In Agar male literacy stands at 92.11 % while female literacy rate was 80.64 %.

2. Arjunwad is a large village with total 1151 families residing. The Arjunwad village has population of 5641 of which 2913 are males while 2728 are females as per Population

Census 2011. In Arjunwad village population of children with age 0-6 is 584, which make up 10.35 % of total population of village. Average Sex Ratio of Arjunwad village is 936, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Arjunwad as per census is 921, higher than Maharashtra average of 894. Arjunwad village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Arjunwad village was 83.47 % compared to 82.34 % of Maharashtra. In Arjunwad male literacy stands at 91.68 % while female literacy rate was 74.71 %.

3. Aurwad is a large village with total 836 families residing. The Aurwad village has population of 4540 of which 2293 are males while 2247 are females as per Population Census 2011. In Aurwad village population of children with age 0-6 is 496, which make up 10.93 % of total population of village. Average Sex Ratio of Aurwad village is 980, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Aurwad as per census is 984, higher than Maharashtra average of 894. Aurwad village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Aurwad village was 89.47 % compared to 82.34 % of Maharashtra. In Aurwad male literacy stands at 92.22 % while female literacy rate was 86.66 %.

4. Chipari is a large village with total 1710 families residing. The Chipari village has population of 7876 of which 4024 are males while 3852 are females as per Population Census 2011. In Chipari village population of children with age 0-6 is 867, which make up 11.01 % of total population of village. Average Sex Ratio of Chipari village is 957, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Chipari as per census is 927, higher than Maharashtra average of 894. Chipari village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Chipari village was 83.61 % compared to 82.34 % of Maharashtra. In Chipari male literacy stands at 89.70 % while female literacy rate was 77.26 %.

5. Dharangutti is a large village with total 1562 families residing. The Dharangutti village has population of 7233 of which 3739 are males while 3494 are females as per Population Census 2011. In Dharangutti village population of children with age 0-6 is 936, which make up 12.94 % of total population of village. Average Sex Ratio of Dharangutti village is 934, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Dharangutti as per census is 895, higher than Maharashtra average of 894. Dharangutti village

has lower literacy rate compared to Maharashtra. In 2011, literacy rate of Dharangutti village was 77.10 % compared to 82.34 % of Maharashtra. In Dharangutti male literacy stands at 83.05 % while female literacy rate was 70.77 %.

6. Ghalwad is a large village with total 735 families residing. The Ghalwad village has population of 3535 of which 1871 are males while 1664 are females as per Population Census 2011. In Ghalwad village population of children with age 0-6 is 352, which make up 9.96 % of total population of village. Average Sex Ratio of Ghalwad village is 889, which is lower than Maharashtra state average of 929. Child Sex Ratio for the Ghalwad as per census is 862, lower than Maharashtra average of 894. Ghalwad village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Ghalwad village was 85.20 % compared to 82.34 % of Maharashtra. In Ghalwad male literacy stands at 91.20 % while female literacy rate was 78.48 %.

7. Haroli is a large village with total 672 families residing. The Haroli village has population of 3280 of which 1691 are males while 1589 are females as per Population Census 2011. In Haroli village population of children with age 0-6 is 373, which make up 11.37 % of total population of village. Average Sex Ratio of Haroli village is 940, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Haroli as per census is 933, higher than Maharashtra average of 894. Haroli village has lower literacy rate compared to Maharashtra. In 2011, literacy rate of Haroli village was 81.08 % compared to 82.34 % of Maharashtra. In Haroli male literacy stands at 88.58 % while female literacy rate was 73.10 %.

8. Jambhali is a large village located in Shirol of Kolhapur district, Maharashtra with total 1020 families residing. The Jambhali village has population of 4963 of which 2562 are males while 2401 are females as per Population Census 2011. In Jambhali village population of children with age 0-6 is 522, which make up 10.52 % of total population of village. Average Sex Ratio of Jambhali village is 937, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Jambhali as per census is 782, lower than Maharashtra average of 894. Jambhali village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Jambhali village was 84.06 % compared to 82.34 % of Maharashtra. In Jambhali male literacy stands at 90.39 % while female literacy rate was 77.44 %.

9. Jayshingpur (rural) is a large village with total 1115 families residing. The Jayshingpur village has population of 4796 of which 2496 are males while 2300 are females as per Population Census 2011. In Jayshingpur (rural) village population of children with age 0-6 is 479, which make up 9.99 % of total population of village. Average Sex Ratio of Jayshingpur (rural) village is 921, which is lower than Maharashtra state average of 929. Child Sex Ratio for the Jayshingpur as per census is 828, lower than Maharashtra average of 894. Jayshingpur (rural) village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Jayshingpur village was 90.27 % compared to 82.34 % of Maharashtra. In Jayshingpur (rural). Male literacy stands at 93.38 % while female literacy rate was 86.94 %.

10. Kondigre is a large village with total 700 families residing. Kondigre village has population of 3245 of which 1638 are males while 1607 are females as per Population Census 2011. In Kondigre village population of children with age 0-6 is 429, which make up 13.22 % of total population of village. Average Sex Ratio of Kondigre village is 981, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Kondigre as per census is 950, higher than Maharashtra average of 894. Kondigre village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Kondigre village was 83.56 % compared to 82.34 % of Maharashtra. In Kondigre male literacy stands at 89.77 % while female literacy rate was 77.25 %

11. Nandani is a large village with total 3312 families residing. The Nandani village has population of 15093 of which 7736 are males while 7357 are females as per Population Census 2011. In Nandani village population of children with age 0-6 is 1567, which make up 10.38 % of total population of village. Average Sex Ratio of Nandani village is 951, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Nandani as per census is 863, lower than Maharashtra average of 894. Nandani village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Nandani village was 83.11 % compared to 82.34 % of Maharashtra. In Nandani male literacy stands at 89.70 % while female literacy rate was 76.25 %.

12. Nrusinhawadi is a large village located in Shirol of Kolhapur district, Maharashtra with total 930 families residing. The Nrusinhawadi village has population of 4168 of which 2137 are males while 2031 are females as per Population Census 2011. In Nrusinhawadi

village population of children with age 0-6 is 369, which make up 8.85 % of total population of village. Average Sex Ratio of Nrusinghawadi village is 950, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Nrusinghawadi as per census is 912, higher than Maharashtra average of 894. Nrusinghawadi village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Nrusinghawadi village was 89.68 % compared to 82.34 % of Maharashtra. In Nrusinghawadi male literacy stands at 93.00 % while female literacy rate was 86.20 %.

13. Shirati is a large village located in Shirol of Kolhapur district, Maharashtra with total 1238 families residing. The Shirati village has population of 5640 of which 2903 are males while 2737 are females as per Population Census 2011. In Shirati village population of children with age 0-6 is 510, which make up 9.04 % of total population of village. Average Sex Ratio of Shirati village is 943, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Shirati as per census is 835, lower than Maharashtra average of 894. Shirati village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Shirati village was 83.12 % compared to 82.34 % of Maharashtra. In Shirati male literacy stands at 90.55 % while female literacy rate was 75.33 %.

14. Shirol is a large village located in Shirol of Kolhapur district, Maharashtra with total 6028 families residing. The Shirol village has population of 27649 of which 14216 are males while 13433 are females as per Population Census 2011. In Shirol village population of children with age 0-6 is 2876, which make up 10.40 % of total population of village. Average Sex Ratio of Shirol village is 945, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Shirol as per census is 833, lower than Maharashtra average of 894. Shirol village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Shirol village was 84.53 % compared to 82.34 % of Maharashtra. The male literacy stands at 90.44 % while female literacy rate was 78.37 %.

15. Udagaon is a large village located in Shirol of Kolhapur district, Maharashtra with total 3136 families residing. The Udagaon village has population of 14513 of which 7411 are males while 7102 are females as per Population Census 2011. In Udagaon village population of children with age 0-6 is 1648, which make up 11.36 % of total population of village.

Average Sex Ratio of Udagaon village is 958, which is higher than Maharashtra state average of 929. Child Sex Ratio for the Udagaon as per census is 883, lower than Maharashtra average of 894. Udagaon village has lower literacy rate compared to Maharashtra. In 2011, literacy rate of Udagaon village was 78.38 % compared to 82.34 % of Maharashtra. The male literacy stands at 84.29 % while female literacy rate was 72.29 %.

16. Umalwad is a large village located in Shirol of Kolhapur district, Maharashtra with total 1061 families residing. The Umalwad village has population of 5024 of which 2615 are males while 2409 are females as per Population Census 2011. In Umalwad village population of children with age 0-6 is 572, which make up 11.39 % of total population of village. Average Sex Ratio of Umalwad village is 921, which is lower than Maharashtra state average of 929. Child Sex Ratio for the Umalwad as per census is 827, lower than Maharashtra average of 894. Umalwad village has higher literacy rate compared to Maharashtra. In 2011, literacy rate of Umalwad village was 83.36 % compared to 82.34 % of Maharashtra. In Umalwad male literacy stands at 90.53 % while female literacy rate was 75.67 %.

Table8. 4 Demographic Features of the Selected Villages

Sr. No.	Names of the villages	No. of households	Sample families	Pop 2011	Sex ratio	Literacy %
1	Shirol	6028	54	27649	945	84.53
2	Udagaon	3136	20	14513	958	78.38
3	Arjunwad	1151	47	5641	936	83.47
4	Ghalwad	735	43	3535	889	85.20
5	Shirati	1238	53	5640	943	83.12
6	Nrusinhawadi	930	25	4168	950	89.68
7	Aurwad	836	30	4540	980	89.47
8	Dharangutti	1562	18	7233	934	77.10
9	Chipari	1710	11	7876	957	83.61
10	Nandani	3312	19	3312	951	83.11
11	Jambhali	1020	15	4963	937	84.06
12	Kondigre	700	02	3245	981	83.56

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13	Jayshingpur (rural)	1115	09	4796	921	90.27
14	Haroli	672	04	3280	940	81.08
15	Umalwad	1061	18	5024	921	83.36
16	Agar bhag	1145	20	5412	954	86.49
Total		24815	388	110827	943	84.15

There are 4973 Antyodaya Anna beneficiaries, 14071 BPL and 61331 above BPL families in the taluka area.

8.8 Agriculture sector

Agriculture is the predominant sector in the selected villages. The village wise data was not available. Hence, the taluka data is used to acknowledge the situation in the region. Sugarcane occupies a pride of place in the agricultural economy of Shirol taluka, as it is one of the important commercial crops. The total area under sugarcane in Shirol taluka was 2288 hectares in 1960-61 which increased to 10422 hectares in 2010-11. The area under sugarcane has increased by almost 355.50 percent in the last 5 decades.

Table 8.5 Area under Different Crops

Items	Values
Geographical area of Shirol taluka (in ha.)	507834
Non-agricultural land area (in ha.)	6041
Cultivable area (in ha.)	41667
Double cropped area (in ha.)	6964
Total cultivable area (in ha.)	48631
Eligible for cultivation (in ha.)	42279
Major crops grown during the season - 2014-15 (data in parenthesis indicate the area in hectares)	
Rice (570) Wheat (1342), K Jowar (155), R jowar (2100), Bajara (21), Maize (336), total Jowar (2255), Nachani (45), Sava (200), Cereals (4955), Gram (2230), Tur (77), Mug (544), Udid (206), Math (18), Wal (209), Watana (18), Pulses (539), Pulses total (3841), total food grains (8790), Sugarcane (17883), Chillies (381), Spices (44), total spices (425), Mango (273), Fruit crops (797), total Fruits (1070), Onion (209), Tomato (85), Vegetables (538), total vegetables (832), F & V (1902), oil seeds (85), Groundnut (2250), Fodder crops (7478), Non-edible crops (27)	
Total area under crops (58794)	
Wet area (22328)	
Agricultural income 2006-07 (DGDP)	Rs. 244693 lakh
Electrical motor pumps (No)	16409
Wells (No)	3429 (9014 ha area)

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Tube wells (No)	541
Irrigation sources (No)	Local MIT – 01
Coop Lift Irrigation Schemes – 75 as on 2010	PT – 04
	KT weirs – 01
Surface irrigation (ha)	8082
NIA (ha)	17096
GIA (ha)	17540
% of GIA to CA	36.07
Milk production 2013-14	29492 (000) litres
PACS (No)	147, A/c holders – 31467, Small A/C holders – 18552, Large A/C holders 31.



Fig.8.2

The increasing area under lift and private irrigation schemes had been mainly responsible for growth in the area under sugarcane. The second main factor that has induced the expansion in the sugarcane area has been the establishment of cooperative sugar factories in the vicinity of the taluka. However, over use of irrigation and chemical fertilizers create problems like waterlogging and salinity that led to decrease in productivity of land. Continuously mono-cropping i. e. area under sugarcane during the last 5 decades increased and created salinity problem in Shirol taluka. (See table 8.6 below).

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E-Mail : klp.dattsssk@gmail.com

Soil Salinity Land in Shirol Taluka in 2007

(Area in ha)

Sr. No.	Name of the Villages	Saline Area Land	Partial Salinity Zone	Total Saline Land
1	Abbdullat	176	137	313
2	Uadgaon	119	87	206
3	Shirdhon	110	543	653
4	Arjunwad	121	328	449
5	Shirdwad	27	147	170
6	Hasure	15	162	177
7	Majarewadi	69	201	270
8	Kurundwad	217	223	440
9	Kawatheguland	105	265	370
10	Kutwad	66	169	235
11	Gourwad	42	195	237
12	Aalas	12	217	343
13	Shedshal	75	99	174
14	Bastwad	28	85	113
15	Kothali	60	206	266
16	Herwad	40	110	150
17	Bubnal	128	253	381
18	Umalwad	41	95	136
19	Danoli	102	238	340
20	Shirti	110	410	520
21	Nandni	83	100	183
22	Shirol	292	379	671
23	Kavathesar	119	213	332
24	Dattwad	78	361	239
25	Akkiwat	230	341	571
26	Danwad	220	120	344
27	Terwad	27	101	128
28	Ghalwad	105	238	343
29	Ganeshwadi	31	52	83
30	Aurwad	30	21	51
31	Takwade	35	157	192
32	Dharangutti	44	67	111
33	Chinchwad	53	118	171
	Total	3164	6238	9402

Source : Soil Testing Lab. Kolhapur

8.9 Rivers and Irrigation

Krishna and Panchaganga rivers flow through the taluka area. There are good numbers of Co-operative Lift Irrigation Schemes in the taluka. They are well managed and running efficiently. The main sources of irrigation in Shirol taluka are surface irrigation through lift irrigation schemes and wells. Co-operative Lift Irrigation Societies have great importance in the matter of production of agricultural production by providing water facilities to the land. This is more so in case of agriculture, which is dependent on nature to the agriculturists for irrigating their lands by pumping water from the rivers. Shirol is the only taluka in the whole of Kolhapur district, where co-operative lift irrigation societies have made tremendous progress. Because of this, taluka is richly drained by the rivers of Panchaganga and Krishna, which are united at Narsobawadi. The Warana and the Dudhganga are the other two tributaries, which flow in Shirol taluka. All of the rivers facilitated increased the surface irrigation by various means of lift irrigation (cooperatives, private, jointly managed). At present there are 75 cooperative lift irrigation societies working in all villages of Shirol taluka. Among various crops, sugarcane is the main crop in such irrigated land.

Table No. 8..7

Irrigation by Different Sources in Shirol Taluka

Sr. No.	Area Irrigated by Different Source	1960-61	1980-81	2009-10	Percentage Change
1	Surface Irrigation/Lift Irrigation	1772	9209	29514	1565.55
2	Well Irrigation	2011	5120	14316	611.88
3	Net Area Irrigated	3783	14329	43830	1058.60
4	Total Gross Area Irrigated	3783	14805	43830	1058.60

Source : Socio Economic Review of Kolhapur District from 1960-61 to 2006-07 and 2009

There is a considerable growth of the sugarcane in the Shirol taluka. Various cane development activities are being implemented by the sugar factory since last two decades. Consequently the cane crushing of the sugar factory has gone up. There is an excessive use of the crushing capacities since last few years. Almost 72846 account holders of various land

sizes are engaged in sugarcane cultivation. Sugarcane crop has a credit link with the PACS; its harvesting is shouldered by the sugar factories. Obviously, farmers prefer to go to sugarcane crop, though it may be a mono crop culture. Other crops have a marketing risk. Labour shortage is another cause in rural area. So there is a surety of cane supply in the area.

Due to short of the crushing capacity of the Datta Sugar, the diversion of the cane supply to other neighbouring sugar factories took place several times. There is diversion of around 25 per cent of sugarcane to other sugar factories. The Datta sugar has worked even late up to April, which is not remunerative to the sugar factory. The sugar recovery deteriorates during the summer. The crushing efficiency of the Datta Sugar is quite good. The cane development department is efficiently managing the quality of the sugarcane in the area. Various incentives are being provided to the farmers through sugar factory.



Fig.8.3

8.10 Industrial sector in the location

There are 1305 industrial units in the taluka area. Kurundwad and Jaysingpur are the two municipal areas in the taluka area. These two cities are having three MIDC areas, where these units are working. Of these units, 159 units are categorised as Red unit, 70 as Orange units and 1076 as Green units. The industrial investment in 162 units was to the tune of Rs 8733 crores. Besides, there are around 4724 micro enterprises working in the taluka area. There are 53 marketing cooperatives 15 godowns functioning for providing the remunerative

prices to the agricultural producers of the farmers and supplying the agricultural inputs to the farming. There are 137 Fair Price Shops working with the PACS and other private agencies. There are 1647 SHGs registered in the taluka. More than 22 villages are having the banking units, 47 villages are having the Post Offices and 45 Health Centres.

8.11 Socio-Economic Profile Selected Samples of the

The corresponding sub-sections are the outcome of the field survey conducted in the vicinity of the Datta sugar. The number of household covered under the field survey was 388 from the selected 16 villages. The details are given table 8. The percentage of irrigated area to total agricultural area was 48.35 in the selected villages. The percentage of sugarcane area to total agricultural area 38.31 in the villages selected so far. Similarly the percentage of sugarcane area to total irrigated area remained at 79.24. This indicates the significance of the sugarcane in the selected villages. Hardly some drought villages have very limited irrigated land area. The area under sugarcane crop always variates very frequently. The supply response to sugarcane always works in the area. Efforts are being made to introduce cent per cent irrigated area. It is possible because the river basin is very near to some villages. Area under sugarcane will further go up during the corresponding period.

The selected families were classified in to various categories for our analysis and exploration.

Table No. 8.8 Sample families in the Project Area

Sr. No.	Names of the villages	No. of households	Sample families
1	Shirol	6028	54
2	Udagaon	3136	20
3	Arjunwad	1151	47
4	Ghalwad	735	43
5	Shirati	1238	53
6	Nrusinhawadi	930	25
7	Aurwad	836	30
8	Dharangutti	1562	18

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9	Chipari	1710	11
10	Nandani	3312	19
11	Jambhali	1020	15
12	Kondigre	700	02
13	Jayshingpur (rural)	1115	09
14	Haroli	672	04
15	Umalwad	1061	18
16	Agar bhag	1145	20
Total		24815	388

1. Dependents in the families

The heads of family indicate the women status in the society. The families covered under the survey indicate that no female was heading the families. Almost all families were headed by male. This indicates the male domination in the society.

The head of the families along with other members work together for the families collectively. The number of dependents in the families is classified in Table 9. The average size of the family is six, which indicate the rational size of the family.

Table No8. 9 Dependents in the Family

Sr. No.	Names of the villages	Sample families	Girls	Boys	Grandparents
1	Shirol	54	16	69	26
2	Udagaon	20	19	31	07
3	Arjunwad	47	51	62	31
4	Ghalwad	43	47	62	09
5	Shirati	53	55	69	34
6	Nrusinhawadi	25	20	33	13
7	Aurwad	30	33	54	12
8	Dharangutti	18	17	20	19
9	Chipari	11	12	13	07

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10	Nandani	19	26	29	07
11	Jambhali	15	15	28	08
12	Kondigre	02	03	03	-
13	Jayshingpur (rural)	09	05	14	08
14	Haroli	04	02	06	02
15	Umalwad	18	16	24	09
16	Agar bhag	20	24	27	09
Total		388	407	484	201

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Table 8.10 Profile of the Sample Families Surveyed for SIA.

