Chapter 1

Introduction

1.1 Municipal Solid Waste (MSW) management is one of the essential services for maintaining quality of life in urban areas and for ensuring better standards of health and sanitation. Presently, this service falls short of the desired level, as systems adopted are not up to the level for processing and disposal of waste. Institutional weakness, shortage of human and financial resources, improper choice of technology, inadequate coverage and lack of short and long term planning are responsible for the inadequacy of service.

For maximum efficiency and effectiveness of this service, it is necessary to tackle this problem systematically and as per the guidelines of MSW rules 2000 analysing the present scenario of the MSW management and come forward with a cost effective system which ensures adequate level of MSW management services to all class of citizens.

The system will include transportation, processing and engineered disposal of wastes in an environmentally acceptable manner in accordance with the Municipal Solid Wastes (Management and Handling) Rules, 2000.

Growth and development of economy triggers expansion in urbanization. This often induces migration of population from rural & semi urban areas to big towns and cities. Unless a proper planning is undertaken well ahead of time, the uncontrolled growth in urbanization can strain municipal infrastructures like water supply, sewage and solid waste disposal resulting in deterioration of environment and public health..

Like most urban cities Greater Noida town is facing these problems. In India, it is now mandatory for all urban and local bodies to comply with the 'Municipal Solid Waste Management & Handling Rules, 2000'. Municipal Solid Waste Management (MSWM) includes all activities that seek to minimize the health, environmental and Aesthetic impacts of solid wastes.

1.2 Proposed Plan of Action

In order to implement an integrated approach to Solid Waste Management Practices in Greater Noida it is necessary to undertake a study of the existing scenario and plan a strategy for processing and disposal of solid waste keeping in view the economic, environmental, social and institutional dimensions. Greater Noida authority conducted a comprehensive study, carried out the waste quantification and quality surveys in order to prepare a comprehensive integrated solid waste management system for the city.

1.3 BACKGROUND

Municipal Solid Waste (MSW) is commercial and residential waste commonly generated from a community. Materials are considered "waste" when they exhaust their useful life and cause nuisance to aesthetic and environment. Improper disposal of trash material may cause and spread disease by harboring pathogenic microbes and disease vectors such as flies, mosquitoes, rodents, and animals and even by attracting destitute and rag pickers. They can also contaminate land and/ or water and may emit foul odor. Recurrence of diseases like gastroenteritis, cholera, jaundice, plague, etc. is a consequence of unsanitary conditions due to unhygienic disposal of wastes.

As per the Municipal council Acts governing Urban Local Bodies (ULBs) in India, solid waste management, which is a part of conservancy, is an obligatory function for a local body. All wastes are solely the property of local urban bodies and it is their responsibility to clear, transport and disposes them off in an environmentally sound manner. It is one of the most important services provided to the citizens by the local body. Generally, almost one third of the total municipal staff is employed for solid waste management. It is only recently that non-governmental organizations (NGOs) have started involving themselves into this field and various innovative practices adopted by them have succeeded either within their own framework or with little help from the local bodies.

For the purpose of solid waste management, it is important to look into the properties of the waste material apart from their origin. Accordingly, they may be classified as:

- Biodegradable: Organic material, which can be degraded by Biological agents, e.g., microbes are known as biodegradable. Examples are food material, fruit and vegetable waste, garden waste (plant waste) etc.

- Recyclables: The waste component that can be transformed into new products in such a manner that the original products lose their identity, example are glass, paper, card board, aluminium cans, and rags etc.

1.4 COMPONENTS OF SOLID WASTE MANAGEMENT

Solid Waste Management (SWM) practices has broadly following

Components:

- Storage of Waste at Source
- Segregation of Waste at Source
- Primary Collection of Waste
- Temporary Storage of Waste
- Transportation of Waste
- Treatment of Waste and / or
- Safe Disposal of Waste at sanitary land filled

A clear understanding of each of these is necessary for a really effective Solid Waste management.

As per Manual on Municipal Solid Waste Management (First Edition, 2000) Govt. of India, functional elements and proposed system of solid waste management are as under:

1.5 WASTE GENERATION:

Waste Generation encompasses activities in which material are identified as no longer being of value (in their present form) and are either thrown away or gathered together for disposal. Reduction of waste at source, although not controlled by solid waste management is now included in system evaluation as a method of limiting the quantity of waste generated. In this scheme reduction management at source is not considered, keeping in view the mixed status of families ranging from slums to high – income group. This aims to create awareness among all the categories of the people.