Sr. No.	Names of the villages	No. of households	Agricultural land area of the village(in ha)	Irrigated area (in ha)	Sugarcane area of the village (in ha)	% of irrigated area to total agricultural area	% of sugarcane area to total agricultural area	% of sugarcane area to total irrigated area
1	Shirol	6028	1062	896	896	84.37	84.37	100
2	Udagaon	3136	710	655	395	92.25	55.63	60.30
3	Arjunwad	1151	345	264	208	76.52	60.29	78.78
4	Ghalwad	735	277	252	171	90.97	61.73	67.86
5	Shirati	1238	477	329	222	68.97	46.54	67.48
6	Nrusinhawadi	930	170	146	146	85.88	85.88	100
7	Aurwad	836	163	163	83	100	50.92	50.92
8	Dharangutti	1562	378	285	255	75.39	67.46	89.48
9	Chipari	1710	357	128	55	35.85	15.40	42.97
10	Nandani	3312	688	175	139	25.43	20.20	79.43
11	Jambhali	1020	253	171	78	67.89	30.83	45.61
12	Kondigre	700	257	104	38	40.46	14.79	36.54
13	Jayshingpur (rural)	1115	378	75	53	19.84	14.02	70.66
14	Haroli	672	172	85	54	49.42	31.40	63.53
15	Umalwad	1061	265	265	185	100	69.81	69.81
16	Agar bhag	1145	1063	896	896	84.29	84.29	100
Total		24815	10112	4889	3874	48.35	38.31	79.24

The sex ratio of the children in the family is 841. The boys dominate in the families. The grand parents in the families were less.

2. Education level in the family

The number of illiterates (1177) in the families is high in the study area. This indicates poor performance of the families who remained illiterates even when the compulsory education facility is being implemented since long. The number of undereducated below matriculation is 709, the number of matriculation is 193, HSC 172, graduates 84 and postgraduates are 19.

Table 8.11 Educational Level of the Persons in the Families

Level of education	No of persons	% to total (2354)
Illiterates	1177	50.0
Undereducated below matriculation	709	30.12
Matriculation	193	8.20
HSC	172	7.30
Graduates	84	3.57
Postgraduates	19	0.81
Total	2354	100.00

3. Occupational classification

Most of people now a day prefer to opt for the side business or the support activities to agriculture sector. More than 91.42% of the families were solely engaged in agriculture sector. Employment in the service sector constitutes 139 persons. It was equally considered as supportive activities in the taluka area. Only 10 persons are engaged in the business and trade activities, while 25 persons are self-employed activities. Other 29 persons are involved in other micro enterprises to support the families (see table 11).

Table No 8.12 Micro-enterprising Activities of the Families

Sr. No.	Names of the villages	Nature of activity	Sample families
1	Shirol	Welding, Tractor and trailer repair, Hoteling	10
2	Udagaon	Dairy	01
3	Arjunwad	Lawyer	01
4	Ghalwad	Retailing, Brick making	02

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5	Shirati	Tempo and stationery	02
6	Nrusinhawadi	Catering, Stationery and Agro-services centre	05
7	Aurwad	Tractor	02
8	Dharangutti	Contractor and Lawyer	02
9	Chipari	Workshop	01
10	Nandani	-	-
11	Jambhali	-	-
12	Kondigre	-	-
13	Jaysingpur	-	-
14	Haroli	-	-
15	Umalwad	Dairy	02
16	Agar bhag	Animal husbandry	01
Total			29

Agriculture provides enterprising activities since the taluka is having potentials of sugarcane crops. All other economic activities are least important in the area. The villagers were equally engaged in cane cultivation since its processing and marketing is linked with sugar factories. People were interested in trading business rather than production activities. Marketing of the fruits is an economic activity in the taluka.

Only 29 families were engaged in business and trading activities. Most of the enterprising activities falls under the micro enterprises and self-employed.

4. Land holding

Since the dependency on agriculture is high, the land holding is less in the taluka area. Large farmers have irrigation facilities. Small land holders could hardly invest in irrigation. Hence they depend on the cooperative lift irrigation. Obviously, the farmers prefer to go for sugarcane agriculture.

Table No. 8.13 Size of Land Holding

Size of land holding	No. of Families	%
Up to 1 acre	71	18.30
1-2 acres	114	29.38
2-5 acres	169	43.56
5-7 acres	14	3.61
7-10 acres	10	2.58
Above 10 acres	11	2.83
Total	388	100.0

Around 283 families (73%) were having the one to five acres of land holding in the villages. The number of large farmers is only 11.

5. Cropping pattern

Agriculture being a main occupation, farmers prefer to go for sugarcane plantation crops. Most of the cultivable land falls under irrigation. The total land area which falls under the dry land constitutes only 3.52 acres and 10.84 acres as non-irrigated area in the selected villages. Remaining 488.57 acres of land area is irrigated. Of the total irrigated land area 67.27 acres was under well irrigation, 22.97 acres under tube wells and 374.07 acres was under the cooperative lift irrigation schemes. Only 24.26 acres of land area was under the modern irrigation i.e. drip and sprinkling system.

More than 427.97 acres (88%) of land area comes under the sugarcane crop. Other supporting crops like Soybean 24.30 acres, fruit plantation 6.20 acres, vegetables 9.77 acres Fodder 3.40 acres Jowar 2.22 acres and other cereals 11.47 acres are grown in the villages during 2015-16 seasons.

6. Addictions

Most of the family members were not addicted by habits. However, around 24 families were having the habit of tobacco and ghutaka. There was only one person smoking bidi was found among the samples, three persons were addicted with alcohol drinking. Other nine persons were having other habits.

7. Income level

The occupational structure of the villages has an impact on the level of income in the villages. The agriculturists were mostly engaged in sugarcane plantation crop. Hence their income level remains high. The employed and self-employed persons mostly belong to the poor families. They preferred to work at the low wages. Hence, the number of families belonging to the low layers of the income stream is high among the selected families.

The agricultural income from the sugarcane earned by the 388 families during the 2015-16 seasons constitute to Rs 4, 23, 75,400 at the current prices. The average falls to Rs.1,09,215 per family and Rs. 99,008 per acre of sugarcane area. The non-agricultural income earned by the families was Rs 66,90,000 during the same year. The per capita income of the families stood at Rs 1,26,457 per family during the year at current prices.

The farm processing was regularly done by 237 families (76%). Mostly the farmers who were engaged in fruit and vegetable have to process their produce. The processing and transport of sugarcane is handled by the sugar factories themselves. Obviously the farmers feel comfortable to entertain sugarcane as their main cropping pattern. Besides, crop loan facility is also provided to the sugarcane, which remained highest at Rs 50000-70000 per acre. The PACS and the other commercial banks provide this facility. The share of PACS remained at nearly 99%.

8. Agricultural training

When farmers are going for commercial crops, they are ought to have a knowledge of cultivation and marketing. The farmers in the project villages have undergone some professional training in sugarcane agricultural practices. The number of such families was 22.68%. Most of the farmers have under gone a rigorous training on sugarcane cultivation and water management for sugarcane. Water is plenty in the villages. Fertiliser application is another area of training of the farmers. Water –fertilizer management is an important training areas required for the farmers engaged in sugarcane cultivation.

Table No. 8.14 Agricultural Training

Sr. No.	Names of the villages	No. of households	Sample families selected for field survey	Short duration training	Diploma	Degree	Modern techniques
1	Shirol	6028	54	02	-	-	-
2	Udagaon	3136	20	-	-	-	-
3	Arjunwad	1151	47	21	-	-	-
4	Ghalwad	735	43	07	-	-	-
5	Shirati	1238	53	-	-	01	-
6	Nrusinhawadi	930	25	-	02	-	-
7	Aurwad	836	30	-	-	-	-
8	Dharangutti	1562	18	-	-	-	-
9	Chipari	1710	11	01	-	-	-
10	Nandani	3312	19	-	-	-	-
11	Jambhali	1020	15	-	-	-	-
12	Kondigre	700	02	-	-	-	-
13	Jaysingpur	1115	09	-	-	01	-
14	Haroli	672	04	-	-	-	-
15	Umalwad	1061	18	-	01	-	-
16	Agar bhag	1145	20	07	-	-	-
Total		24815	388	83	03	02	-

9. Cultural resilience

The cultural vulnerability is observed in most of the modern societies. With growth of economic provisioning the vulnerability goes up. But the villages covered under survey protect the resilience level at the higher level. Even after the growth it will be maintained by the villages. Every village is having a temple. Rituals are regularly conducted in such villages (see table 14).

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People worship the God and Goddesses. The cultural vulnerability index is very less in the villages. Only 18 families have expressed their modernity and abused the traditional worships.

Table 8.15 Cultural Resilience

Sr. No.	Names of the villages	No. of households	Sample families selected for field survey	No of families followed rituals and festivals	No of villages with temples	Cultural distracting activities followed by the families
1	Shirol	6028	54	49	54	05
2	Udagaon	3136	20	20	20	-
3	Arjunwad	1151	47	47	47	-
4	Ghalwad	735	43	41	43	02
5	Shirati	1238	53	50	53	03
6	Nrusinhawadi	930	25	22	25	03
7	Aurwad	836	30	28	30	02
8	Dharangutti	1562	18	18	18	-
9	Chipari	1710	11	11	11	-
10	Nandani	3312	19	18	19	01
11	Jambhali	1020	15	15	15	-
12	Kondigre	700	02	01	02	01
13	Jaysingpur	1115	09	09	09	-
14	Haroli	672	04	04	04	-
15	Umalwad	1061	18	17	18	01
16	Agar bhag	1145	20	20	20	-
Total		24815	388	370	388	18



10. Impact of the Project

Datta Sugar is located in highly dense irrigated area. The availability of sugarcane surpasses the crushing capacity of the unit. In fact the crushing goes more than the established capacity. So, its management thought that it would be advantageous to improve the living conditions of people in and around the plant site by expanding the unit. It will therefore, generate employment of resources and the persons in the local area. In turn local people can avoid uncertainty of job, raise their living standard, do supplementary jobs and other farming, cattle, poultry, brick making unit etc. thus, to stabilize and prosper in life. This will surely be a positive impact on the livelihood of the people living around the site.

A. Advantages and disadvantages

1. Economic advantages

Almost all families have a positive response to the installation of the project. Since it brings industrial growth with development in infrastructure and employment levels in the region, the per capita income is likely to grow largely with employment opportunities. Employment and the general facilities grow with the expansion of the sugar factories. The business outlook also changes. Other social infrastructure will also go up (see table 15).

Table 8.16 Classification of the Responses in the Advantages of the Project

Sr.No	Advantage of the Project	Frequency	Percent
1	Employment increases	387	99.74
2	Facility increases	345	88.92
3	Business increases	367	94.59
4	Turnover of money in the villages	388	100.0
5	Other facilities increases	370	95.36
6	Total	426	100.00

2. Disadvantage of Pollution

Any industry renders some pollution and waste, which needs to be minimized through remedial systems. More than 52% of families know that the pollution increases through industrial enterprises. More than 35% families have responded that water pollution would be the major source of pollution. But people also know that it could be reduced through alternative measures. Villagers also know the recycling of the waste water mainly for agricultural purpose. Air pollution can also increase with the industrial project. Of the total families 29.38% families have responded to air pollution and 32.98% to noise pollution. But there are various measures to reduce them. People know about the modern tools and techniques of reducing the pollutions.

1. Willingness to accept

Willingness to accept the hazards and willingness to pay for the distress caused by expansion of the industry is one of the best contingent method of assessing the SIA and EIA. People prefer development at the cost of distress caused by pollutions. However, if the proper and perfect techniques are applied remove or to reduce the disasters, it would be further more acceptable to the people. The expansion of the crushing capacity is much needed aspect of the region. It has local as well as individual benefits. So people are willing accept the expansion. The general infrastructure in the region and roads grows with the industrial expansion. Its rate of returns to the society is higher. Infrastructural development further provides general incentives for growth of the region. It has a long term impact on the region. Business and other social facilities have the least scope to develop due to the crushing expansion (see table 16).

Table 8.17 Classification of the Responses for willingness to accept

Sr.No	Advantage of the Project	Frequency	Percent
1	Migration will decline	351	90.46
2	Economic provisioning will grow	371	95.62
3	Other sources of income will increase	283	72.94
4	Turnover of money in the villages will go up	365	94.07
5	Self-employment will increases	251	64.69
6	Cultural resilience	369	95.10
7	Others	248	63.92

The rural-urban migration will be reduced through this project. Infrastructural development obviously helps to grow the transport modes and means in the region. More than 70% of the families were in the positive response of growing transport facilities in the villages.

The economic provisioning in the villages will grow with the project. Small enterprising activities in the villages will grow due to the project in the area. Self and wage employment provides an opportunity to implement the inclusive grow model. Inclusiveness also increases with project, which brings out the elimination of the poverty in the region. People will not feel excluded. The rate of return on such incidences remains higher than the development of the developed one.

Expectations from the factory

The growth needs to be adjusted with the hazards. Various tools and techniques can be employed to reduce or to minimize the hazards. People have positive expectations from the project. The classification indicates that employment and the industrial activities will grow and provide jobs in the region.

People were in urge of road development, medical aids, education and safe drinking water facilities in the villages, which the project enterprises are interested to fetch needs. Besides people were assured of what can be grown in the region. Most prominent predictions of the villagers was growth of hotel industry, retail shopping, cloth shops, vegetable marketing,

poultry and milk development and employment in transport activities. These are likely to grow with the project.

Table 8.18 Classification of Expectations from the Sugar Factory

Sr.No	Advantage of the Project	Frequency
1	Employment	56
2	Remunerative sugarcane prices	203
3	Social capital	09
4	Health facilities	29
5	Education facilities to grow	07
6	Training facilities	11
7	Overheads	27

The schooling facility is one of the least required demands of the families. Expansion will not need the schooling facility to grow. All families were in access of the schools, hence; need not worry about this facility. People also know that the medical and health facilities also go with expansion of the project. Those in access need not worry about the facility. Only 11 families have placed their expectations in this concern.

The tradeoff between advantages and the disadvantages have to be obtained through proper policy initiatives and their effective implementations. The villagers were predicted of growing business avenues in the villages. The wage and self-employment are an immense opportunity to the villagers to grow their standard of living. When money enters in to the village economy, ultimately the standard of living increases with provision of various business avenues in the villages.

What can grow?

What can be grown in the villages was responded by 56 families. Mostly hoteling, milk and poultry activities, shops and retailing etc. will grow in the villages around the site. An urge of development, the villagers deserve, depends on their short and long term needs of the villagers. They need good roads, employment, educational needs and drinking water. People will get

opportunities to increase additional sources of income. Dairy, animal husbandry, transport means and modes, grocery shops, welding and repairs, agro-services, poultry, hotels, stationery and flour mills will grow in the respective village localities. This provides self-employment to women in the villages. Out of 56 responses more than 50% respondents have told that dairy will grow, which in turn makes the non-creditworthy persons creditworthy.

Conclusions

The project has a positive response from the public. The willingness to pay and the willingness to accept the project has positive outcome. The ratio between this is around 1: 10.09. It means the benefits are ten times greater than the loss. The losses due to the polluting agents are proposed to be diluted through various methods. The wastes and the pollutions can be reduced with some measures as suggested in the report. The social and cultural vulnerability index responds a very less and level of resilience is at the higher side. The sustained high growth rates and poverty reduction, however, can be realized only when the sources of growth are expanding, and an increasing share of the labour force is included in the growth process in an efficient way. From a static point of view, growth associated with progressive distributional changes will have a greater impact in reducing poverty than growth which leaves distribution unchanged. This in fact expresses the inclusive growth of the region.

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CHAPTER - 9

ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

9.1. ENVIRONMENTAL POLICY:

The EMS shall give importance on energy and resource recovery. In case of sugar industry it would be water recycling so that the cost of water can be reduced and also to conserve Natural water resources. The waste minimization would reduce the capital as well as recurring expenditure on ETP and also disposal of treated effluent.

9.2. ORGANIZATIONAL COMMITMENT:

The Top Management shall consider that Socio-economic development go hand in hand with environmental issues and the industry shall give commitment to implement all the statutory requirements., such as conservation of water recycle all cooling waters and excess condensate. The air emissions shall be controlled by installing Wet-scrubbers. All the solids wastes shall be composted.

9.3. ENVIRONMENTAL IMPACT ASSESSMENT:

The industry shall carryout the EIA studies from time to time to assess the environmental quality and review the policies and commitments.

9.4. COMMUNITY CONSULTATION:

There shall be good rapport between the Management and the Public. The Management shall publish all the technical and financial aspects of the EMS not only in annual reports but also in local newspapers.

Table No.9.1: Objectives and Targets:

Sr. No.	Object and Management tool	Target	Date of completion	Responsible agency	Supervisor
1.	Water pollution Control	To achieve irrigation / steam standards	Along with the commissioning of the plant.	Contractor	Consultant / Civil Engineer.
2.	Air Pollution Control	To achieve SPM concentrations below	-do-	Suppliers	Consultant / Chief

		150 mg/Nm³			Engineer
3	EIA studies	To monitor ground and surface waters/ soil. Ambient Air Stack emissions, Noise.	Before and after the completion of the project surrounding an area of 5 KM.	Industry	Consultant / Regulatory agency.
4	Noise control (Silencer pads, barriers, self protective devices such as earplugs & earmuffs)	To achieve sound levels below 75 dB during the day time and 70 dB during the night time.	Along with the commencement of the unit.	Contractor / Management	Consultant / Chief Engineer
5	Domestic waste Management (septic tanks followed by anaerobic filter and Root Zone treatment)	To achieve recyclable water for gardening / tree plantations	Septic tanks followed by filters along with the establishment of the colony and Root Zone treatment after one year.	Contractor	Consultant / Civil Engineer.

9.5 ENVIRONMENTAL MANAGEMENT CELL PATTERN AND REPORTING

The industry shall appoint a consultant to advice on various issues related to environment.

9.6 LABORATORY FACILITIES

The industry shall establish laboratory facilities to carryout Air, Noise, Soil, Water and wastewater Analysis. The important lists of equipment are given, as guidance. The Environment cell shall use these facilities to monitor the treatment plant efficiency and also the effect of treated effluent on land and ground and surface water quality. Similarly, the stack emissions, ambient air quality & Noise levels are to be monitored regularly. The instruments are to be calibrated as per the specifications and in any case at least once in a year.

9.7 DOCUMENTATION

Records of Air Quality, Solid Waste Disposal and wastewater treatment plant operations shall be maintained. It is suggested to publish these results in the local newspapers.

9.8 OPERATIONAL AND EMERGENCY PLAN:

The factory shall prepare a Disaster Management Plan and organize regular meetings of the workers to exchange the ideas on the procedures to be followed to maintain clean and healthy environment to avoid fire and accidents. The mock drills are to be organized regularly. A safety officer shall be appointed with supporting staff

Table 9.2 : LIST OF LABORATORY EQUIPMENT

1.	Air Pollution Monitoring Equipments
	a) Stack Monitoring Kit b) High Volume Sampler c) Meteorological Station (Wind Velocity & Direction, Temperature & Humidity)
2	Autoclave
3	Bacteriological Incubator
4	Balance a) Double Pan b) Single Pan
5	BOD Incubator
6	Centrifuge
7	COD Reflux Unit
8	Conductivity Meter
9	Distillation Apparatus
10	Dissolved Oxygen Meter
11	Drying Oven
12	Flame Photometer
13	Kjeldhal Assembly
14	Magnetic Stirrer
15	Microscope
16	Muffle Furnace
17	pH Meter
18	Platinum Crucibles (2 Nos.)
19	Refrigerator
20	Soxhlet apparatus
21	Sound Measurement Apparatus
22	Spectrophotometer
23	Nephelometer

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Table No.9.3: EFFLUENT TREATMENT PLANT MONITORING DATA

Sl. No.	Date	1	2	3	4	5		
		Flow (Cum/day)	Color	Temperature (°c)	Power (Kw H)	Chemicals used in ETP		
						Lime	Urea	Super Phosphate

Table No.9.4: PERFORMANCE OF EFFLUENT TREATMENT PLANT

Sl. No	Particulars	6	7	8	9	10	11	12	13
		pH	COD (mg/l)	SVI	Oil & Grease (mg/l)	SS (mg/l)	BOD (mg/l)	MLSS (mg/l)	SRT
1	Before Primary Treatment								
2	After Primary Treatment								
3	Biological Treatment								
4	Secondary Clarifier								
5	Effluent quantity used for irrigation								

Schedule of tests 1 to 8 - Every Day, 9 and 10 - Alternate Day and 11 to 13 – once in a week.

If the biological treatment consists of more than one unit, the performance shall be expressed for each unit separately.

DATE:

SEAL/STAMP

MANAGING DIRECTOR

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Table No.9.5 : AIR POLLUTION DATA (STACK)

Sl. No	Date	No. of Boilers	Capacity of Boiler (TPH)	Type of Boiler	Stack Details			EMISSION DATA						Remarks
					Height (m)	Diameter (m) Top Bot.	Material of stack	Flue Gas Velocity (m/s)	Temperature (°C)	SPM mg/Nm ³	NO _x (µg/Nm ³)	SO ₂ (µg/Nm ³)	CO ₂ Percent	

Schedule: Once in a month

Table No.9.6 : AIR POLLUTION DATA (AMBIENT)

Sl. No	Date	Location of Station with respect to Wind direction	Distance from Stack	PM _{2.5} mg/Nm ³	PM ₁₀ mg/Nm ³	NO _x (µg/Nm ³)	SO ₂ (µg/Nm ³)	CO ₂ (µg/Nm ³)	Relative humidity	Wind Direction	Ambient air Temperature		Remarks
											Max	Min	

Schedule: Once in a month at least in three stations.

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Table No.9.7 : SOUND LEVELS (dB) Leq

No	Station	Date				
1	Cane Cutter					
2	Mill House					
3	Mill house turbine					
4	Boiler house					
5	Boiling section					
6	Steam Exhaust					
7	Centrifugal section					
8	Pan section					
9	Power Turbine					
10	Colony					

Schedule: Once in month

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Proform to monitor impact of pollution discharged to environment

The following parameters shall be analyzed as per the schedule given below.

C) Well Water/ Surface Waters

Table No 9.8 : Well Water/ Surface Waters Proform to monitor impact of pollution discharged to environment

Sr. No.	Parameter	Daily	Weekly	Monthly
1	Color			*
2	Odor			*
3	pH			*
4	Alkalinity			*
5	COD			*
6	BOD			*
7	T.S			*
8	TDS			*
9	SS			*
10	Chlorides			*
11	Calcium			*
12	Magnesium			*
13	Hardness			*
14	Sodium			*
15	Potassium			*
16	% Na (max)			*
17	Conductivity μ mhos/cm			*

D) Soil

Table No.9.9 : Soil Proform to monitor impact of pollution discharged to environment

Sr. No.	Parameter	Daily	Weekly	Monthly
1	pH			*
2	Conductivity µmhos/cm			*
3	Available Nitrogen kg/ha			*
4	Available Phosphorus kg/ha			*
5	Available Potassium kg/ha			*
6	Organic Carbon %			*
7	Sodium %			*
8	Calcium %			*
9	Magnesium %			*
10	C.E.C. meq/100gm			*

9.9. TRAINING:

It is suggested to send the staff regularly for training to educational, R&D institutes, Pollution Control Boards- Centers of excellence. They shall be also deputed to workshops and seminars. The usefulness and implementation of the training shall be reviewed by the top management. In order to understand legislation and recent development in the field, the management has been advised to purchase all the publications of the CPCB and subscribe to journals. A selected list of the text books and Indian journals are given in Annexure II.

9.10. ENVIRONMENTAL IMPACT, COMPLIANCE AND REVIEW AUDITS:

The Environmental Management Cell shall carry out Environment Audit, EIA Studies and Compliance Report. The management shall engage an external agency to cross check the internal system and report directly to the Managing Director about discrepancies if any.

9.11. WASTE MINIMIZATION OPTIONS:

The industry shall adopt various options for waste minimization by proper in plant control measures, good housekeeping practices and process modifications etc.

9.12 –WATER RECYCLING: The water recycling approach shall be the major loop to conserve water.

9.13. INTERLOCKING THE PROCESS WITH ETP PERFORMANCE AND AIR EMISSIONS: -

Even though it is advisable to stop the operations if there are upset conditions in ETP or APC performance, it is suggested to find alternative approaches such as diverting the effluent into panic ponds or “Compost plant”. In case of failure of APC, the ground level concentrations do not increase beyond 600 meter from the stack and thus may not have much adverse impact on the Habitation of Khandali village. However, the workers shall be advised to use masks instead of installing stand by APC equipment.

1.REFERENCE BOOKS: -

1. Standard methods for the examination of water and wastewater, (2005), 21st Edition, APHA. AWWA-WPCF
2. Manual on Water and Wastewater analysis,(1988) BY NEERI, Nagapur - 440020
3. Water and Wastewater Testing 1985 By – R.P. Mathur 2nd Edition, Nemchand and brothers- Roorkee-247667
4. Microbiology for Sanitary Engineers, 1962 by ROSE, E. McKinney- McGraw Hill Book Company, Inc. New York
5. Wastewater Engineering Treatment Disposal Reuse, 1979, By –Metcalf and Eddy Inc. 2nd Edition, Tata McGraw Hill Publishing Company Ltd; New Delhi
6. Instrumental Methods of Analysis, By Dr. D. K. Sharma, Goel Publishing House Meerut.
7. Chemistry and Unit operations in Sewage treatment by D. Barnes & D. Wilson. Applied Science Publisher.
8. Text book of Water supply and Sanitary Engineering 1971 by S.K. Husen, Oxford & TBH publishing Company, New Delhi.
9. Water and Wastewater Technology by Mark J. Hammer, Willey and Sons Publishing.
10. Environmental Impact Assessment Handbook, (1980) BY- G. J. Rau and C.D. Wooten, McGraw Hill Book Company Inc. New York.
11. Environmental Impact Assessment (1977) BY- L. Canter. McGraw Hill Book Company Inc. New York.
12. Environmental Engineering by Peauy, Row. Tata McGraw Hill Book Company Inc. New York.
13. Wastewater treatment for Pollution Control (1986), By Soli J. Arceivala Tata McGraw Hill Book Company Inc. New York.
14. Microbiology (1977) by Pelczar M.I. and R.D. Reid 2nd Edition Tata McGraw Hill Book Company Inc. New York.
15. Solid Waste Management in Developing countries (1983), A.D. Bhide, B.B.Sundersen, Indian National Scientific Documentation Centre, New Delhi.
16. Composting, Sanitary Disposal and Reclamation of Organic Waste (1956) Gotaas H.B. WHO, Geneva.

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17. Water and Wastewater Engineering BY Fair, Geyer, Ocum, Tata McGraw Hill Publishing Company Ltd; New Delhi
18. Chemistry for Environmental Engineering by C.N. Sawyer, McCarty
19. Air Pollution, Its Origin and Control (1981) by Keenth Wark and Cecil F. Warner, Harper and Row Publishers New Delhi.
20. Air Pollution Volume I, II, III, IV (1968), by A.C. Stern, Academic Press New York
21. Air Pollution and Industry (1972) R.D. Rosean, Nostrand Reinhold and Co-New York
22. Air Pollution Control Theory (1980) by Martin Crawford, Tata McGraw Hill Publishing Company Ltd; New Delhi
23. Methods of Air sampling and Analysis (1977), 2nd Edition by APHA, Washigton D.C.
24. Noise Control Handbook of Principles and Practices BY Davis M. Liscomli and Arthur C. Tayler Jr. Van Nostrand Reinhold and Co. New York.
25. Oil Chemical analysis (1967) By M. L. Jackson, Prentise Hall of India, Pvt. Ltd. New Delhi.
26. Chemistry of Soil (1969) BY Firman E. Bear. Oxford and IBH Publishing Company New Delhi.
27. Methods of Analysis (1955) by Association of Official Agricultural Chemists Washington 4, C.D.
28. Commercial Methods of Analysis (1972) By F. D. Snell. F.M. Biffen. D.B. Taraporewala Sons & Company (P) Ltd; Mumbai.
29. Pollution Cotrol Acts, Rules and Notifications Issued Thereunder Central Pollution Control Board. (Ministry of Environment and Forests, Govt. of India) September 2001, Parivesh Bhavan, East Arjun Nagar, Delhi-110032

2. LIST OF JOURNALS IN THE FIELD OF ENVIRONMENT

1. "Journal of the Institute of Public Health Engineers, India", Secretary General Institute of Public Health Engineers India. 1 Garstin Place, Calcutta, 700 001
2. "Journal of Indian Association for Environmental Management Indian Association for Environmental Management", NEERI, P.O. Nagpur -440020
3. Indian Journal of Environmental Health, Director, NEERI, Nagpur- 440 020
4. Scavenger Society for clean Environment, Garden Resort, 606 Sion -Trombey Rd. Chembur, Bombay- 400071
5. Asian Environment. P.O. Box. -90 MCC Makati, Philippines.
6. Down to Earth – Centre for Science and Environment. 41, Tughlakabad Institutional Area New Delhi. 110062

CHAPTER – 10

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

10.1 . IMPACTS AND MITIGATION PLAN:

The Environmental Management plan shall consist of the impacts and mitigation measures during the construction and operation of the units. The impacts on environmental components such as Air Quality, Water Quality, Noise levels and Soil quality shall be illustrated in detail. The methodology consists of the measures on minimization of the proposed impacts. Some of the Environmental Components, proposed impacts and mitigation measures are listed below.

Table No. 10.1: Impacts and Mitigation Plan

Sr. No.	Environmental Component	Source	Impact	Mitigation measures
1.	Air Quality	- Excavation, Transportation during the Construction, - Emission through stack (After the Plant is commissioned)	- Increased Dust levels. - Increase in the Ground level concentration of SPM	-Provide masks to the workers and spray water to suppress the dust. -Install Wet-scrubber/ Electrostatic Precipitator to control stack emissions.
2.	Water Quality	-Process - Hot water (Condensates) -Spillages & leakages - Periodical washings	-Oil & grease, BOD & low pH. -ETP performance gets affected, -Shock loads on ETP. - Shock loads on ETP	-Provide oil & grease separators-mechanical. -Adopt Clean technologies as per Comprehensive Industry Document on Sugar Industry (COINDS), Control pH by biological means. - Cool the water and reuse. - Adopt dry-cleaning methods and collect the leakages, spillages and reprocess. - Provide a separate storage pond and add in a controlled manner to ETP.

3.	Noise	Turbines, Steam exhausts, Cane cutters, Boiler	Affects the hearing and cause fatigue and sometimes nervous breakdown.	-Provide silencer pads and barriers and give earplugs and earmuffs. Change the work schedules of the workers from high exposure places to low levels of exposure.
4.	Soil Quality	Application of treated effluent	Increase in soil salinity.	Effluent quality as well as quantity shall be strictly controlled by regular monitoring.
5.	Green-belt	All around the factory and within the premises	Helps to reduce CO ₂ levels	Provide at least 2500 plants per hectare covering more than one-third area of the vacant land.

Table 10.1 A : Impacts and Mitigation measures specific to SHREE DATTA SSK Limited

Sr No.	Nature of Impact	Major Impact Identified	Mitigation measures suggested
1	Air Pollution	1.Fugitive emissions of Bagasse and fly ash are observed. 2.Bagasse is entering into drains even though the Drains are covered inside and outside the factory. The Gutter choked up 3.Eventhough ambient air quality standards are meeting inside the factory premises, there are complaints with regard to fly'ash in nearby villages.	1. Collection of Bagasse and storage are to be improved and,fly ash Disposal to be implemented on day to day basis The Gutters shall be replaced with closed pipe 2. Steam is taken from Urjankur Shree Datta power company Ltd., which erected the Co-generation plant on Boot principles. The matter was

			referred to them and asked to check the efficiency of the ESP.
2	Air Quality Modelling	1.Aermode version 7.4 was used to predict the air Quality. The impacts on PM10, PM2.5, SO₂ and NO_x are not significant and are within NAAQS standards. 2.Eventhough the Air Quality of all the stations in the study area are meeting the AAQ standards, the complaints are received from the neighboring villages, the online monitoring results are meeting the standards. 3. The predictions are made for one season and when only once the project requires clearance. The impacts on post monitoring is neglected. Thus there are no cross checks.	1. ESP has been provided as ASP equipment 2. Continues monitoring of Air Quality may be the best solution to cross check the results whenever such complaints are in recurrence. 3. Suggested to carry out post monitoring Air Quality status and evaluate the impacts for suggesting mitigation measures
3	Hazardous Waste	1.The only hazardous waste spent oil generation is very low as the Industry is not using lubricating oils. 2.Hazardous chemicals such as NaOH,H₂SO₄ are in small quantities and stored in plastic containers. 3. As the effluent carries negligible quantities of oil & grease, no impact on receiving soil for land applications.	No action is contemplated. No action is suggested. No action is suggested.
4	Water Pollution	1. Industry follows the recycling of cooling waters and condensates from its	1. Industry proposes to adopt the practice of recycling for the proposed Distillery.

		unit due to severe shortage of water in Solapur district same practice shall be followed for evaporator condensates and spentlees from Distillery units by providing condensate polishing units. 2. As the availability of filler material pressmud is main limitation for spentwash composting, the Distillery unit may not run for more than 200 days which may affect the economy of industry. 3. The composting process shall be designed and operated properly to avoid only possible contamination of ground water.	2. It is suggested to mix Bagasse cillo along with pressmud to reduce the requirement of filler material besides concentrating digested effluent in multiple effect evaporators. 3. Industry shall strictly implement the CPCB guidelines and operate the composting plant with utmost care to avoid seepage leakages.
5	Industrial Solid Waste	1. The major industrial solid waste generated are pressmud fly ash and ETP Sludge lime clinker. All the solid waste are composted with spentwash and converted into manure. This process is known as composting. If composting operations are not practiced	1. Composting operations are to be scientifically carried out. The leachates shall be collected and pumped back for composting operations 2. The excess fly ash can be sold to brick manufacturers or can be

		scientifically leachates may enter into Environment and contaminate soil, ground and surface waters. 2. The entire quantity of fly ash may not be consumed in composting operations. 3. Fly ash is very light and can enter into environment and cause fugitive emissions	sold as soil conditioner. 3. Fly ash shall be stored in silos/ shall be disposed immediately without any storage to avoid fugitive emissions.
6	Socio Economics	1. The project has positive impacts. The willingness to pay and the willingness to accept the project has positive outcome. 2. The ratio between these is 1:10.09.It means benefits are more than 10 times than the loss. 3. The social and cultural vulnerability index responds very low and resilience is at the higher side.	

		4. From a static point of view growth associated with progressive distributional changes will have a greater impact in reducing poverty than growth which leaves distribution unchanged. 5. Management is responsive to reduce poverty level by giving economic incentives and Facilities to the employees and Farmers which are the centre of the growth	
7	LandUse	1. Quantification of generated land use and interpretation of the data indicates 68% is irrigated.land. 2. Highest Source of irrigation is Dug wells & Tube wells, and lift Irrigation schemes. 3. The area derived from satellite image and census statistics do not match. The area derived from satellite image is geometrical whereas census data is sum of all villages.	As the irrigation land is mainly under sugarcane cultivation the availability of water sources may get depleted so suggested to adopt modern practices of irrigations such as drip and sprinkler systems.
8	Hydrology, Ground Water &	1. Due to severe Draught conditions the water levels in the wells are depleting.	1. Rain water harvesting to recharge wells in combed area. 2. Excess irrigations practices

	Water Conservation	2. Ground water Quality is also brackish and cannot be used for drinking purpose 3. The farmers are excavating wells in River Beds which may result in depletion of River water for villages.	shall be avoided to reduce salinity. Exaction of water from river bed by digging wells shall be strictly prohibited.
9	Ecology and Biodiversity	1. Identifying Pollution absorbing trees and plants 2. Core zone was considered as 5kms radius and Buffer zone from 5 Km to 10 Km radius of the project site. The study area was divided into Grids of 1Sq.Km. Stratified random sampling method was adopted. Six Grids from the Core zone and four Grids from the Buffer zone were studied. The Study area is rich in Faunal Components and also in Bird population. Faunal components and Habitat for Bird population should not be disturbed. 3. Shannon Weiner Index suggest maximum Species diversity which should be protected. Shannon weiner Index varied from 1.89 to 3.03 and species Richness from 25 to 42 for plant population. SW Index varied between 2.323 to 3.298 and species index 41 to 136 for bird population.	
10	Risk Assessment and Hazardous Management	1. Pool height and the distance required for storage of Rectified Spirit, Ethanol Were Calculated 2. Location of Fire	• Not Applicable • Not Applicable

		extinguishers were suggested and Disaster Management plan was suggested.	
		3. Safety measures to the employees were suggested	• Not Applicable
11	Noise and Vibrations	Noise levels at Boiler and Turbine house are high (85db to 95 db)	Provide Acoustic enclosures and check the standards of Noise levels of the machines and report to the supplier for corrective action

10.1.B.IMPACT ASSESSMENT BASED ON BATTELLE ENVIRONMENT

10.1.B. INTRODUCTION:

In any Impact assessment, the weight ages for the Impacts are given based on past experience. These weight ages are based broadly on the various types of environmental affects and issues.

In BEES, the major pollution aspects are classified as below.

- Biological Environment.
- Environment Pollution.
- Aesthetics.
- Human Interest.

It may be clearly indicated that the weightages are arbitrarily assumed and requires verification after the implementation of the project.

Some of the important abbreviations used are given as below.

- EQ- Environmental Quality Indicator.
- PIU-Parameter Importance Units.
- EIU- Environment Impact Unit.
- EIU is assed as = $(\sum EQ \times PIU)$ before – $(\sum EQ \times PIU)$ after

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- In this exercise
- EQ is taken as 0 (poor) to 1 (good)
- PIU is taken as 1000 points.

Table No. 10.1.B Impact Assessment based on Battelle Environment Evaluation System (BEES)

S.No.	Impact	PIU (X)	EQ (Before) (Y)	EQ (After) (Z)	EQ (Before) (XY)	EQ (After) (XZ)	Result
I	Environmental Pollution(600)						
I.A	Air Pollution	300	0.5	0.6	150	180	+30
I.B	Water Pollution	100	0.2	0.1	20	10	-10
I.C	Land Pollution	100	0.5	0.4	50	40	-10
I.D	Solid Waste Pollution	100	0.2	0.1	20	10	-10
		600			210	240	0
II	Biological Pollution (100)						
II.A	Aquatic life	50	0.30	0.20	15	10	-5
II.B	Flora & fauna	50	0.40	0.30	20	15	-5
		0					-10
III	Aesthetics(100)						
III.A	Odour & Fly nuisance	100	0.2	0.1	20	10	-10
IV	Human Interest (200)						
IV.A	Employment	20	0	0.3	0	6	+6
IV.B.	Standard of living	80	0.2	0.8	16	64	+48
IV.C.	Land Cost	40	0.2	0.5	8	20	+12
IV.D.	Infrastructural facility	60	0.2	0.8	12	48	+36
		1000					+82
		1000				Net	+82

10.2. RECORDS AND DOCUMENTATIONS: -

The Registers shall be maintained on the performance of ETP, Chemical consumption, Power requirements etc. and these records shall be made available to the Regulatory Agency, Consultant and Stakeholders.

10.2.A. DOCUMENTATIONS: -

All the important documents such as consent letters, Environmental Clearances, Water Cess returns, Environmental Statement Form – V, Hazardous Waste (Management & Handling) Rules, 1989 and amended rules thereof and compliance reports shall be exhibited for inspection by the Government Agencies and Stakeholders.

10.2. B. GAZETTE NOTIFICATIONS: -

The Gazette Notifications published by the MOEF shall be kept in the laboratory for ready reference. Similarly, the testing procedures for Water, Air, Soil and Wastewater shall be kept in the laboratory at each equipment for ready reference.