1.6 WASTE HANDLING, SORTING, STORAGE, AND PROCESSING AT THE SOURCE:

Waste handling and sorting involves the activities associated with management of wastes until they are placed in storage containers for collection. Handling also encompasses the movement of loaded containers to the point of collection. Sorting of waste components is an important step in handling and storage of solid waste at the source. For example the best place to separate waste materials for reuse and recycling is the source of generation. Households are becoming more aware of the importance of separating newspaper and cardboard, bottles/glass, kitchen waste and ferrous and non-ferrous materials.

1.7 COLLECTION:

The functional element of collection includes not only gathering of solid waste and recyclable materials, but also to transport these materials, after collection, to the location where the collection vehicle is emptied. This location may be material processing facility, a transfer station, or a landfill disposal site.

1.8 SORTING, PROCESSING AND TRANSFORMATION OF SOLID WASTE:

The recovery of sorted materials, processing of solid waste and transformation of solid waste that occurs primarily in locations away from the source of waste generation are encompassed by this functional element. Sorting of commingled (mixed) waste usually occurs at material recovery facility, transfer station, combustion facilities, and disposal sites. Sorting often includes the separation of bulky items, separation of waste components by size using screens, manual separation of waste components, and separation of ferrous and non – ferrous metals.

Waste processing is undertaken to recover conversion products and energy. The organic fraction of MSW can be transformed by a variety of biological and thermal processes. The most commonly used biological transformation process is aerobic composting. The most commonly used thermal transformation process is incineration.

Waste transformation is undertaken to reduce the volume, weight, size and toxicity of waste without resources recovery. Transformation may be done by a variety of mechanical equipment's (e.g. shredding), thermal (e.g. incineration without energy recovery) or chemical (e.g. encapsulation) techniques.

1.9 TRANSFERS AND TRANSPORT:

The functional elements of transfer and transport involves two steps

(i) The transfer of waste form a smaller collection vehicle to a larger transport Equipment.

(ii) The subsequent transport of the waste, usually over long distance, to a Processing or disposal site.

1.10 DISPOSAL:

The final functional element in the solid waste management system is disposal. Today the disposal of waste by land filling or uncontrolled dumping is the ultimate fate of all solid wastes, whether they are residential wastes collected and transported directly to a landfill site, residual materials from Materials Recovery Facilities (MRFs), residue from the combustion of solid waste, rejects of composting, or other substances from various solid waste processing facilities. A municipal solid waste landfill is an engineered facility used for disposing of solid waste on land or within the earth's mantle without creating nuisance or hazard to public health or safety, such as breeding of rodents and contamination of ground water.

1.11 Objectives / Scope of DPR

The present DPR is an attempt to address various issues faced by Greater Noida authority for processing and disposal of waste in an integrated and practical manner.

Greater Noida authority is planning to implement various elements of the findings in an integrated and sustainable manner through Public Private Partnership (PPP).

The Objective of preparation of DPR includes.

I. Designing Mechanized refuse transfer station within the city area which will receive daily garbage collected by the private agency.

II. Designing Mechanized transfer station which includes platform, RAMP, mechanized compaction units, Hoppers, vehicle parking area, vehicle workshop facilities, etc.

III. Developing a system of waste transportation from Refuse transfer station to the proposed waste processing and engineered sanitary landfill facilities using High capacity containers (20cu.mtr minimum) and High capacity hook lift system mounted on trucks.

IV. Designing municipal solid waste processing facilities and engineered sanitary landfills as per MSW rules 2000 including all required components of the facilities.

V. Promote processing of waste for deriving bio-organic fertilizer or any other products which will have resale value in the market thus by reducing the quantity of inerts going into the landfill,

VI. Ensuring that quantity of waste going to landfills is minimal and ensure safe disposal of the inert reaching the landfill.

VII. Designing leachate treatment plant to ensure treatment of leachate generated from MSW and related components.

VIII. Promote public private partnership in MSW thus by promoting sale of maximum products derived waste processing.

IX. Effecting cost recovery.

1.12 The Scope of Work for preparation of DPR is mentioned below:

Proposed project period - 25 years

I. Allocation of Minimum 2 Acre land within city area for setting up of Mechanized Refuse Transfer station with compaction Units

II. Design, Erection of concrete platform with RAMP for garbage collection vehicles to empty the garbage in the hopper of compaction units.