10.2. C. TROUBLESHOOTING: -

Table No10.2 : Troubleshooting

Sr. No.	Parameter	Area of Occurrence	Causes	Mitigation measures
1	Low pH	a) Anaerobic Digesters.	- High organic loading - Extraneous or toxic matters	- Discontinue the loading temporarily - Increase the alkalinity by adding lime/Sodium bi-carbonate Total Alkalinity shall be maintained three times the Total Volatile Fatty Acids. - Identify the source of toxic substance. Either detoxify

		b) Aeration Systems	-High F/M ratio more than the design.	or do not allow the waste to enter into the ETP or treat it separately -Reduce the organic load and maintain the F/M as per the design.
2.	Low COD/BOD removal efficiency	Poor performance of biological reactors	Increase in organic loading	Characterize the waste stream. Provide additional units if required.
3	SVI	Aerobic Systems	Low MLSS concentration (below 2000 mg/l) Sludge Bulking (SVI above 100)	- Increase MLSS concentration by increasing the re-circulation ratio of the return sludge. -Check the D.O. in the aeration tank. Always maintain D.O. above 1.5 mg/l - Check the F/M Ratio. - Chlorinate the waste to reduce filamentous growth.
4	Sludge Rising	Settling Tanks	De-nitrification	Increase the sludge withdrawal rate from the clarifier and also increase re-circulation ratio.

5	Lubricants	Oil and Grease	Due to improper maintenance of the removal mechanism. -Poor Housekeeping practices.	Control the spillages of oil and grease and adopt efficient oil removal device.
6	Low D.O.	Aeration tanks	Poor performance	Check the oxygenation capacity of the aerators. Always purchase aerators from reputed manufacturers.
7	Poor efficiency of SPM removal	APC equipment	Performance of different type of equipment. a) Multi cyclone- 50-55% b) Wet-scrubber- 80-85% c) ESP- 95-98 %	Select appropriate equipment to meet the regulatory standards

The main objective of Environment Management Plan (EMP) is to conserve resources, minimize waste generation, treatment of wastes, recovery of by products and recycling of material. It also incorporates vegetation and landscaping of the open area and also the post project quality monitoring. The EMP measures to minimize adverse impact are classified as below:

Measures built in the process

Measures during construction phase

Measures during operational phase

10.3 MEASURES BUILT IN THE PROCESS

The objective is to employ environment friendly processes. It shall incorporate efficient utilization of resources, minimum waste generation, built in waste treatment and operational safety. The measures suggested are :

10.4 CONSTRUCTION PHASE MANAGEMENT PLAN

10.4.1 - WATER MANAGEMENT

Construction equipment requiring minimum water for cooling should be chosen. High pressure hoses should be used for cleaning and dust suppression. If water from well is to be extracted, the rate of extraction should be kept below the safe yield level.

10.4.2 - SURFACE WATER QUALITY

The construction activities would be avoided during monsoon season, particularly the excavation work if possible. Wherever needed check dams and dykes shall be provided for control of soil erosion. The soil holding / binding vegetation such as grass shall be grown around the construction site before commencement of construction activity to reduce soil erosion. Appropriate sanitation facilities will be provided for workers.

10.4.3 - GROUND WATER QUALITY

Construction wastes will not be discharged to surface or ground water bodies. As far as possible construction wastes will be recycled and reused. Alternatively they will be disposed off on a designated landfill site.

10.4.4 - AIR QUALITY

All vehicles and construction equipment with internal combustion engines will be maintained for effective combustion to reduce vehicular emissions. Vehicles and all internal combustion engines shall meet the prescribed emission standards of CPCB.

Unleaded petrol will be used for vehicles in use

Good quality petrol and diesel from authorized dealers will be used, thereby ensuring good combustion and hence reduced gaseous emissions. It is advised that the industry shall have its own fuel station.

Vehicles being allowed within the construction site for the construction activity should meet standards as per the CPCB guidelines.

Water will be sprayed with high-pressure hoses for dust suppression during dust generating activities such as excavation, crushing, concrete mixing, material handling etc.,

As far as possible asbestos will not be used for construction work. If asbestos is used, all asbestos waste will be collected separately and disposed off on landfill with appropriate soil cover.

10.4.5 - NOISE

Construction equipment with minimum noise and vibrations will be chosen.

Construction workers engaged and operation of the noise producing equipment will use earplugs and / earmuffs.

Construction equipment with internal combustion engines will be provided with proper silencers and mufflers to reduce noise levels.

Noise attenuating green belt will be developed to reduce noise impacts.

10.4.6 - LAND

CHECK BUNDS SHALL be built in the construction area to prevent soil erosion due to rainwater.

Measures will be taken to minimize waste soil generation. Construction waste material will be recycled.

Designation and demarcation of construction site with due provision for infrastructure.

Using appropriate measures for slope stabilization to reduce soil erosion.

10.4.7 - ECOLOGY

Plantation of dust absorbing trees near dust emission areas.

Plantation of soil holding / binding and fast growing plants e.g. grass to avoid soil erosion.

Plantation of noise attenuating species to reduce noise pollution both during the construction as well as in the operation phase.

Stabilization of all disturbed slopes before the onset of monsoon to avoid soil erosion.

Avoiding felling of existing trees / vegetation as far as possible. If necessary, the number of trees felled to be replaced with double the number of trees in the form of green belt development.

Reuse of wastewater generated out of construction activity for irrigation / green belt.

Avoiding use of high noise producing equipments during nighttime to avoid impact on fauna in the study area.

10.4.8 - SOCIO – ECONOMIC FACTORS

Making use of local people for construction work to the maximum extent possible.

* Providing proper facilities for water supply, sanitation, domestic fuel, education, transportation, etc. for construction workers. Protection of company employees and equipment from construction hazards, including open excavations, falling objects, welding operations, dust, temporary wiring, and temporary overhead electrical lines. Barricades and fences are provided around the construction area. Personnel protective equipments e.g. safety helmet, goggles, gumshoes, etc. will be provided to the workers.

10.5 OPERATIONAL PHASE MANAGEMENT PLAN

The generation of pollutants such as wastewater, gaseous emissions and solid wastes during normal operational phase will cause adverse impacts and stress on various environment parameters. The management plan for mitigation of adverse impacts and enhancement of beneficial impacts are discussed below.

10.5.1 WATER MANAGEMENT

10.5.1.A - WATER RESOURCES

Fresh water required shall be minimized by adopting 3R principles.

A network of planned storm water drainages shall be provided to avoid contamination of rainwater with factory wastewater or other waste material. Rain harvesting plan shall be implemented to collect and store rainwater and also to replenish the ground water source.

10.5.1.B - WASTE WATER

The quantity and quality of wastewater in the plant is controlled by following measures :

Recycle of process water including steam condensate and reuse of treated wastewater in the plant. Control of water taps, washings, leakages from pump glands and flanged joints. Overflow of vessels is strictly avoided. Floor cleaning with water will be replaced with dry cleaning with bagasse. Leakage and spillage of molasses at pumps and vessels is collected in small pits and recycled.

Effluent treatment facilities shall be provided to make the treated water fit for land application.

Storage reservoirs of adequate capacity shall be provided to hold rainwater and treated effluent during unfavorable climatic conditions.

10.5.2 - AIR ENVIRONMENT

Gaseous emission in the industry is mainly due to burning of bagasse in boilers. These are controlled by installation of ESP & Wet Scrubber. The fugitive emissions are mainly from roads. Besides the APC equipment, the following measures shall be adopted.

Tree plantation in 3 to 5 rows shall be developed all around the premises.

All internal roads shall be properly paved or tarred to avoid fugitive emissions. A tree plantation in 2 to 3 rows shall be developed on both sides of the roads.

All the other roads in the vicinity of the factory used for transportation of raw materials and products will be paved or tarred, and these shall be maintained in good condition. Trees shall be planted on either side of the road. D.G. sets shall be provided stack of 6 m high above the roof level. Vehicle engines are maintained in good condition to avoid incomplete combustion.

10.5.3 - SOLID WASTE

Green belt of 4 to 6 m width is maintained all around the compost, bagasse and press mud yards.

ETP Sludge, boiler ash and lime sludge may be mixed together to produce enriched manure.

10.5.4 - NOISE ENVIRONMENT

Necessary measures as indicated below are taken to reduce sound intensity below the allowable limits at the source itself. In general at the locations of turbines, compressors, fans etc. The sound intensity generally exceeds the standards. The workers engaged in such locations are provided with earmuffs/ear plugs to have additional safety.

Adoption of noise reduction measures in the industry as per the CPCB guidelines.

Specifying the noise standards to the manufacturers of machineries.

Acoustic barriers or shields to the machineries.

Vibration free foundations for machineries.

Acoustical walls and roofs to the building where such machineries are installed.

Segregation of machineries having high noise level in isolated buildings.

Incorporation of sound absorbers to blowers and compressors.

Sound control measures to steam vents.

Proper maintenance of machineries, especially oiling and greasing of bearings and gears etc.

Avoiding vibration of machineries with proper design of machineries such as speed and balancing etc.

Use of personnel protective equipment such as earmuffs and earplug for persons working in such locations.

Plantation of green trees around the factory building and premises to control the intensity of noise to the surrounding area.

With above noise abatement measures the noise level in the premises will be maintained within the desired limits. It will be ensured that the workers in high noise areas use earmuffs, earplugs. Further, it is ensured that the noise level in side the work area will conform to the standards of industrial area and noise level outside premises will conform to the standards of residential areas.

10.5.5 BIOLOGICAL ENVIRONMENT

Plantation program as indicated below will be undertaken to enhance biological environment.

Development of green belt all around the project site.

Conservation of existing vegetation.

Taking up tree plantation work in the vicinity of factory in co-operation with village authorities as a community service.

Clearing of existing vegetation should be kept to minimum and should be done only when absolutely necessary.

Plantation program should be undertaken in all available areas. This should include plantation in the proposed plant premises, along the internal and external roads, around the solid waste storage yards and around the administrative buildings.

10.5.6.A - CRITERIA FOR SELECTION OF SPECIES FOR GREEN BELT

Rapid growth and evergreen habitats

Tolerance to water stress and extreme climatic conditions

Difference in height and growth habits

Aesthetic and pleasing appearance

Provide shade

Large bio-mass to provide fodder and nitrogen

Improving waste land

To suit specific climate and soil characteristics (local species).

Sustainability with minimum maintenance

Recommended plant species shall be utilized for development of green belt and greenery in and around the factory premises.

10.5.7. Rain Water Harvesting:

The Roof top area is found to be 8000 SQM and the maximum rainfall estimated is around 650 mm. The ruff coefficient is taken as 0.8.

Thus the total water in any Rainy season would be $8000 \times 0.65 \times 0.8 = 4160 \text{ m}^3 / \text{season}$.

The Collected Rain water shall be recharged into the existing rainwater havesting pond.

10.6 OCCUPATIONAL HEALTH STUDIES

10.6.1 INTRODUCTION:

The health status of the employees who are exposed to Boiling and Pan Section and Boilers are subjected to heat and vapors from sugar process are monitored. The important test such as X ray, Lung fuction test and fitness are carried out and tabulated. The inference can be drawn as all the employees are medically fit.

Shree Datta Shetkari Sahakari Sakhar Karkhana Limited Charitable Trust, Shirol

Employees Health Status Table No.10.3

Sr. No.	Name of Employee	Age	Sex	X RAY	LUNG TEST	Found- Fit/Not Fit Physically or Mentally for the Work
1	Mahavir Balaso Patil	50	Male	Y	N	FIT
2	Shashikant Balu Pujari	41	Male	Y	N	FIT
3	Praveen Jotiram Patil	42	Male	Y	Y	FIT
4	Prashant Annaso Sutar	41	Male	Y	N	FIT
5	Malgonda Maruti Mali	40	Male	Y	Y	FIT
6	Dipak Laxman Jadhav	39	Male	Y	Y	FIT
7	Mahadev Shahu Varekar	50	Male	Y	Y	FIT
8	Shivaji Bapu Gotkhinde	53	Male	Y	N	FIT
9	Ramesh Bandu Mane	42	Male	Y	N	FIT
10	Suresh Annappa Nipane	44	Male	Y	Y	FIT
11	Bhanudas Pandurang Mane	41	Male	Y	N	FIT
12	Yunus Badshaha Shaikh	41	Male	Y	N	FIT
13	Gopal Sidram Jangam	38	Male	Y	Y	FIT
14	Rajesh Yashwant Thomake	42	Male	Y	N	FIT
15	Balaso Datta Bavache	45	Male	Y	Y	FIT
16	Rajendra Sukhdev Ghule	40	Male	Y	Y	FIT
17	Rajaram Baburao Mane	40	Male	Y	N	FIT
18	Kiran Dhondiram Vathare	42	Male	Y	N	FIT
19	Abaso Anandrao Patil	40	Male	Y	Y	FIT
20	Aashalam Rasul Bhusari	42	Male	Y	Y	FIT
21	Pandurang Ganpati Patole	56	Male	Y	N	FIT
22	Ajit Chandrakant Kumbhoje	32	Male	Y	Y	FIT

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD., SHIROL
PO : DATTANAGAR 416 120 TALUKA-SHIROL, DIST.KOLHAPUR, (MS) India
E-Mail : klp.dattsssk@gmail.com

23	Sunil Tatoba Patil	42	Male	Y	Y	FIT
24	Raghunath Balaso Chavan	51	Male	Y	Y	FIT
25	Yunus Isak Pathan	35	Male	Y	Y	FIT
26	Digambar Bhagwat Kamble	42	Male	Y	Y	FIT
27	Mohan Pandit Kamble	56	Male	Y	Y	FIT
28	Balaso Amagonda Patil	32	Male	N	Y	FIT
29	Dilip Devappa Pattekari	55	Male	Y	Y	FIT
30	Babaso Annu Ghatage	52	Male	Y	Y	FIT
31	Rajaram Bhauso More	50	Male	Y	Y	FIT
32	Iargonda Angonda Patil	53	Male	Y	Y	FIT
33	Abadugafar Gousmahamad Patel	55	Male	Y	Y	FIT
34	Hari Santu Kamble	53	Male	Y	N	FIT
35	Vijay Mohan Mane	28	Male	Y	N	FIT
36	Raghu Joti Parit	52	Male	Y	N	FIT

Note: Around 25 to 30 lakhs are reserved for occupational health programme

10.7 REHABILITATION AND RESETTLEMENT (R & R) PLAN

DSSK Ltd. has adequate existing infrastructure on 85.46 ha of factory owned premises. There are no project affected persons of any kind. Hence Rehabilitation and Resettlement Plan is not relevant.

10.8 ENVIRONMENTAL POLICY

- 1) Comply with relevant laws and regulations as well as any additional measures to maintain sustainable environment.
- 2) Adopt a systematic approach of EMP for continual improvement.
- 3) Prevent pollution and recycle, reuse and reduce wastes.
- 4) Minimize emission by using clean fuels.
- 5) Conserve resources by efficient operation and process.
- 6) Develop green belt in an around plant area.
- 7) Create awareness to employees to avoid spillages, wastages and also general public for clean and healthy environment.
- 8) Safety and health of employees is the prime and utmost priority of the Management.

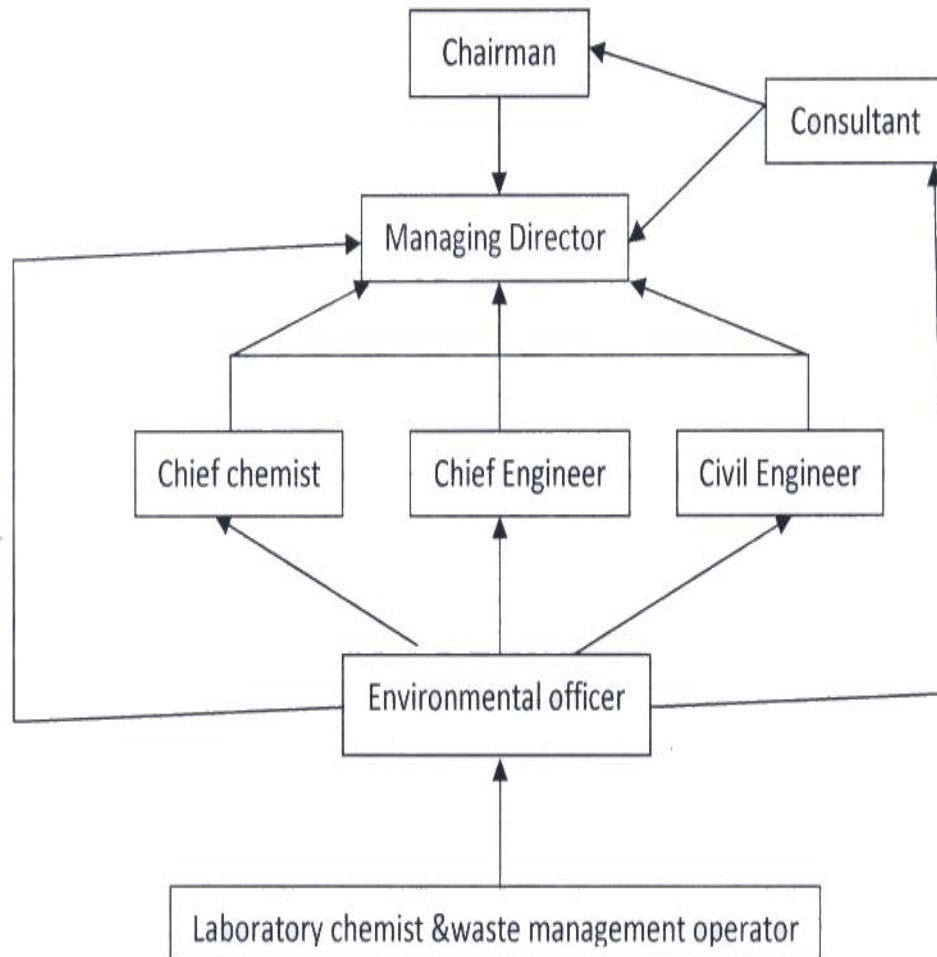
10.9 STANDARD OPERATING PROCEDURES OR PROCESSES:-

Process Identification:-

- A) Whether lubricating oils used at mills are collected and recirculated.**
- B) Whether alignment of the mills are checked regularly to avoid heating of bearings to reduce excessive use of cooling waters.**
- C) Whether the evaporators and juice heaters are as per the designed crushing capacity to eliminate contamination of juice vapours in condensates.**
- D) Whether the entrainment catches are giving the desired efficiency to avoid entrainment.**
- E) Whether sulphur burner gasses are scrubbed and the scrubbed water is collected and treated.**
- F) Whether hot condensates are only used for imbibition, milk of lime preparation and floor washings.**
- G) Whether quality of all cooling waters, excess condensates, floor and vessel washing are checked regularly and recycling of all these streams are practiced.**
- H) Spray pond overflow may contain organic and inorganic solids contamination and should be treated before disposal.**
- I) Fly ash shall be sold to brick manufactures or used as soil conditioner.**
- J) Efficiency of each unit of the ETP shall be checked regularly and up gradation of the units may be required as per the efficiency achieved in each unit.**
- K) Air emissions shall be checked regularly and up gradation of APC equipment is to be carried out, if necessary.**
- L) All the employees working in high sound level areas such as milling plant. Compressors, boilers and turbines shall be provided with ear plugs / ear muffs.**
- M) Helmets and goggles shall be provided to all employees and the employees working at high heat exposure zones shall be provided with heat resistant Aprons.**

Fig10.1 - Hierarchical System

C) Hierarchical system:-



D) Does the company have a system of reporting compliance violation of environmental norms to the Board of Directors of the company and shareholders or stake holders at large.

10.10 NON COMPLIANCE REPORT

Table No.10.4: Non Compliance Report

Sr. No.	EC Conditions	Compliance
1	Six monthly reports are to be submitted to MPCB/ CPCB/ Regional Director, MoEF.	Complied Regurly
2	Effluent standrads and air emissions shall meet the MPCB/EP ACT, 1986 standrads, whichever is stricter.	Effluent standards, ambient air quality standards and noise standards are meet. Steam is taken from Urjankur Shree Datta Power Company Limited and as such stack emissions standards are not applicable.
3	The treated effluent characteristics and air emissions shall be displayed in the website of MPCB/ CPCB.	Complied
4	Rain water harvesting shall be implemented	Implemented
5	Occupationl health studies of the employees are to b regurly carried out.	Complied
6	Capital and recuuring expenditure environmental protection shall not be diverted.	Yes, funds are used for specific purpose only.
7	Greenbelt shall be 33% of the total area of the factory area	Complied

CHAPTER 11

RISK ASSESSMENT AND SAFETY / EMERGENCY MANAGEMENT

PLAN

11.1 RISK ASSESSMENT

The industry with its complex nature of activities involving various plant machineries, raw materials, products, operations, intermediates and environmental discharges has a number of associated hazards. A minor failure may lead to a disaster causing heavy losses to life, property and environment. It is, therefore necessary to ensure safety and reliability of any new plant, through a systematic study of industrial installations based on scientific methods to identify possible failures and prevent their occurrences before they actually cause disasters and production loss. Risk assessment studies are being conducted to ensure safety in the industry. It consists of following activities:

Risk identification

Risk assessment

Risk prevention & Safety measures

Monitoring and assessment of safety performance

Some of the terms frequently associated with risk assessment are defined below.

11.1.1 HAZARD

A hazard is any material or situation that has the inherent potential for an event to occur which may damage life, property or environment.

11.1.2 RISK

A risk is the probability (likely hood) and severity of an adverse effect (hazard) on health, property or environment, which can be quantitatively expressed as

$$\text{Risk} = \text{Probability} \times \text{Consequence}$$

The concept of risk includes not only probability and consequence but also how the society evaluates them.

11.1.3 RISK ASSESSMENT

Risk assessment is the estimation of the likely hood of damage to health, property and environment. It is also associated with risk identification.

11.1.4 RISK PREVENTION OR CONTROL

It is the activity of trying to prevent the chances of hazardous events occurring, which if occurred can cause damage to life, property or environment.

11.2 OBJECTIVES OF THE STUDY

To ensure safe operation of the plant, it is proposed to carry out the Risk Analysis Study with the following objectives,

To study the industrial operations, related to the manufacture of Ethanol

To identify the major hazards relating to fire, explosion and toxicity due to storage and handling of hazardous chemicals

To visualize and quantify primary and secondary effects and damage potentials of the identified maximum credible accident scenarios using standard procedure

To study the nature of exposures, pathways and consequences of maximum credible accident scenarios and characteristics of risk levels

To provide guidelines for disaster management plan

Risk assessment studies have been carried out to assess the worst-case scenarios of the plant operations to formulate an emergency management plan.

11.3 PROJECT FEATURES AND HAZARDS

There are no hazardous processes in the proposed project.

The probable fire hazard in the plant is in the areas of storage and handling. In case of leaks, invisible vapors spread easily and can be set on fire by ignition sources. Therefore, it is important to control or eliminate all potential ignition sources in areas that might lead to ignition of vapor. All forms and types of energy can be considered a potential ignition source.

The potential sources of ignition are :

Open flames/Electrical wiring / devices

Smoking, Heat sources / Hot surfaces

Welding and cutting Friction

Sparks and Arcs, Static sparks

Gas Compression

Following are some of the precautions that will be taken to minimize the probability of ignition:

Electrical equipment and wiring should be protected for the hazard. (Flame proof fittings)

If a heating operation is necessary, use only indirect heating methods

Do not allow any open flames

Provide grounding and bonding for all equipment

Maintenance program will be established to ensure that all equipment and safety controls are functioning satisfactorily.

11.3.1 IDENTIFICATION OF POSSIBLE HAZARDS

In order to identify hazards the following two methods have been used.

Identification based on storage and handling of hazardous chemicals

Identification involving relative rating technique through Fire Explosion and Toxicity Index.

11.3.2 IDENTIFICATION INVOLVING RELATIVE RATING TECHNIQUE THROUGH FIRE EXPLOSION AND TOXICITY INDEX

Fire, explosion & Toxicity Indexing (FETI) is a rapid ranking method for identifying the degree of hazard. The basic objectives that characterize Fire Explosion and Toxicity Index are, Identification of equipment within the plant that would contribute to the initiation or escalation of accidents.

Quantification and classification of the expected damage potential of fire explosion and toxicity index in relative terms

Determination of area of exposure

Fire explosion and Toxicity Index is a product of Material Factor and Hazard Factor. Material factor represents the flammability and reactivity of the chemicals. The hazards factor itself is a product of general process and special process hazard.

Respective Material Factor (MF), General Hazard Factors (GHF), Special Process Hazard factors (SPH) are computed using standard procedure of awarding penalties based on storage, handling and reaction parameters. Material factor / General factor is a measure of intrinsic rate of potential energy release from fire and explosion produced by combustion or other chemical reaction.

11.3.3 GENERAL PROCESS HAZARD (GPH)

The plant activities, which contribute to a significant enhancement of potential for Fire and Explosion, have been identified. The measured values of penalties have been added to obtain the value of General Process Hazard as given IN DOWS Fire & Explosion Index Hazard classification guide.

11.3.4 SPECIAL PROCESS HAZARD (SPH)

The Special Process Hazard includes, the factors that contribute, the probability and occurrence of accident. They are :

Process temperature

Low pressure

Operation in or near flammable range

Operation pressure

Low temperature

Quantity of Flammable and toxic material

Corrosion and erosion

Leakage, Joints

11.3.5 MINIMUM PREVENTIVE AND PROTECTIVE MEASURES FOR FIRE AND EXPLOSION

Based on the categorization of Degree of Hazard, the following Table.

Table No.11.1 : Minimum preventive and protective measures are recommended.

Features	Light	Moderate	FE & I Rating		Severe
			Intermediate	Heavy	
Fire Proofing	2	2	3	4	4
Water Spray Directional	2	3	3	4	4
Area	2	3	3	4	4
Certain Special Instruction	1	2	2	2	4
Temperature	2	3	3	4	4
Pressure	2	3	3	4	4
Flow Control	2	3	4	4	4
Blow down – spill	1	2	3	3	4
Internal Explosion	2	3	3	4	4
Combustible gas Monitors	1	2	3	3	4
Remote Operation	1	2	2	3	4
Dykes	4	4	4	4	4
Blast and Barrier wall separation	1	2	3	4	4
1 = Optional 2 = Suggested 3 = Recommended 4 = Required					

11.4 HAZARD ANALYSIS

11.4.1 PRELIMINARY HAZARD ANALYSIS

Preliminary Hazard analysis is used to identify typical and often relatively apparent risk sources and damage / events in a system. Based on the preliminary hazard identification, the storage and handling facilities of molasses, press mud and bagasse has been recognized as distinctive and relatively evidential risk source.

Hazards of significant nature whose consequences are worth considering involving specified area or number of personnel are likely to be present etc., are considered in identifying the hazards. The significant hazards in the plant could be hazards related to storage and handling.

Loading and unloading from storage and forwarding may lead to containment failure for various reasons. Such situation can cause fires or explosions depending upon the situation.

11.4.2 HEALTH HAZARDS

The following acute health effects may occur

Can affect when breathed in and by passing through skin

May cause mutations

Can irritate the skin. Repeated contact can dry the skin with cracking, peeling and itching

Exposure can cause headache, nausea, a feeling of heat and drowsiness, higher exposure can cause unconsciousness

Exposure can irritate the eyes, nose, mouth and throat

11.5 MAXIMUM CREDITABLE ACCIDENT ANALYSIS

Maximum Creditable Accident Analysis (MCA Analysis) is one of methodologies evolved to identify worst credible accident with maximum damage from a distance, which is still believed to be probable. The analysis do not include quantification of probability. The following is an attempt in this direction.

Hazardous substance may be released as a result of failures or catastrophes, causing damage to surrounding area. The physical effects resulting from the release of hazardous substances can be calculated by means of Models. The results thus obtained through modeling are used to translate the physical effects in terms of injuries and damage to exposed population and environment.

The probable fire hazard in the plant is in the area storage and handling. It is proposed to store about 40 days production of the products within a common dyke of 40 x 55 m. In a worst case, it is assumed that the entire contents are leaked out or due to rupture of the pipeline connecting the tank and on ignition fire will eventuate forming pool fire. In order to assess the radiation levels, heat radiation model has been used. The algorithm of the models is based on the formulae published in the yellow book by (TNO, Netherlands). Details of the model are given below :

1. HEAT RADIATION MODEL – POOL FIRE

The heat load on objects outside the burning pool of liquid can be calculated with the heat radiation model. This model uses average radiation intensity, which is dependent on the type of the liquid. Consideration is also taken of the diameter to height ratio of the fire, which depends on the burning liquid. In addition, the heat load is also influenced by the following factors :

Distance from the fire and relative humidity of air (water vapor has a relatively high heat absorbing capacity)

2. VISUALISATION AND SIMULATION OF MAXIMUM ACCIDENTAL SCENARIOS

The worst-case scenarios, which is considered for MCA analysis in a Pool fire due to failure of storage of molasses in the tank form area.

As a worst case it is assumed that the entire contents are leaked out. In the event of spilling its contents through a small leakage or due to rupture of the pipeline connecting the tank and on ignition, fire will eventuate forming pool fire. As the tanks are provided within the dyke wall, the fire will be confined within the dyke wall.

Fires affect surroundings primarily through radiated heat, which is emitted. If the level of heat radiation is sufficiently high, other objects, which are inflammable, can be ignited. In addition, any living organism may be burned by heat radiation. The damage caused by heat radiation can be calculated from the dose of radiation received, a measure of dose is the energy per unit area of surface exposed to radiation over the duration of exposure.

3. EFFECTS OF POOL FIRE

Pool fire may result when bulk storage tanks will leak/burst, and the material released is ignited. As these tanks are provided with dyke walls to contain the leak and avoid spreading of flammable material, the pool fire will be confined to the dyke area only. However, the effects of radiation may be felt to larger area depending upon the size of the pool and quantity of material involved.

Thermal radiation due to pool fire may cause various degrees of burns on human bodies. More over, their effects on objects like piping, equipment are severe depending upon the intensity. The heat radiation intensities due to the pool fire of the above tank forms are computed using the pool fire model.

4. DAMAGE CRITERIA FOR HEAT RADIATION

The following table indicates likely damage level for different levels of heat radiations :

Type of Damage	Incident Radiation Intensity (kW/m ²)
i. Spontaneous ignition of wood	62.0
ii. Sufficient to cause damage to process equipment	37.5
iii. Minimum energy required to ignite wood at infinitely long exposure (non-piloted)	25.0
iv. Minimum energy required for piloted ignition of wood, melting plastic tubing	12.5
v. Sufficient to cause pain to personnel if unable to reach cover within 20 seconds; however blistering of skin (1 st degree burns) is likely.	4.5
vi. Will cause no discomfort to long exposure	1.6
vii. Equivalent to solar radiation	0.7

5. CRITICAL RADIATIONS OF INTEREST ON HUMAN BODY

Continuous 1.5 kW/m² on UN protected skin

Blisters in skin at 30 sec 5 kW/m²

Protected skin 5 kW/m²

Special protection 8 kW/m²

For continuous presence of persons, thermal radiation intensity levels of 4.5 kW/m² for plant operators and 1.6 kW/m² for outside population are usually assumed. These criteria are followed where peak load conditions may occur for a short time but mostly without warning. If the operators are properly trained and clothed, they are expected to run to shelter very quickly. For the secondary fires, a thermal incident radiation of 12.5 kW/m² is adopted as minimum criteria.

6. PHYSIOLOGICAL EFFECT OF THRESHOLD THERMAL DOSES

The effects of heat radiation depend upon the intensity and duration of exposure. Intensity and duration put together is the thermal dose. The consequences on human body for different thermal dose are tabulated here :

Dose threshold (kW/m ²)	Effects
37.5	3 rd degree burns
25.0	2 nd degree burns
4	1 st degree burns

11.6 CONSEQUENCE ANALYSIS

Consequence analysis is a part of hazard analysis and it provides a relative measure of likelihood and severity of various possible, hazardous events and enables those responsible to focus on the potential hazards. For practical purposes, the risk analysis may be based on subjective common-sense evaluation. Thus, this study concerns itself with the adverse effects of accidental and short-term release of hazardous materials on people in the surrounding area. The long-term effects of continuous pollutants are not dealt with.

i. FAILURE FREQUENCIES

Failure rates for various critical equipment are very important in risk assessment. Very limited data in this regard is available in our country. However, Safety and Reliability Directorate of UK and IEEE of USA have certain data in this regard. Relevant data are extracted and used in estimating failure rates leading to release of chemical. This data has different norms such as per hour, per vessel year, errors per million operations etc.

ii. FAILURE DATA

Process Control Failure	3.0 e (-) 5 per hour
Process Control Valve	2.4 e (-) 6 per hour
Alarm	4.6 e (-) 5 per hour
Leakage at largest Storage tank	3.0 e (-) 5 per year
Leakage of pipeline (150 mm dia) Full Bore	8.0 e (-) 8 per meter per year
Leakage of pipeline (150 mm dia) 20 % rupture	2.6 e (-) 8 per meter per year
Human failure	1.8 e (-) 3 demand

iii. PROBABILITY OF OCCURRENCE OF IDENTIFIED HAZARDS

The probability and consequence for each identified hazard event considering the method and procedure of plant operation and existing infrastructure for hazard control is evaluated.

The following criteria is adopted related to ignition probabilities :

For instantaneous releases, immediate ignition may occur 0.25 times. There could be delayed vapor cloud explosions for such releases, towards residential areas 0.9 times. Flash fire probability if 0.5.

When the release is continuous, the chance of immediate ignition is 0.1 and delayed ignition is 0.75. A directional probability of 0.2 is considered with regards to wave propagation direction in case explosions.

iv. IGNITION SOURCES OF MAJOR FIRES

Electrical Wiring	23%
Smoking	18%
Friction –bearings / broken parts	10%
Overheated materials	08%
Hot surfaces – boilers – lamps	07%
Burner flame – torch	07%
Combustion sparks	05%
Spontaneous ignition	04%
Cutting, Welding	04%
Exposure fires	03%
Incendiaries	02%
Mechanical sparks	02%
Molten substances	01%
Chemical action	01%
Static charge	01%
Lightning	01%
Miscellaneous	01%

v. SITE SPECIFIC CONSEQUENCES

In order to assess the site-specific consequences, information pertaining to the site such as nearest habitation, nearest industry etc. was collected.

The nearest village to the plant site is Shrepur with a population of about 5000 located at distance of 1.0 km from the plant site. Site specific consequences, analysis of failure cases are carried out with the objective to study how many persons are involved in an accident and are likely to get killed or injured, or how large is the area which is likely to be destroyed or rendered unusable so that a true assessment of the safety of the plant can be made.

11.7 SAFETY MANAGEMENT PLAN

Industries are prone to hazards due to the complex nature of their installations and activities. Even though all safety measures are adopted, the hazards leading to emergency situations and disaster are likely to occur under unforeseen circumstances. The project

proponents are therefore required to prepare an “Emergency Management Plan” (EMP) for the proposed project. An industrial emergency is a situation likely to arise due to catastrophic failure of plant and systems, which may have serious detrimental effects on life, property or environment. EMP is the systematic information along with a set of instructions and preparatory details to meet such eventualities with a view to contain it to the minimum in terms of damage or loss to health, life, property and environment within the industry or outside the industry.

11.8 OBJECTIVE OF EMERGENCY MANAGEMENT PLAN

The emergency management plan is concerned with preventing hazards through good design, operation, maintenance and inspection. Though every care is taken at the design stage itself, absolute safety is not achievable and therefore the essential aspect of emergency management plan must include measures to mitigate the effects of such eventualities. An important element of mitigation is emergency planning, i.e., recognizing that accidents are possible, assessing the consequence procedure would need to be implemented in the event of an emergency.

The main objective of emergency management plan is to keep the organization in a state of readiness to contain the extent of emergency and cascading effect of the original emergency and bring the incident under control with priority to saving of life, preventing further injury and loss of property and also to bring back the plant to normal and to working condition. Mobilize internal and external resources of man, materials and services required to manage emergency. Containing the hazards will require prompt action by operators and emergency staff. Minimizing the effects will include rescue, first aid, evacuation, rehabilitation and giving information promptly to the concerned people.

Emergency planning is just one aspect of safety and is not substitute for maintaining good standards within the plant operation. Before starting to prepare the EMP, it should be ensured that all the necessary standards and codes of safety including electrical, insurance etc., are followed from the design stage itself in the industry. For convenience of planning the emergencies are classified as on-site and off-site emergencies.

11.8.1 ON-SITE EMERGENCY

It consists of those situations affecting one or more plants of the industrial facility and manageable by a planned resources of the industry itself.

In Ethanol industries the eventualities are likely to cause emergency situation confined to the industry itself, and therefore, on-site emergency management plan is prepared for the proposed industry.

11.8.2 OFF-SITE EMERGENCY

It consists of more serious situations affecting several plants of the industry, even spreading outside and requiring outside assistance including state and national level resources mobilization.

11.8.3 RISK ASSESSMENT

To work out EMP, it is necessary to assess the risk involved in and around the proposed industry.

11.9 STRUCTURE OF EMERGENCY ORGANIZATION

In the event of disaster it is required to declare emergency, evacuate persons, arrange rescue, repair (hazard control) operations and medical attention to injured etc. Officers of the factory have to be designated to be In-charge of these operations. Other important aspect of EMP is to acquaint and train concerned persons in the factory and around about the likely hazards, and the measures in case of disaster so that the consequences are minimized.

A team consisting of senior officers of the factory is formed to manage the emergency situations. A senior officer of the factory is overall in-charge of the emergency management group and is designated as Emergency Declarer. Incident controller and Emergency coordinator will have the responsibility of Control if Incidence. Incidence control involves operations of prevention and control of damage to life and property during emergency situation and the emergency co-ordination involves the activity of facilitating the former. Incident controller and emergency coordinator are in turn assisted by different teams to carry out specified tasks of the emergency management.

11.9.1 EMERGENCY CONTROL ROOM (EMR)

It is expeditious and an advantage to have one specified control room for interactions and directions. The Administration building is chosen as the ECR, from where emergency situation is controlled by emergency controller. Senior staff and communication facilities are available in the administrative building. In case of hazard to administrative building, an alternative room is identified as an alternative location. The ECR is provided with communication facilities and information files required in control of emergency situation.

11.9.2 LIST OF FACILITIES AT EMERGENCY CONTROL ROOM

P & T, Fax, Telephone and E-mail facilities for internal and external communications.

Mobile Phones

Layout plan of factory and site with indication of vulnerable zones, location of safety equipments and other resources, escape routes, roads, assembly points and evacuation plants etc.

List with addresses of first air centers, fire fighting personnel, employees trained in Fire fighting and safety, key officers of the factory, statutory authorities, essential services and organizations.

Data sheet of chemicals

Copy of EMP, list with addresses of emergency control team members and siren with codes

Internal and external telephone directories

Emergency shutdown procedure for each plant

Security Officer along with emergency coordinator is responsible to maintain the ECR along with the facilities indicated above.

11.9.3 SAFETY MEASURES

Rescue and control team have to work under hostile environment and therefore require different types of protective appliances and equipments. Further to manage the situation such as ambulance, fire brigade, emergency vehicle, ladders etc. in addition to fire fighting and first aid facilities. These facilities will be procured and kept at easily accessible locations. A list of safety equipments, protective appliances and other facilities needed for control of emergency is given below.

1. COMMUNICATION SYSTEM

P & T, internal and external telephones, mobile telephones, Fax, E-mail, etc., shall be available at ECR. Internal telephone and mobile phone are provided to all departments. Receptionist during daytime and the security officer during other times are available for communications within and outside the factory premises.

2. FIRE FIGHTING FACILITY

FIRE HYDRANTS

Fire hydrant system with hose pipe of 7 kg/cm² pressure with single hydrants are located at strategic points in the Plant.

Water tank at elevated place	:	50 M ³ capacity
Water pump at 10 kg/cm ² pressure	:	200 M ³ /hr.