III. Complete civil work at transfer station land including site levelling, concreting, Concrete platform of height 4.5 Mtrs, RAMP for vehicle entry & exit, Boundary walls, vehicle parking & washing area, workshop facilities, Administration and site office, security cabin, approach road etc.

IV. Design & Erection of minimum 20 cu.mtr Hopper above the compaction units using MS steel sheets & angles

V. Supply, mounting of mechanized compaction units of reputed make - Minimum 2 Nos. (1 operational and 1 standby)

VI. Electrification for operation of machineries, required lights, including provision of required capacity diesel generator

VII. Design, fabrication & supply of high capacity refuse containers of MS sheet with a minimum capacity of 20cu.mtr for storage & transfer of daily garbage from transfer station to processing & disposal site.

VIII. Design, fabrication & supply of High capacity hook lift mounted on trucks for transportation of containers from transfer station to processing & disposal site

IX. Design lay out of proposed waste processing facilities & engineered sanitary landfill as per MSW rules 2000 which includes the following;

A. Approach Roads
B. Weigh Bridge facilities
C. Boundary walls (civil where ever required and fencing where ever required)
D. CCTV facilities
E. Waste receiving area
F. Material Recovery Facilities (Manual or Mechanical)
G. Waste to compost plant
H. Waste to RDF plant (Optional)
I. Engineered sanitary landfills

J. Internal Roads

K. Leachate treatment Plant

L. Horticulture & landscaping

M. Product storage area

N. Shed area for composting facilities

O. Workshop facilities

P. Administration office

Q. Electrification

R. Laboratory

X. Preparation of Bill of Quantities (BOQs).

XI. Preparation of Detailed Cost Estimates.

XII. Preparation of Implementation Plan.

Chapter 2

CITY PROFILE OF GREATER NOIDA

1 Introduction

Greater Noida is located in district gautam budh nagar, uttar Pradesh at a distance of 16 km from Delhi. It is situated at latitude of about 28”30` north and Longitude of 77”30` east and is adjacent to and west of northern railway line (Delhihowrah).The vicinity of Delhi makes this industrial area more important.

2 Locations

Greater Noida is located in close proximity to three industrial townships:meerut(75km),ghaziabad(25km) & Faridabad(55km).It is easily approachable from Delhi by road& also from dadri,ghaziabad,sikandarabad and Other towns of u.p. on the east. The notified area of Greater Noida comprising of 124 villages and about 40,000 ha. of area bounded is broadly bounded by NH-24 in the NW,river Hindon in the western side & G.T.Road / Northern Railway main line to Calcutta on the eastern side.It is abutting the areas of Noida on its western side and Ghaziabad on the northern side.For industrialists, the markets are next door and for residents it is a green haven with up-to-date social & civic amenities in a pollution free environment.

3 Background

According to Master Plan 2021 the population considered for first phase (2000-2011) is 7 lakh and for the second phase (2011-2021) it is 12 lakh .The populations of both phases includes the population of villages falling in urbanisable area. Planning is for the city having comparatively low population density and more open spaces.so, density assumed for two phases of development is60 ppha as per the existing provisions for town density. Present gross density of the city is also nearly 60 ppha. Total population projected for first phase =7 lakh. Total area proposed for first phase =7,00,000/60 =11,666.60 ha. say 12,000 ha. Population projected for second phase =12,00,000
Assuming same density for second phase, total area proposed =12,00,000/60 =20,000 HA.

4 Factors for Urbanisation:

The city is a result of intense pressure on national capital of Delhi on its periphery.
Just outside the area of Noida, the pressure for development around Delhi & DMA started manifesting in the form of haphazard growth by colonizers and speculative land dealings in the area. The Govt. of U.P. notified area under" u.p. regulations of building operations act,1958" on
19th sept., 1989, under "U.P. Industrial Area Development Act, 1976".The Govt. of U.P. vide notification dated 28th Jan. 1991 constituted "Greater Noida Industrial Development Authoroty".The first Master Plan was prepared by authority in 1992 from S.P.A. as a consultant.The plan was for 5 lakh population and was then revised in NCR Plan context in 1996 as Outline Development Plan 2001 for Surajpur-Kasna sub regional centers.