FIRE EXTINGUISHERS

Fire extinguishers

Foam water	:	2 each at main office and stores
CO ₂ type	:	6 Nos. one each at departmental office
DCP type	:	8 Nos. in Plant
Sand buckets	:	Nos. as Specified

FIRE PROTECTIVE APPLIANCES

Three sets of fire safety appliances each consisting of fire mask (6), face shield (6), fire gloves(12), fire helmet (12), safety belts (6), located at office and Ethanol plant.

FIRE BRIGADE

Fire brigade facilities available at Factory site, Akluj and other nearby industries shall be utilized whenever need arises.

3. SFETY EQUIPMENTS AND APPLIANCES

These equipment and facilities listed below are kept at administrative building / stores building and are under the control of emergency coordinator

First Aid medical units - one unit at each department, 4 units at store and 4 units at ECR.

Safety belts

Earmuffs, Noise muffs, Nose masks against dust, Aprons against chemical spillage.

Shockproof gloves and mats.

Leather / Asbestos Aprons.

Safety items of shoes, gumshoes, hand gloves, helmets, goggles.

Safety ladder.

Face masks & gas masks (against SO₂ gas).

Asbestos pullovers, leather gloves.

Breathing apparatus.

Stretchers and oxygen cylinder

Flame proof battery and lighting .

Ambulance facilities from hospital and Akluj and other near by industries.

Emergency lighting facilities.

Air lifeline for working in vessels and tanks

4. EMERGENCY TRANSPORT VEHICLE

One vehicle along with driver is always made available at the factory premises for emergency.

5. AMBULANCE

Ambulance facilities at hospitals of Akluj and other near by industries will be made available whenever need arises. The Industry shall have its own Ambulance facilities.

6. ASSEMBLY POINTS

Assembly points are those locations where the persons not connected with emergency operations can wait for further instructions or for rescue, transportation and rehabilitation. These points are safe locations free from hazard and have easy access to other departments of the factory. Premises at the entrance of Sugar/power plant are specified as assembly point for the employees working in the Sugar / power plant. Assembly points will be managed by security officers and are under the control of emergency coordinator.

11.10 ACTION PLAN FOR CONTROL OF EMERGENCY

Various functions to be carried out for control of emergency are categorized and assigned to Emergency Controller, and to the members of Incident Control and Emergency Co-ordination.

1. IDENTIFICATION AND ASSESSMENT OF HAZARDS

The worker, who is first to notice the hazard will communicate the incident to the plant supervisor personally or through phone. The plant supervisor will come to the spot, to assess the situation and communicate to Declarer of Emergency or his alternative, through phone / messenger. The supervisor assumes the responsibility to control the hazard till the arrival of emergency controller to the spot.

It is essential that the situation be identified at the earliest possible time and judged correctly and if necessary an emergency be declared. Under this plan, the G.M. Sugar plant

(or alternate G.M. Power plant) shall move to the place of hazard/calamity. He will assess the nature and magnitude of situation and if necessary decides to declare emergency and assumes the responsibility of emergency control.

2. DECLARATION OF EMERGENCY

For the purpose of declaring emergency, the declarer will arrange to sound the siren continuously for two minutes with intermittent low pitch at every half minutes. On hearing the coded sound, the workers in factory and around will be alerted for emergency situation and especially the members of emergency control teams will be in touch with emergency control room (ECR) for necessary direction. Workers of the plants that are not affected by the emergency can continue their normal work.

11.11 FUNCTIONS OF EMERGENCY MANAGEMENT PRSONNEL

i. FUNCTIONS OF DECLARER OF EMERGENCY

* After receipt of message the emergency declarer will visit the spot assess the situation of hazard and take over the management of emergency.

* Declare emergency if the situation is of serious in nature by means of coded siren and by public address system.

Interact with Incidence controller and emergency coordinator and direct them to proceed with the operations of emergency control. Arrange to liaison with fire brigade, medical assistance; seek aid from near by factories and outside experts.

Monitor emergency control operation and give necessary guidance.

Nominate person to give information to media and families of team members and affected persons.

Arrange to inform statutory authorities such as Chief Inspector of factories, Maharashtra State Pollution Control Board, Local Police authorities etc.

Give all clear signal through the coded siren, when the emergency situation has been controlled and normalcy restored.

Make a detailed report.

ii. FUNCTIONS OF INCIDENCE CONTROL INCIDENT CONTROLLER :

Assemble the members of incident control team.

Decide the course of action to be taken to control the particular type of emergency and give direction for evacuation, repair and essential services.

Arranges for appropriate safety equipment and necessary tools for the team members.

Keep in touch with the "Declarer of Emergency" and inform the progress being made.

After completely controlling the emergency, inform the emergency declarer of the same.

iii. EVACUATION TEAM

Ensure that the evacuation paths are adequately lighted if the emergency situation arises during night hours.

Evacuate the workers through the exit route to assembly point.

Remove obstacles inside plant for movement of personnel and machineries used for controlling emergency.

Organize for accounting of personnel and in case of differences, initiate search and evacuation.

iv. REPAIR TEAM

Shutdown power supply, boiler and other machineries in case it is required.

Segregate the affected area.

Remove dangerous material from work area to prevent any secondary disaster.

Fighting of the fire with fire extinguishers, fire hydrants and fire fighting equipments.

Attend hazard control operations such as prevention of leaks etc.

v. ESSENTIAL SERVICE TEAM

Maintain essential services like D.G. sets, water, compressed air and power supply for lighting and other essential needs.

Plan for alternative facilities in the event of power failure to maintain essential services such as lighting, telephone, water and other utilities.

Give necessary instructions to electricians and shift-in-charges regarding emergency power supply and isolations of certain sections.

Ensure availability of adequate quantities of protective equipment and other emergency service materials, spares etc.,

vi. FUNCTIONS OF EMERGENCY CO-ORDINATION EMERGENCY CO-ORDINATOR:

Assemble team members of emergency coordination group. Plan the course of action needed to assist the emergency control and direct the operations

Maintain liaison with emergency declarer and incident controller.

Make available necessary funds for rescue and emergency operations, and canteen facilities shall be kept open.

Assist incident controller in updating of EMP, training of personnel for emergency operations, organizing mock drills and furnishing reports to emergency declarer.

vii. TRANSPORTATION VEHICLE TEAM AND

Make available vehicles.

viii. MEDICAL ASSISTANCE TEAM:

Keep a list of First aid personnel of the factory and seek their assistance.

Maintain adequate stock of first aid emergency requirements. If necessary, mobilize extra medical help from outside.

Ensure that all the personnel safety appliances and protective equipments are available for the emergency activities.

Arrange medical treatment to the injured and if necessary shift the injured to nearby hospitals.

xi. SECURITY

Receive and assemble the workers at the assembly point.

Along with relief team account the number of workers with respect to attendance register.

Cordon off the hazard location. Control the public and traffic.

x. COMMUNICATION TEAM

Maintain liaison with hospital, fire brigade, police station etc., and seek their assistance whenever needed.

Maintain liaison with neighboring industries and if required seek assistance.

Persons treated for minor injuries are escorted to their residence. Intimation to be sent to the kith and kin of those personnel who are hospitalized through messengers, who in turn will also intimate the emergency coordinator.

xi. EMERGENCY SHUT DOWN OF PLANTS

The shutdown may be required either to one or more plants and is decided by the declarer of emergency. Incidence may be confined to a particular plant such as fermentation unit, distillation unit or dehydration unit. In such cases, stop steam, stop pumps and motor, release pressure from pressure equipments and switch off power to the plant. In case of major event to the entire plant, stop main steam supply, switch off main power supply and release pressure from pressure equipments. D.G. Sets shall be used for emergency power requirement and lighting.

xii. EVACUATION OF PERSONNEL

All the employees shall be trained to understand emergency sirens and to leave the premises through specified exit routes and report to assembly point. The evacuation team and the respective plant manager are in-charge of evacuation. Evacuation paths and assembly paths shall be displayed in plant for workers knowledge. Low and high pitch siren for one minute in the respective plant is the indication for the workers to evacuate the location. The team members of medical team shall attend to the injured and give first aid.

xiii. ACCOUNTING OF PERSONNEL:

The plant manager along with evacuation personnel is responsible for accounting the personnel of the plant involved and of the rescue team. In the event of any worker not accounted for, the matter is reported to control room so that the necessary arrangements can be made for rescue team to search and locate the missing person. The security officer again verifies accounting of personnel at the assembly point. The attendance roll of the employees is available with the plant manager and the security officer.

xiv. INFORMATION TO THE RELATIVES OF AFFECTED PEOPLE:

Persons with minor injuries who are given first aid and not requiring further medical care are taken to their residence with an escort. In case of persons hospitalized, the message is immediately sent through a messenger to their relatives and he has to confirm the same to the emergency coordinator.

xv. MEDICAL TREATMENT:

On intimation from declarer of emergency / emergency coordinator the head of medical assistance team will arrange for necessary facilities to render medical treatment for affected workmen.

Send medical assistants where the evacuated workmen are reporting.

Ensure that those requiring medical assistance are segregated.

Arrange for ambulance and transportation for shifting the affected workers to hospitals.

Treat all who can be handled inside the factory premises.

Inform outside hospitals about treatment of injured and seek their assistance. If required arrange for hospitalization.

Sufficient number of factory persons should be trained in first aid and emergency medical service. Presence of adequate number of trained first aid and other service is ensured in each shift.

xvi. MUTUAL AID

Emergency coordinator / safety officer shall arrange for assistance such as ambulance, fire fighting equipment, medical facilities etc. from nearby industry and other agencies for fighting fire and rescue work. The authorities to be contacted are given in Table-3.

xvii. SECURITY

The security officer will attend to the following :

Receive and assemble the evacuated workers at the designated assembly point.

Account for number of workers by keeping readily the number of workers who entered into the factory along with rescue and relief team.

Organize for fire control and call for outside help.

Help the police to control the traffic and law and order, outside the factory premises.

xviii. LAW AND ORDER

The security officer along with emergency coordinator will attend to the following:

Control traffic and crowds and keep the area clear.

Maintain law and order.

Cordon off the affected premises.

Keep liaison with the local police and seek their assistance if needed to maintain law and order.

xix. ALL CLEAR SIGNAL:

Once the emergency is controlled, the declarers of emergency assess the situation along with other team leaders. If he is satisfied that normalcy is regained and no further hazards involved, he shall arrange all clear signal by giving one minute continuous siren at high pitch.

xx INTIMATION TO AUTHORITIES

Immediately after the incidence is brought into control, the personnel manager in coordination with declarer of emergency will inform telephonically to all the Government officers and to the Maharashtra Pollution Control Board. A detailed report on the nature of emergency and its consequence will be sent to them within 24 hours of the incidence.

xxi. RELIEF AND REHABILITATION

After emergency situation is over, the prime responsibility of the declarer of the emergency is to interact with management and arrange for rehabilitation of those affected (physically and financially) due to the hazards and take remedial measures as necessary.

xxii. REVIEW OF INCIDENCE

After emergency situation is over, the management shall appoint an expert committee to identify the causes leading to the emergency situation.

Preventive measures to avoid recurrence of such situations in future.

Identifying the areas of lapses in implementing emergency plan so that the same can be improved in future.

Recommendation for further strengthening of EMP.

xxiii. UPDATE OF EMERGENCY PLAN

The declarer of emergency shall arrange a meeting of all the members of the emergency organization once in six months to review EMP and also to ensure its effectiveness.

xxiv. TRAINING AND REHEARSAL

Mock drills and training exercise will be conducted half yearly to acquaint all the employees of the factory to

11.12 IDENTIFY HAZARD

Understand the siren for emergency declaration, evacuation and all clear messages.

To know the exit routes and assembly points in case of evacuation.

Render necessary help during the emergency,

First aid personnel, firefighting personnel, team members of emergency management are adequately trained. Rehearsal and mock drills will be conducted as indicated above.

For training program assistance of District Fire Brigade Station, Central Labor Institution, etc., shall be utilized. Such training from external agencies will be arranged once in a year.

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E-Mail : klp.dattsssk@gmail.com

**Table – 11.2 ORGANIZATION - CHART
EMERGENCY**

Sr. No.	Designation	Person	Alternate Person
1.	Declarer of Emergency	Managing Director	1. Chief Chemist 2. Chief Engineer
2.	Incidence Controller	Chief Engineer	Maintenance Engineer
2.1	Evacuation and Resource Team	Production Manager	Production Chemist
2.2	Repair Team	Maintenance Manager	Asst-Engineer (maintenance)
2.3	Essential Service Team	Utility Engineer	Asst. Engineer (Utility)
3.0	Emergency Coordinator	Quality Manager	Chemist
3.1	Transportation Vehicle Team	Commercial Manager	Asst. Commercial Manager
3.2	Medical Services Team	Environmental Manager	Asst. Environmental Manager
3.3	Security	Security Officer	Security Supervisor
3.4	Communication	Safety Officer	Commercial Manager

Table –11.3 - AUTHORITIES

Sr. No.	Authority
1.	The Chief Inspector of Factories, Maharashtra State.
2.	The Chief Inspector of Boilers, Kolhapur.
3.	The Member Secretary, Maharashtra Pollution Control Board, Mumbai.
4.	The Regional Officer, MPCB, Kolhapur.
5.	The Deputy Commissioner, Kolhapur.
6.	The Superintendent of Police.
7.	Inspector of Police, Shirol.
8.	General Hospital, Shirol.
9.	The Inspector of Police, Jaysingpur.
10.	Primary Health Center, Shirol.
11.	Fire Station Officer, Kolhapur.
12.	List of Adjacent Industries.

ANNEXURE I

PHOTOGRAPHS OF GREEN BELT



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E-Mail : klp.dattsssk@gmail.com

ANNEXURE I

PHOTOGRAPHS OF GREEN BELT



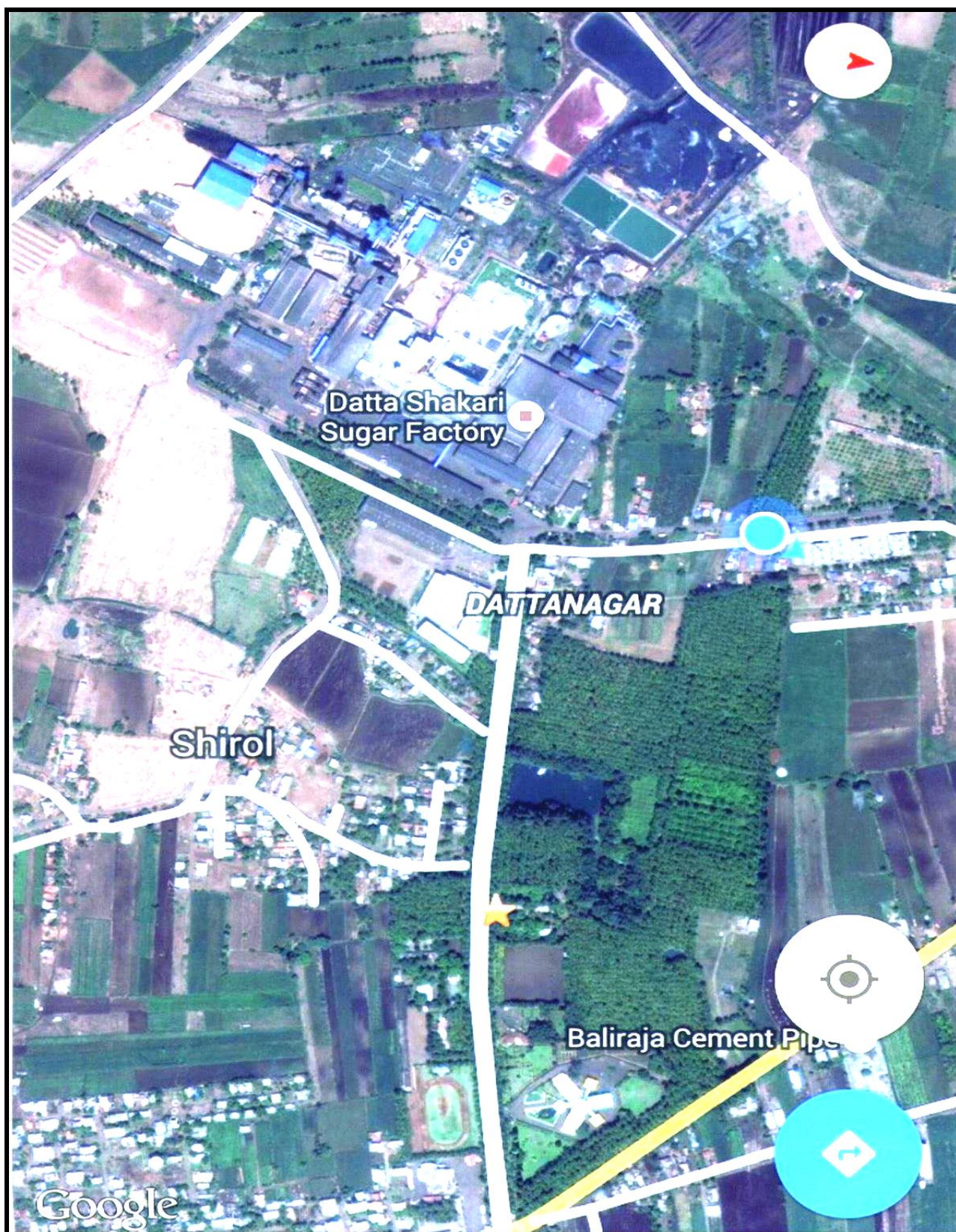
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E-Mail : klp.dattsssk@gmail.com

FRONT VIEW ADMENSTRATIVE BUIDLING



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E-Mail : klp.dattsssk@gmail.com

AERIAL VIEW OF FACTORY



ANNEXURE II

MANUFACTURING PROCESS

Cane is weighed on the platform weigh-bridge and is dumped into cane carrier. It is prepared by leveller and cutter and it is passed through mills for extraction of the juice. Weighed quantity of hot water used on last mill Bagasse to extract maximum quantity of juice. Mills juice from mills is pumped to the boiling house.

The mixed juice is weighed on automatic axwell Boulouge type weighing scales. First heating of the juice is done in raw juice heaters upto 65° to 70°C. The juice is then taken into continuous sulphitation tank where it is mixed with proportionate quantity of milk of lime and sulphur dioxide gas. The reaction is controlled by maintaining proper pH. After sulphitation juice is again heated upto 100° to 102° in sulphur juice heaters and is transferred to Dorr Clarifier for setting. After retention of 2^{1/2} hours clear juice is taken from the top and mud is taken from the bottom.

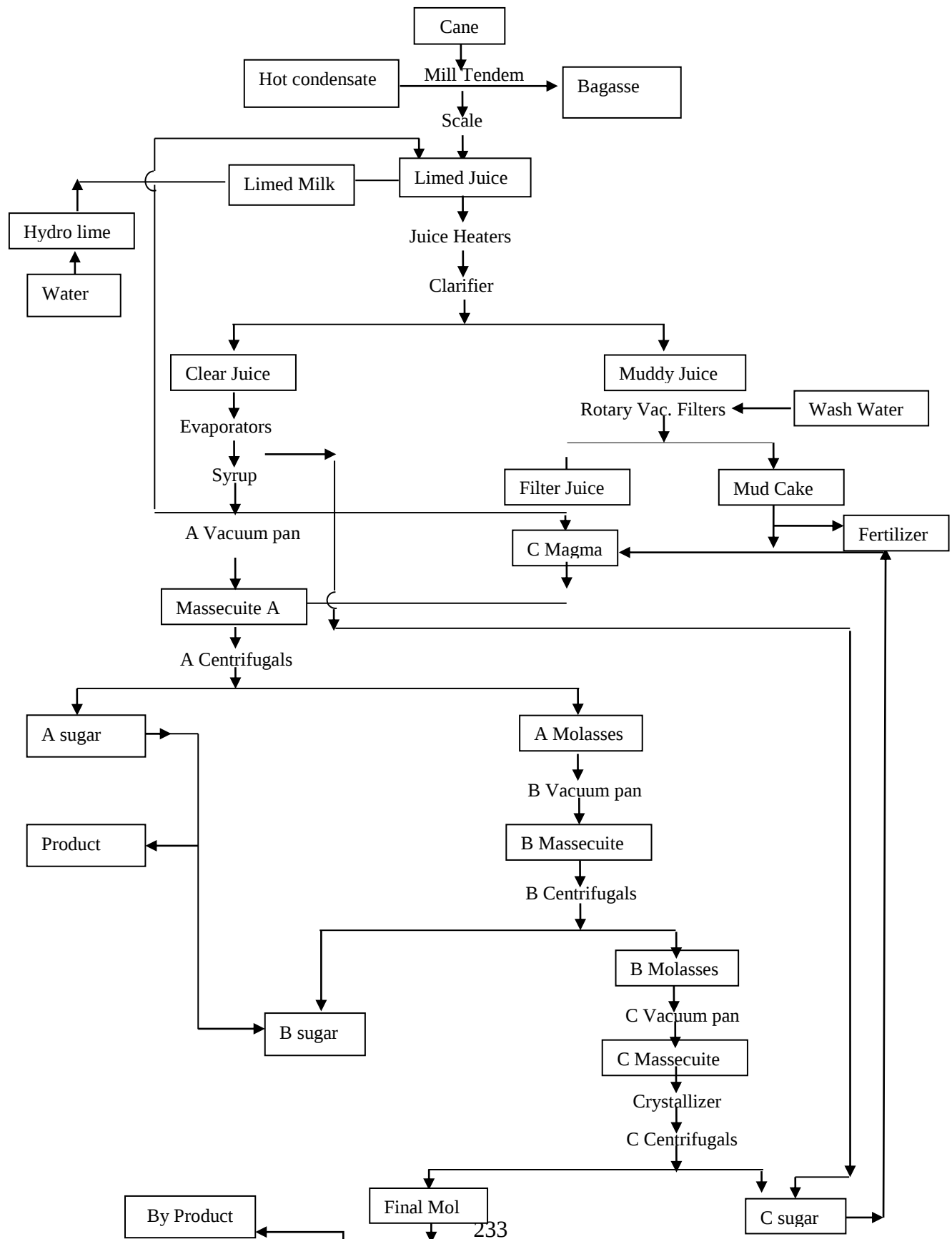
This mud is mixed with fine bagacillo and is filtered through Oliver vacuum filter. The filtrate juice is again taken in weighed raw juice and filter cake is taken out and used as manure. Clear juice is obtained from clarifiers is further concentrated into evaporators and is converted into syrup. This syrup is again sulphited in continuous syrup sulphitation and send to pan section for manufacture of sugar.

Sugar is manufactured in the vacuum pans by further concentration of syrup along with the seed as footing. The syrup and seed boiled in the vacuum pan is called as a massecuite. The massecuite after completion of boiling in vacuum pan is dropped in the crystallizer.

The massecuite is taken into centrifugal machine for separation of sugar molasses. The sugar separated in the Centrifugal Machine is dropped in hopper. It is dried there by passing hot and cold air and is graded on graders and is bagged, weighted and marked as per L.S.I. standard. The molasses sent out from the machine is reboiled and after third boiling the molasses is sent out is store in steel tank as final molasses which is being used in distillery for alcohol manufacture.

The Bagasse coming from mills is used in boiler as a fuel for production of steam and excess quantity of Bagasse is used for paper making industry. The generated steam is used for driving the turbines and heating and boiling the juice and syrup.

Manufacturing Process Flow Sheet Fig.11.1



Addition of Equipment Suitable For 9000 TCD & its Tentative Cost

Table No. 11.4

Sr.No.			Cost In
01.	Cane Carrier	Extension of width up to 2300mm with 200mm pitch chain, Suitable planetary drive and motor	60
02.	Cane Chopper	New assembly of 54 knives with reduction gear box and motor	20
03	Cane Leveler	New swing type assembly of stalled edge knives	25
04	Cane Fibrizer	Modification b adding two more dice and by increasing no of hammers suitable to extended cane	20
05	Rake Elevator	Modification of carrier suitable for extended cane carrier width	15
06	Mill No.OI	Addition of TUFR roller above the existing TRF	25
07	New Mill	Two roller mill as 6th mill of size 45" X 90" with suitable planetary gear box and AC VFD drive and rake type elevator	650
08	Addition	of identical pumps for strained & unstrained juice	20
09	Bagasse Elevator	Existing bagasse elevator modification to suit new 6th mill and replacement of chain by 200mm pitch, 80 T breaking load	25
10	Main Bagasse Carrier	Modification to suit new 6th mill and replacement of chain by 200mm pitch and SOT breaking load	25
11	Mill House Craine	Modification and extension of gantry suit new 6th mill	25
		Total-	910

Addition of Equipment Suitable For 9000 TCD & its Tentative Cost

Table No. 11.5

Sr.No.	Equipment Name	Cost In Lacs
01.	Sulphitor/Syrup Tower	40
02.	500 m² Heating surface Juice heater (4 Nos)	180
03.	400 m² Heating surface Juice heater (2 Nos)	60
04.	Rj/Sj/Cj Juice Pump (9 Nos)	36
05.	Syrup pump (2 Nos)	6
06.	NK 1500 Cont. C/F Machine (2 Nos)	37.5
07	10 X 20 Feet Oliver Filter (1 No.)	40
08.	Sul/Clear Juice DCH	75
09.	32 Feet Clarifier	100
	Total-	574

The total tentative cost for additional equipment suitable for 9000 TCD is 1484 L

ANNEXURE III

Techno Economic feasibility report of ETP facilities provided at

Shree Datta Shethkari SSK Ltd., Dattanagar, Tal: Shirol, Dist: Kolhapur

Shree Datta S.S.K. Ltd., Dattanagar, Tal: Shirol Dist: Kolhapur has a Sugar unit of 7500 TCD. Full pledged Effluent treatment plant based on Anaerobic and Aerobic Biological treatment principles was provided to treat Sugar factory effluent. It is proposed to expand the Sugar Factory capacity from 7500 TCD to 9000 TCD. The industry has adopted recycling arrangements of entire excess condensates into process as well as its Distillery unit and also as make up water for cooling towers. Thus, the water consumption as well as the effluent quantity of 700 cum/day shall remain same.

The design details are as below:

1. Oil & Grease Tap: Mechanical Oil & grease trap was provided to remove spent oils. The spent oil was mixed with Bagasse & burnt in boiler.
2. Flow Meter: A continuous flow meter with data logger was installed to measure the effluent quantity both at the outlet.
3. Design parameters: Flow - 700 m³/day
COD - 2500 mg/l
BOD - 1500 mg/l
Suspended solid - 300 - 400 mg/l
4. Equalization tank: In order to minimize the fluctuation in flow & to have uniform flow & effluent characteristic, an equalization tank of 400 m³ capacity is provided the detention time is $400/700 = 13.71$ Hrs.

A detention time of 8-12 hr is adequate & thus the equalization tank capacity is adequate.

5. **Washing Storage Tank (Panic Tank):** There could be unprecedent discharges of high concentration of organic matter entering in to ETP due to washings of vessels / process failures which may affect the performance of biological treatment performance. In order to overcome this eventuality, a panic tank (washing storage tank) of one day capacity is usually provided. The effluent from this tank is pumped uniformly in a controlled manner to biological process. The capacity of panic tank is 800cum which is 27 hr capacity & thus adequate.
6. **Primary Settling Tank:** A primary settling tank is provided to remove the settleable solids in the incoming effluent which can incidently remove organic matter as well as suspended solids. The BOD removal efficiency expected is 25-30% and suspended solids removal efficiency expected is 75-80%.
7. **Anaerobic filter:** Anaerobic filter is an anaerobic treatment where the organic matter is stabilized in the absence of oxygen. The filter media could be either stone or PVC. The stone media can give a BOD removal efficiency of 15-20%, whereas the PVC media can give removal efficiency of 35-40%. The existing stone media was replaced with PVC media to obtain higher removal efficiency.

BOD entering into filter is $700 \times 1200 \times 103 / 106 = 840$ kg/day.

BOD removal from the filter is $840(1-0.5) = 420$ Kgs

The effluent leaving from filter is $840-420=420$ Kgs, which shall be treated in aerobic ETP.

8. **Aerobic Treatment:**

BOD load to be treated is 420 Kg/day.

O₂ required is $420 \times 2 = 840$ Kgs.

Air required is $840 / 0.20 = 4200$ kgs/day.

Efficiency of Root Blowers is 80%.

Blower capacity required is $4200 / 0.80 = 5200$ kgs/day

Provide two Twin Root Blowers of 30 HP capacity.

Aerobic Tank capacity:

$F/M = 0.15$

MLSS = 4000 mg/l

X = aeration tank volume in million liters

$420 / 4000X = 0.15$

$X = 420 / 600 = 0.7$ million liters i.e. 700 cum

The aeration tank capacity provide is 800cum

And hence adequate 90% BOD removal is expected

Effluent leaving aeration shall have BOD of $420(1-0.9) = 42$ kgs, which is equivalent to 60 mg/l.

9. Clarifier: Overflow rate of secondary clarifier varies between 8-15 m³/m²/day.

Daily flow is 700cum

Diameter of clarifier provided is 8.25 m

Area of clarifier is 53.478 m²

Overflow rate of maximum 15 m³/m²/day is permitted.

Over flow rate provided is $700 / 53.478 = 13.09$ m³/m²/day.

The clarifier size is adequate.

Suspended solids removal in the clarifier varies between 80-90%.

Initial Suspended solids concentration 300 mg/l(max)

Final suspended solids $300(1-0.8) = 60$ mg/l

10. Sludge Drying Beds:

Excess Sludge produced would be 0.10 kg per kg of BOD removed.

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BOD removed in aerobic process is $420-42= 378$ kgs.

Excess Sludge produced is $378 \times 0.10 = 37.80$ kgs. Solids percent in sludge is 1%.

Volume of sludge $37.8/0.01=3780$ liters (i.e. 3.78 Cum)

Provide 10days time for sludge drying.

Volume of sludge Drying Beds required is $3.78 \times 10 = 37.8$ Cum.

Sludge Beds Volume provided is 45 cum and hence adequate.

11. 15 days storage tank for treated effluent during no demand period of Irrigation

Capacity of the tank = $15 \times 700 = 10500$ Cum.

The capacity of tank provided is 11000 Cum and hence adequate.

The tank is constructed with HDPE lining and concreting at bottom and sides of the tank

Estimated COD, BOD, Suspended Solids removal efficiency of ETP

Table No. 11.6

Sr. No.	Unit	BOD mg/l		COD mg/l		Suspended Solids mg/l		Efficiency %		
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	BOD	COD	SS
1.	Equilization Tank	1500	1500	2500	2500	400	400	--	--	--
2.	Primary Setlling tank	1500	1100	2500	2000	400	100	27	20	75
3.	Anaerobic Filter	1200	700	2000	1200	100	80	37	40	20
4.	Aeration Tank	700	60	1200	240	80	60	92	80	25

Fig. 11.3

ETP Flow Chart

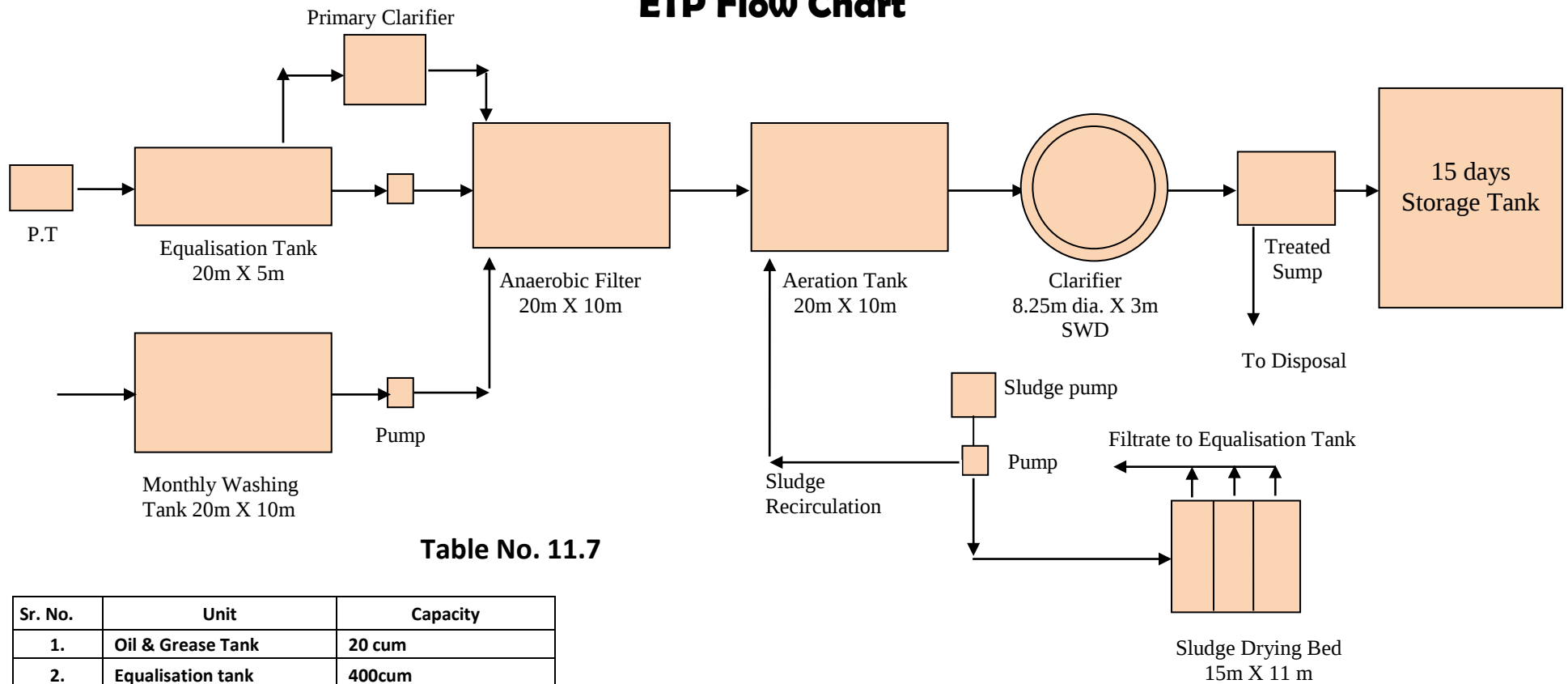


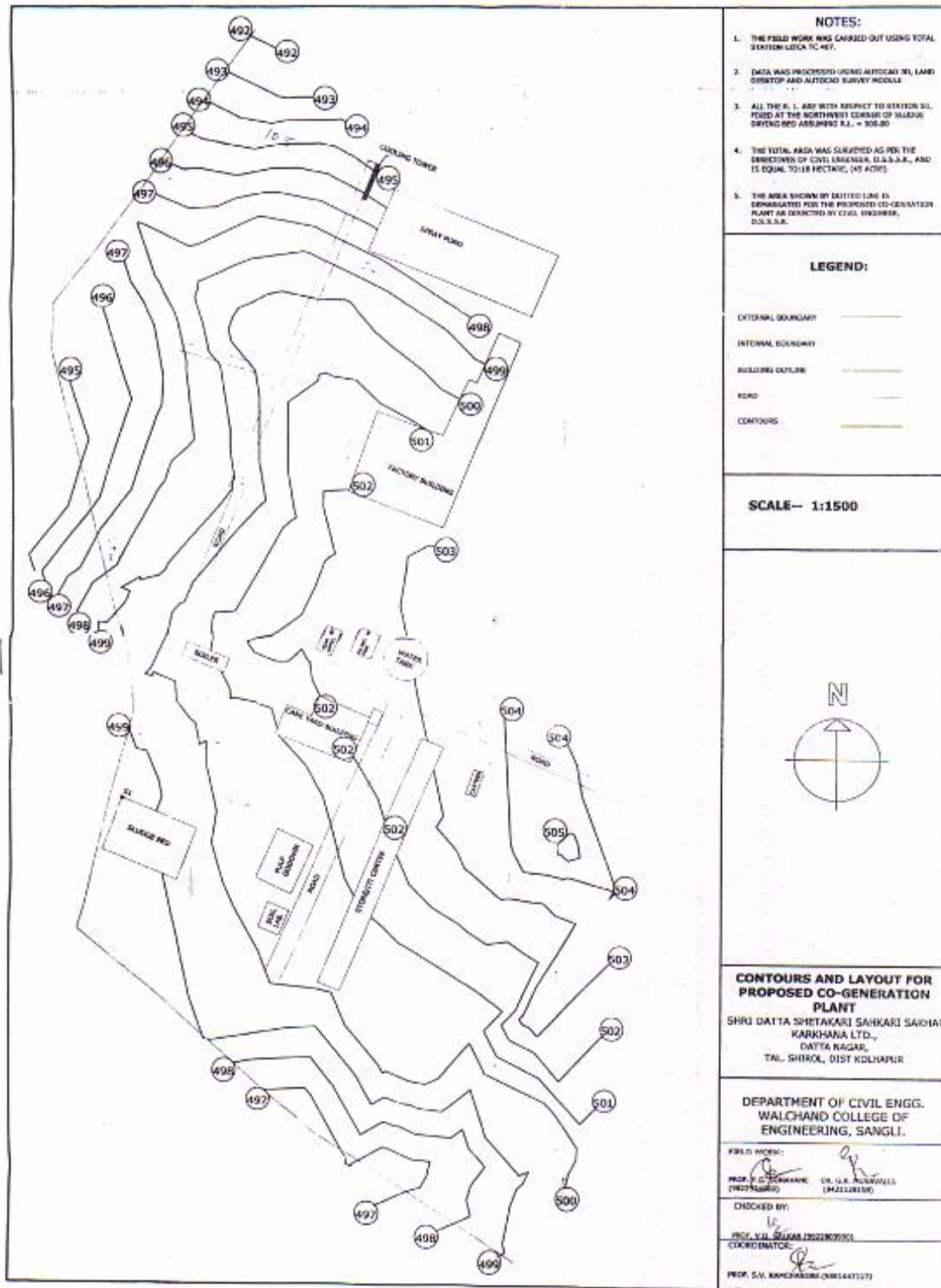
Table No. 11.7

Sr. No.	Unit	Capacity
1.	Oil & Grease Tank	20 cum
2.	Equalisation tank	400cum
3.	Primary Clarifier	42 cum
4.	Washing Tank	800 cum
5.	Anaerobic Filter	800 cum
6.	Aeration Tank	800 cum
7.	Clarifier	8.25 m dia X 3m swd
8.	Sludge Drying Bed	15cum X 3 nos
9.	15 Days storage Tank	11,500 cum

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E-Mail : klp.dattsssk@gmail.com

ANNEXURE IV

Contour Map Fig.11.4



ANNEXURE V

GOVERNMENT OF MAHARASHTRA

No. ENV (NOC) /2000/130/CR-21/D-I

☎ :- 2854707
Fax :- 2029388/2025946

Environment Department,
15th floor, New Admn.Bldg.,
Madam Cama Road, Mantralaya,
Mumbai - 400 032

Date :- 23rd March, 2000

To,

The Managing Director,
Shri.Datta Shetkari Sakhar Karkhana Ltd.,
Shirol, Tal - Shirol
District - Kolhapur.

**Subject :- Environmental Clearance for expansion of
crushing capacity from 5000 MT/Day to 7500
MT/Day.**

Sir,

I am directed to refer to your letter No. 15389/ENVR/ETP/1999-2000 dated 29th January, 2000 on the subject mentioned above and to state that the Environment Department of the State Government has no objection from the environmental angle to permit you to expansion of -

crushing capacity from 5,000 MT/Day to 7500 MT/Day
At - Shirol, Tal - Shirol, District - Kolhapur.

subject to the following conditions and general conditions appended to this letter.

These stipulations will be enforced among others under the Water (Prevention & Control of Pollution) Act., 1974 the Air (Prevention & Control of Pollution) Act., 1981, the Environment (Protection) Act., 1986 and the Public Liability Insurance Act., 1991 alongwith their amendments.