5 Life in Greater Noida

The demographics of Greater Noida, mainly consists of students, corporates and labour class workers. Students are mostly temporary residents who come mostly from other parts of Uttar Pradesh, but in some cases from faraway places of India, and abroad. This is owing to the large number of colleges in this region.

Landmarks

- Sharda University
- Noida University
- Gautam Buddha University
- BIMTECH
- India Expo Center, a vast exhibition and conference center
- Indian Grand Prix Formula One circuit
- Jaypee Greens golf course
- Parichowk

Industry

Greater Noida is home to numerous companies

- Alstom
- BPCL R&D centre
- Asian Paints
- Daewoo Motors
- Delphi automotive
- Honda Siel Cars India
- New Holland Tractors
- NTPC Dadri
- Yamaha Motors
- Minda Corporation Limited [5]
- i3 Consulting
- Sharda Motor Industries ltd. (Kaushal Bhati---HR Department)
- HiGlance Laboratoires Pvt. Ltd.

IT & Biotech

There are various IT and Biotech companies in the area.[4]

- NIIT
- Wipro Technologies
- Yashoda Hospital & Research Centre
- HCL Technologies
- LG Electronics
- Moser Baer
- Samsung Electronics
- STMicroelectronics
- C&S Efacec MV India Pvt ltd

Hospitals

- Kailash Hospital

- ITS Dental Hospital
- Sharda Hospital
- Shashi Dental Care,B-104 Alpha 1
- Yatarth Hospital Near Sector P-3
- Sehdev Hospital Nead Sector P-3

Schools

Greater Noida is home to many good schools, engineering, medical and management colleges.

- Pragyan School
- RPS International School
- Appejay International School
- Delhi public school
- Ram-eesh International School (RIS)
- Somerville school
- Ryan International School
- Oxford Green Public School
- B.S. Public school Ladpura
- Lord Krishna Public School
- Ascent International School
- JP International School
- Daffodil Public School
- Ryan International
- Vishwa Bharti Public School

Engineering Colleges

- Priyadarshini college of computer sciences.
- Skyline Institute of Engineering & Technology.
- College of Engineering and Technology-IILM-AHL (CET-IILM-AHL)Website
- ITS college of engineering
- IEC College of Engineering
- Alpine College of Engineering Website
- Galgotias College of Engineering and Technology
- G.L.Bajaj Institute of Technology and Management (GLBITM)
- Greater Noida Institute of Technology
- Noida Institute of Engineering and Technology
- United College of Engineering & Research

Management Schools

- NIILM CMS
- Indus World School of Business (IWSB)
- INDUS BUSINESS ACADEMY GREATER NOIDA
- "GNIT COLLEGE OF MANAGEMENT A PART OF GNIT GROUP OF COLLEGES"
- Harlal Institute of Management and Technology (Previously Harward Institute of Management and Technology) HIMT
- LLOYD BUSINESS SCHOOL [6]

- IILM CMS
- Noida University - School of Business Management
- Galgotias Institute of Management & Technology(G.I.M.T.)
- KCC Institute of Management
- BIMTECH
- Accurate Institute of Management and Technology
- Business School of Delhi
- IILM GSM
- Ishan institute of management (iim)
- mangalmay institute of management and technology
- accurate institute of management and technology(AIMT)
- sharda university

Societies in Greater Noida

- iHOMZ Noida
- Gharonda Housing Society, GH06, Alpha I (Abhishek Maurya) 700m from Pari Chowk
- Silver City II 3 km from Pari Chowk
- Sports City 15 km from Pari Chowk
- Ansal Megapolis 6 km from Pari Chowk
- Black Gold Society 2.0 km from Pari Chowk
- Parsvnath Platinum 2.5 km from Pari Chowk
- Parsvnath Edens 3 km from Pari Chowk
- Parsvnath Privilege 3 km from Pari Chowk
- Eldeco Green Meadows 3.5 km from Pari Chowk
- Eldeco Residency Green
- Eldeco Citadel 3.5 km from Pari Chowk
- ATS 4 km from Pari Chowk
- Unitech Verve 4.5 km from Pari Chowk
- Unitech Cascade 4.5 km from Pari Chowk
- Unitech Habitat 4.5 km from Pari Chowk
- Unitech Horizon 4.5 km from Pari Chowk
- NRI City Near Pari Chowk
- [Designarch E Homes]5 km from pari chowk
- Eldeco Golf View Apartments Sector Omega-1
- Satilila Society- The Grand Forte- Sigma 4– 6 km from Pari Chowk
- VrindaCity 4 km from Pari Chowk
- Anand Ashray 4 km from Pari Chowk
- Black Gold
- Himprasth Society (I.T.B.P)
- Jalvayu Vihar 4.5 km from Pari Chowk
- Prahari Vihar
- AWHO 4.5 km from Pari Chowk
- Harmukh Society 500 m from Pari Chowk
- Senior Citizen 4.5 km from Pari Chowk
- Greenwoods
- Assotech Springfields
- Silver City -II, 3 km from Pari Chowk, Opposite WIPRO SEZ