The above permission is without prejudice to any other permissions required under any of the laws, bye-laws or regulations in force and that the Government may impose additional conditions from time to time for control of pollution, if necessary.

Yours faithfully,

B.T.Narkar
(B.T.Narkar)
Section Officer

Encl : As above

*Original to CC.
Copy to CE/D/2
ADM
Ch. Engr
SM
27/3
W*

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD. SHIROL DINWANE NO. 19627 27 MAR 2000 SENT TO
--

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD., SHIROL
PO : DATTANAGAR 416 120 TALUKA-SHIROL, DIST.KOLHAPUR, (MS) India
E-Mail : klp.dattsssk@gmail.com

GOVERNMENT OF MAHARASHTRA

No. ENV (NOC) /2000/130/CR-21/D-I

☎ :- 2854707
Fax :- 2029388/2025946

Environment Department,
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The above permission is without prejudice to any other permissions required under any of the laws, bye-laws or regulations in force and that the Government may impose additional conditions from time to time for control of pollution, if necessary.

Yours faithfully,

B.T.Narkar
(B.T.Narkar)
Section Officer

Encl : As above

*Original to CC ✓
Copy to CE/D/2 ✓
ADM ✓
Ch. Engr ✓
SMA ✓
27/3 ✓
M ✓*

SHRI DATTA SHETKARI SAHAKARI SAKHAR KARKHANA LTD. SHIROL DHWANE NO. 19427 27 MAR 2000 SENT TO

1. The Project Authority shall take adequate safety precautions in handling the raw materials, plant and machinery and the products of the processes so as to avoid any damage/loss of life or property, or environment.

2. The Project Authority shall provide personal protective equipments, impart training and medical facilities to the workers handling the hazardous/dangerous raw materials, finished products or processes.

3. The Project Authority shall prepare the on-site disaster management plan and should submit to the Director, Industrial safety and Health. The copies of which shall also be submitted to the District Collector, Local Authority, MPCB and the Environment Department, Government of Maharashtra. The Project Authority shall submit the information to the Director, Industrial Safety and Health for the preparation of the off-site disaster Management plan. The Project Authority should carry out periodical rehearsal of the on-site disaster management plan.

4. The Project Authority shall comply with all statutory requirements for safe transportation of raw materials/finished products in case of trucks/tankers carrying hazardous raw material shall be washed and cleaned up within the plant premises, so as to ensure no pollution in the vicinity.

5. The Project Authority shall use cleaner technology for the manufacturing process and the clean fuel for the operations so as to reduce process waste, liquid effluents and gaseous emissions.

6. The Project Authority shall treat the liquid effluents so as to conform to the standards prescribed by MPCB. The disposal of the treated effluent shall be in accordance with the conditions imposed by MPCB/GOM (Govt. of Maharashtra/Govt. of India). The continuous monitoring facility for the effluents should be provided by the project authority. If the effluent quality exceeds the standards at any time the corresponding units of the plant which are contributing the excessive pollutant load shall be stopped from the operations till the quality of pollutant discharged from those units are brought down to the required level. Under no circumstances, the quality of the effluent shall exceed the limits mentioned in the consent letter. The Project Authority should draw water consumption plans and the time bound sincere efforts for the reduction of water consumption should be made.

7. In case the treated effluent is proposed to be utilised for land irrigation/gardening on the land owned by the Project Authority, the sufficient area should be earmarked for the same purpose in consultation with the Agriculture Department. Under no circumstances, such an effluent should be allowed to flow outside the premises of the project. During Monsoon or heavy rainfall period, if the treated effluent can not be absorbed in the project land and there is a likelihood of the effluent going into the nearby areas, the respective unit should be put out of operation immediately. For the purpose of effluent disposal, mechanical system (sprinkler etc.) and shall make adequate arrangements for the storage of excessive

GCP.ROTA/II-898(2000-10-93)

N.S. (P.T.O.)
Received.

5.40pm to 7.05pm

Date - 24th Aug 2016 Wednesday

DAL Page No-2 to 3

The Project Authority shall regularly and periodically undertake soil testing of the land which are being used for the disposal of the effluent and shall also undertake periodical and regular testing of water sources in the vicinity of the project.

8. The Project Authority shall control the air emissions as per the standards prescribed by MPCB. No change in the design of stack and fuel mix be done without the permission of MPCB. Minimum number of air quality of air quality monitoring stations should be set up in consultation with MPCB in the plant and nearby areas. The air quality should be monitored on regular basis. All the stacks of the plant should be provided with the continuous stack monitoring equipment and the stack emission levels shall be recorded and submitted to the MPCB as per their directives.

10. The process emissions shall meet the standards prescribed by MPCB. At no time, the emissions should be beyond the standards. The respective units which exceed the standard should be put out of order immediately and should not be restarted until the control systems are rectified.

10. The solid waste shall be treated and disposed off as prescribed in the authorisation certificate granted by MPCB in accordance with the Hazardous Waste (Handling and Management) Rules, 1989 (Wherever applicable).

12. The Project Authority shall take precautions so as to reduce other types of environmental problems like noise, odour, thermal/heat and radio activity etc. (if applicable).

12. The Project Authority shall set up environment management cell with a suitably qualified staff, to carry out various functions of the environment management. The Environment Management plan should be prepared by the project authority and same shall be submitted to MPCB. The Project Authority shall also earmarked funds for the Environment Management Cell and same shall not be diverted for any other purpose. The Project Authority shall prepare environment statement every year and copy of the same should be submitted to the MPCB.

13. The cases of any disaster/accident/mishap due to handling raw materials, processes, plant and machinery or finished products, the Project Authority shall be personally, jointly and severally be responsible for the event.

15. Tree plantation programme should be undertaken at the rate of not less than 2500 trees per ha. on the factory land, in consultation with the Forest Department of the State Government and MPCB.

15. This environment clearance is not transferable and shall lapse after a period of 2 years from the date on which the clearance is given, unless the intended development is commenced before the expiry of the period.

16. The Project Authority must strictly adhere to the stipulations made by NPCB/Government of Maharashtra/Government of India. The Project Authority shall submit the compliance report regarding conditions imposed by NPCB/Government of Maharashtra (Environment Department)/Govt. of India before commencement of production/activity.

19. The company should store Molasses in still tank and not in Kaccha pit.

**ENVIRONMENTAL CLEARANCE CONDITIONS AND
COMPLIANCE FOR 5000 TO 7500 TCD**

Sr.No.	EC Conditions	Compliance
1.	The Project Authority shall take adequate safety precautions in handling the raw materials, plant and machinery and the products of the processes so as to avoid any damage/loss of life or property, or environment.	Adequate steps are taken for storage of materials. No Hazardous chemicals are used in The Process.
2.	The Project Authority shall provide personal protective equipments, impart training and medical facilities to the workers handling the hazardous/dangerous raw materials, finished products or processes.	Workers are provided with Helmets, Aprons, Hand Gloves and Gum Boots at the places like Boiler, Mill House etc. Well furnished Hospital is established by the Management for Medical Assistance.
3.	The Project Authority shall prepare the on-site disaster management plan and should submit to the Director, industrial safety and Health. The copies of which shall also be submitted to the District Collector, Local Authority, MPCB and, the Environment Department, Government of Maharashtra. The project Authority shall submit the information to the Director, Industrial Safety and plan. The Project Authority should carry out periodical rehearsal of the on-site disaster management plan.	On site and off site emergency places are prepared and submitted to the authorities. Mock drills are regularly undertaken.
4.	The Project Authority shall comply with all statutory requirements for safe transportation of raw materials/finished products in case of trucks/tankers carrying hazardous raw materials shall be washed and cleaned up within the plant premises, so as to ensure no pollution in the vicinity.	All the safety precautions are taken for the transport of the raw materials. No Hazardous raw material is transported.
5.	The Project Authority shall use cleaner technology for the manufacturing process and the clean fuel for the operations so as to reduce process waste, liquid effluents and gaseous emissions.	The Industry adopted the cleaner technology to recycle the entire

		condensates water back to the process. The waste water produced is less than 40 liters as against the CPCB guidelines of 100 liters per tonne of Cane crushed. ESP is provided to control emissions from Boiler.
6.	The Project Authority shall treat the liquid effluents so as to confirm to the standards prescribed by MPCB. The disposal of the treated effluent shall be in accordance with the conditions imposed by MPCB/GOM (Govt. of Maharashtra/Govt. Of India). The continuous monitoring facility for the effluent quality exceeds the standards at any time the corresponding units of the plant which are contributing the excessive pollutant load shall be stopped from the operations till the quality of pollutant discharged from those units are brought down to the required level. Under no circumstances, the quality of the effluent shall exceed the limits mentioned in the plants and time bound sincere efforts for the reduction of water consumption should be made.	The MPCB standards are met as per the consent conditions. Continuous monitoring facilities are installed for the treated effluent. The water consumption for process is nil. River water is drawn for Domestic purpose only.
7.	In case the treated effluent is proposed to be utilised for land irrigation/gardening on the land owned by the Project Authority, the sufficient area should be earmarked for the same purpose in consultation with the Agriculture Department. Under no circumstances, such an effluent should be allowed to flow outside the premises of the project. During Mansoon or heavy rainfall period, if the treated effluent can not be absorbed in the project land and there is a likelihood of the effluent going into the nearby areas, the respective unit should be put out of operation immediately. For the purpose of effluent disposal, mechanical system(sprinkler etc.) and shall make adequate arrangements for the storage of excessive of the Project Authority shall regularly and periodically undertake soil testing of the land which are being used for the disposal of the effluent and shall also undertake periodical and regular testing of water sources in the vicinity of the project.	100 acres of land is available for treated effluent for irrigation purpose which is adequate. Testing of Ground water, Quality is carried out in the project area once in a year.

8.	The Project Authority shall control the air emissions as per the standards prescribed by MPCB. No change in the design of stock and fuel mix be done without the permissions of MPCB. Minimum number of air quality of air qualify monitoring stations should be set up in consultation with MPCB in the plant and nearby areas. The air quality should be monitored on regular basis. All the stacks of equipment and the stack emission levels shall be recorded and submitted to the MPCB as per their directions.	Stack emissions are met by the Urajankur Shree Datta Power Company which is operating the Co-generation power plant on BOOT principles. Around eight ambient air stations are monitored regularly.
9.	The process emission shall meet the standards prescribed by MPCB. At no time, the emissions should be beyond the standards. The respective units which exceed the standard should be put out of order immediately and should not be restarted until the control systems are rectified.	Process emissions are not generated. Sulphur burner gases are scrubbed. Sugar Bagging Section is provided with dust collector.
10.	The solid waste shall be treated and disposed off as prescribed in the authorisation certificate granted by MPCB in accordance with the Hazardous waste (Handling and Management) Rules, 1989 (Whenever applicable).	Solid wastes are converted into manure along with spentwash.
11.	The Project Authority shall take precautions so as to reduce other types of environmental problem like noises, odour, thermal/heat and radio activity etc.(if applicable).	Acoustic measures and Silencer pads are provided to reduce Noise levels. Workers are also provided with ear plugs/muffs at places like Turbine, Boiler, Compressors etc. Workers are provided with Aprons and helmets and Googols at places like Boiling House and mill House. There are no significant odour problems

		in Sugar industries.
12.	The Project Authority shall set up environment management cell with a suitable qualified staff, to carry out various functions of the environment management. The Environment Management plan should be prepared by the project authority and same shall be submitted to MPCB. The Project Authority shall also earmarked funds for the Environment Management Cell and same shall not be diverted for any other purpose. The Project Authority shall prepare environment statements every year and copy of the same should be submitted to the MPCB.	A full pledged Environment cell headed by the chief chemist is set up. Around fifty lakhs are earmarked for Environmental Management plan. The industry also engaged a consultant to advice the Industry on Environmental issues. Environment statements form V is submitted every year on or before 30th September.
13.	The cases of any disaster/accident/mishap due to handling raw materials, processes, plant and machinery or finished products, the Project Authority shall be personally, jointly and severally be responsible for the event.	Noted.
14.	Tree plantation programme should be undertaken at the rate of not less than 2500 trees per ha. On the factory land, in consultation with the Forest Department of the State Government and MPCB.	As per the revised guidelines of CPCB green belt is developed as 1500 trees per hectare in consultation with the forest-Department.
15.	This environment clearance is not transferable and shall expire after a period of 2 years from the date on which the clearance is given, unless the intended development is commenced before the expiry of the period.	The project was commissioned in 2001-2002, well before the expiry of two years.

16.	The Project Authority must strictly adhered to the stipulations made by MPCB/Government of Maharashtra/Government of India. The Project Authority shall submit the compliance report regarding conditions imposed by MPCB/Government of Maharashtra (Environment Department)/Govt. Of India before commencement of production/activity.	Compliance Report is submitted regularly.
17.	The Company should store Molasses in still tank and not in Kaccha pit.	Molasses are stored in Steel tanks only.

ANNEXURE VI

122nd Meeting of State Level Expert Appraisal Committee - I held on 24th, 25th & 26th Feb, 2016

Item no. 27	M/s. Shree Datta Shetkari Sahakari Sakhar Karkhana Ltd.(ToR) Expansion /modernization of sugar unit from 313 TCH (7500 TCD) to 375 TCH (9000TCD) at plot no. agar bagh-343 to 352, 354, 361 shirol-251, 252, 717, 903, 129, 133/2,135,134,136,210,213,214,230,229,232 to 237, 242, 246+241, 247 to 249, 127, 131, Tal- Shirol, Kolhapur.
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The PP gave a detailed presentation for approval of ToR for their proposed expansion /modernization of sugar factory crushing activity from 7500 TCD to 9000 TCD. The Project was considered under 5(j)-B1 category of the Schedule of the EIA Notification, 2006.

The Committee noted that the present sugar factory also has 36 MW cogeneration plant and 16 KLPD distillery. These ancillary activities will continue at same quantum of production while sugar manufacturing is proposed to be enhanced. This enhancement will not entail any additional water requirement and effluent generation. Water requirement will remain at 100 m³ and effluent generation at 750 m³.

After detailed discussion the Committee decided to **approve ToR** for preparation of EIA report subject to the following conditions:

1. For the EIA report the prescriptions of Model ToR by MoEF published in April, 2015 shall be adopted.
2. A detailed analysis of fuel requirement for the boiler may be made to prove that additional fuel will not be required.
3. Details of emission inventory may be given w.r.t steam generation and effluent.
4. The PP shall achieve an outlet TPM of less than 100 mg/Nm³.
5. In consonance with the Notification of CPCB the PP shall not exceed quantum of final treated effluent discharge beyond 100 lit/tonnes of cane crushed. Similarly quantum of waste water from spray pond / cooling tower blow down shall not exceed 100 litres/tonnes of cane crushed. These may be shown through precise calculations.

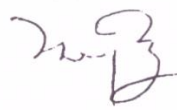
122nd Meeting of State Level Expert Appraisal Committee - I held on 24th, 25th & 26th Feb, 2016

6. Details of ash management including storage facility and disposal of ash to brick manufacturers ensuring there is no generation of air pollutants in the entire process of handling of ash may be described.
7. Public Consultation will be required.

It was decided that following members will visit the project to study the present processes and environs of the plant on 9.3.2016 at 11 am-

1. Shri. T. C. Benjamin, Chairman
2. Shri. B.H Sehgal, Member
3. Shri. C. I. Sambutwad, Member
4. Shri. D. A. Hiremath, Member
5. Prof. (Dr.) R. Dod, Member


Member Secretary


Chairman

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/
ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

5(j):STANDARD TERMS OF REFERENCE FOR CONDUCTING
ENVIRONMENT IMPACT ASSESSMENT STUDY FOR SUGAR
INDUSTRY AND INFORMATION TO BE INCLUDED IN EIA / EMP
REPORT

A. STANDARD TERMS OF REFERENCE

- 1) Executive Summary
- 2) Introduction
 - i. Details of the EIA Consultant including NABET accreditation
 - ii. Information about the project proponent
 - iii. Importance and benefits of the project
- 3) Project Description
 - i. Cost of project and time of completion.
 - ii. Products with capacities for the proposed project.
 - iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.
 - iv. List of raw materials required and their source along with mode of transportation.
 - v. Other chemicals and materials required with quantities and storage capacities
 - vi. Details of Emission, effluents, hazardous waste generation and their management.
 - vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)
 - viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided.
 - ix. Hazard identification and details of proposed safety systems.
 - x. Expansion/modernization proposals:
 - a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.
 - b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification

**STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR
PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE**

2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

- xiv. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.
 - i. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)
 - ii. Details w.r.t. option analysis for selection of site
 - iii. Co-ordinates (lat-long) of all four corners of the site.
 - iv. Google map-Earth downloaded of the project site.
 - v. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.
 - vi. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.
 - vii. Landuse break-up of total land of the project site (identified and acquired), government/private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)
 - viii. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area
 - ix. Geological features and Geo-hydrological status of the study area shall be included.
 - x. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)
 - xi. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.
 - xii. R&R details in respect of land in line with state Government policy

5) Forest and wildlife related issues (if applicable):

- i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

**STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/
ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE**

- ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)
 - iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.
 - iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon
 - v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area
 - vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife
- 6) Environmental Status
- i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.
 - ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.
 - iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQPM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.
 - iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.
 - v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.
 - vi. Ground water monitoring at minimum at 8 locations shall be included.
 - vii. Noise levels monitoring at 8 locations within the study area.
 - viii. Soil Characteristic as per CPCB guidelines.
 - ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.
 - x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.
 - xi. Socio-economic status of the study area.

**STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR
PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE**

7) Impact and Environment Management Plan

- i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.
- ii. Water Quality modelling - in case of discharge in water body
- iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyer-cum-rail transport shall be examined.
- iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.
- v. Details of stack emission and action plan for control of emissions to meet standards.
- vi. Measures for fugitive emission control
- vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.
- viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.
- ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.
- x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.
- xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.
- xii. Action plan for post-project environmental monitoring shall be submitted.

**STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/
ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE**

- xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.
- 8) Occupational health
 - i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers
 - ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.
 - iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,
 - iv. Annual report of health status of workers with special reference to Occupational Health and Safety.
- 9) Corporate Environment Policy
 - i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.
 - ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.
 - iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.
 - iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report
- 10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.
- 11) Enterprise Social Commitment (ESC)
 - i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise

**STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR
PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE**

Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

- 12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.
- 13) A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCE FOR EIA STUDIES FOR SUGAR INDUSTRY

1. Complete process flow diagram describing each unit, its processes and operation in production of sugar, along with material and energy inputs and outputs (material and energy balance).
2. Details on water balance including quantity of effluent generated, recycled & reused. Effort to minimize effluent is charge and to maintain quality of receiving water body.
3. Details of effluent treatment plant, inlet and treated water quality with specific efficiency of each treatment unit in reduction in respect to fall concerned / regulated environmental parameters.
4. Number of working days of the sugar production unit.
5. Details of the use of steam from the boiler.
6. Details of proposed source-specific pollution control schemes and equipments to meet the national standards.
7. Collection, storage, handling and transportation of molasses,
8. Collection, storage and handling of bagasse and press mud.
9. Flyash management plan for coal based and bagasse and action plan
10. Details on water quality parameters such as Temperature, Colour, pH, BOD, COD, Total Kjeldhal Nitrogen, Phosphates, Oil & Grease, Total Suspended Solids, Total Coli form bacteria etc.
11. Details on existing ambient air quality and expected, stack and fugitive emissions for PM10, PM2.5, SO2*, NOx*, etc., and evaluation of the adequacy of the proposed pollution control devices to meet standards for point sources and to meet AAQ standards. (*-As applicable)

ANNEXURE VII

Site Specific Technological Data at Shree Datta Shetakari Sahakari Sakhar

Karkhana

Month	Year	Mean Daily Maximum Temperature(o°c)	Mean Daily Minimum Temperature(o°c)	Relative Humidity		Rainfall (mm)
				(8:30AM)	(17:30PM)	
March	2016	35.50	15.80	65	27	Nil
April	2016	34.50	16.20	69	37	Nil
May	2016	37.60	22.50	71	48	Nil

Note: Wind direction is dominantly from E.

WindRose Digrams are as per “Aermod Version 7.4”

ANNEXURE VIII