Hotels in Greater Noida

5-star hotels include: Radisson

Shopping Arcades

- The Grand Venezia - 1.2 km from Pari-Chowk near Golf Course
- Omaxe Connaught Place - 5 km north of Pari-Chowk
- Kasana tower alpha commercial belt
- Central market beta 2nd by bhati brothers
- Ansal Plaza

A modern mall with the following utilities

- Multiplex - Reliance Big Cinemas.
- Chroma - electronic store.
- Various fast food and family restaurants like McDonalds, Pizza Hut,Dominos
- Reliance Retail Shop
- Lilliput Kidswear
- KFC
- CCD
- Jagat Farm
- Beta-2 Market

ALPHA 2 MARKET It is located in the center of Greater Noida and has the following offices:

- HDFC
- ICICI
- Honey Money Top - A high-end retail store
- Many property dealer offices
- Pizza Hut

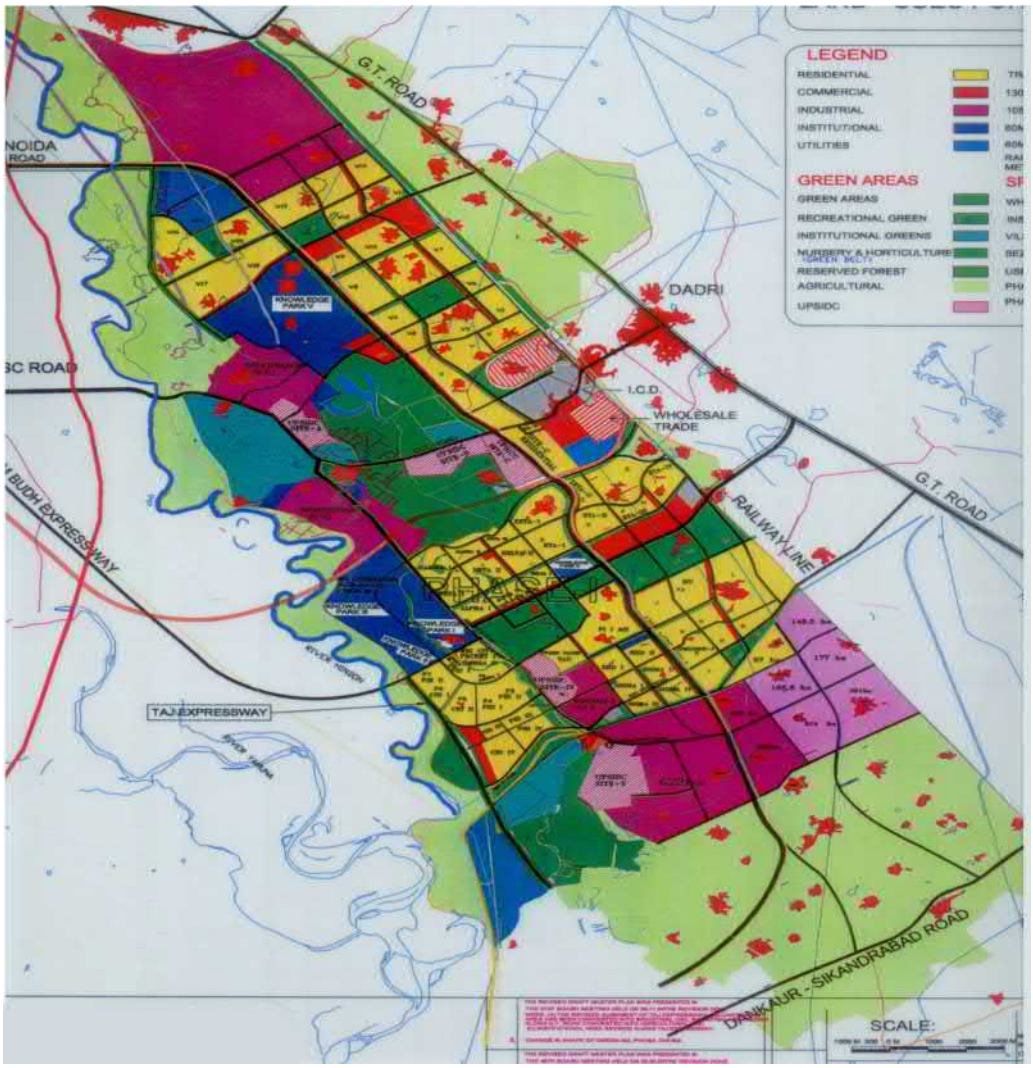
Land Use Projections:

Table 1: Land Use Distribution

LAND USE	*2001 (Ha)*	*% age*	*2011 (Ha)*	*% age*	*2021 (Ha)*	*% age*
RES.	1310	25.8	3000	25	5000	25
INDS.	1596.96	31.5	2600	21.5	3800	19
COMM.	99.74	2	720	6	1200	6
INST.	570.63	11.2	1400	11.7	2400	12
GREEN	1361.9	26.8	3000	25	5000	25
TRANS.	137.32	2.7	1280	10.6	2600	13
TOTAL	5075	100	12000	100	20000	100

-area earmarked for special economic zone 1000 ha
-area earmarked for regional level institutions 570 ha
-area earmarked for cantonment 1600 ha.

Greater Noida Map – Current and proposed Land Use



6 Population and Land Use

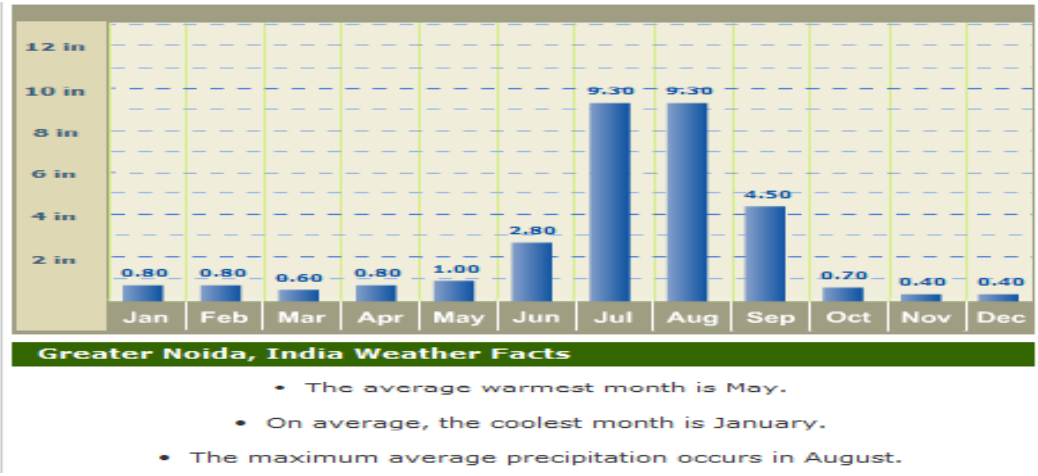
With an expected population of 3 lakhs up to 2001, 7 lakhs up to 2011 and 12 lakhs up to 2021, Greater Noida City has been designed for planned growth to ensure supply will always exceed demand

Land use breakup of Outline Development Plan year 2021 for Projected urban population of 12 Lakhs. The authority envisions an integrated town planning with care to small details and contingencies the land usage is planned.

As a model of smart town planning, land has been appropriated for various activities as under:

Recreational	25%

Transportation	13%
Public and semi utilities	12%
Residential	25%
Commercial	6%
Industrial	19%



CHAPTER – 3

THE PRESENT SCENARIO OF MSW MANAGEMENT PRACTICES IN THE CITY

&

EXECUTIVE SUMMARY OF THE PROPOSED PROJECT

Present Scenario

A waste generation study has been conducted by GNIDA in order to study the current scenario of solid waste management. It has been found that Solid waste management at Greater Noida has been designed on the basis of 'segregation at source', segregating biodegradable and non-degradable at source only. Presently Solid Waste collection and Mechanical Sweeping of the city has already been privatized and is being successfully executed by the privatized firm however due to lack of a designated dumping ground the

private companies are facing agitation time and again from the locals and thus it has become nearly impossible to meet the desired results as per MSW rules 2000. Hence taking into consideration the present scenario as well as future aspects with regards to processing of waste there is an urgent need of setting up an engineered sanitary landfill such that the waste is not only disposed but also segregated and processed in order to ensure minimal effect on land, water and habitation.

EXECUTIVE SUMMARY OF THE PROPOSED PROJECT

SALIENT FEATURE OF PROJECT

The Salient features of the project for processing & disposal of MSW at proposed site in village Astauli are provided below:

- Land area: 50 acres
- MSW processing and disposal capacity 150 TPD
- Source of water: Ground Water

SITE LOCATION & DESCRIPTION

The site has been identified by Greater Noida Industrial Development Authority (GNIDA) as potential site for the development MSW management facility in village Astauli.. The' salient features of the site in village Astauli are as given below:

- Geographically proposed site is located at 28° 22' 80" N latitude and 77° 40' 28" longitude. The proposed site is approx 22 kms from Greater Noida township.'

- The Site is 2.5 km away" from the" main Kasna-Sikandrabad Road. Dankaur Railway Station) and Railway line crossing.

- The proposed site can be approached by a paved road connecting Greater Noida and Kasna-Dankaur Railway Station. A small road bifurcating just near the railway *I* road crossing and going parallel to' the railway line leads to the site. The proposed site lies across the Hirnauti Drain cum nala forming the south east corner of the site.

- The site is bounded by village chak road by two sides i.e. north eastern side by a cart track road from village Astauli to Makrandpur'(Fatehpur) and south eastern side by another.

- Nearest township is Dankaur Rly Station about 2.5 kms from the site. Road along the railway' track is under construction.

- No human settlement is marked within 500 meters from the site.

- The Proposed site lies at the outskirts of Village Astauli beyond 500 m distance.

- The ground water is around 5m bgl at the proposed site.

- The proposed site is double cropped with intense agriculture activity having number of tube wells.

- A school playground is on the south of the proposed site.

ENVIRONMENTAL SETTING OF THE STUDY AREA

The baseline environmental status was assessed for 10 Km buffer zone around the proposed site in village Astauli. The study was based on primary and secondary data collected through on-site field observations and obtained from agencies such as Indian Meteorological Department, Geological Survey of India, State Ground Water Department, Census of India and Local Forest Department. The following environmental components were focused at during this study:

- Air Environment (Meteorology, Ambient Air Quality, Noise Levels, etc.)
- Water Environment (Quality and Quantity of Surface and Groundwater sources) .
- Land Environment (Geology, Hydrogeology, Land use)
- Ecological Environment (Terrestrial and Aquatic Flora & Fauna)
- Socio-Economic

The baseline status collated from analysis of secondary and primary data is summarized in the Table E-1 below.

Table E1: Baseline Status of proposed site in village astuli

Attribute	Baseline Status
Meteorology	Climate of the proposed site is characterized by a cold winter, hot summer· and general dryness except during south-west monsoon, when humidity is high. The relative humidity is higher in August (84.5%); while, July and September fluctuate from 75 to 80%. The mean monthly wind velocity is highest during June i.e 8.5 Km/hr. 'and lowest being during winter i.e in November about 4.0 Km/hr. The wind direction is easterly from June to September, while remain westerly from January and continues upto June: The site receives greater part of the annual rainfall between July and September accounting for about 90% of the annual rainfall. The annual rainfall for the year. 2002-03 is 917 mm and that for monsoon it is 857 mm.
Ambient Air Quality	Ambient air monitoring was carried at the proposed site between '15.08.08 to 23.08.08 for 24 hours, 3days.The pollutant concentration levels of NOx, S02, and RPM (PM10& SPM were measured. It was observed that the concentration levels of SPM & RPM, NOx and S02 were well within the prescribed limits.
Noise Levels	Noise monitoring was carried out at the site. The noises level monitored were within the prescribed limits for rural areas.
Water Quality	The assessment of water quality in the study area was done and compared with the drinking water standards prescribed by CPCB. There is only one surface water canal within the 10km buffer zone i.e Mat branch of upper Ganga Canal. Distance from the proposed site is about 1.2 Km. One sample of surface water was collected at the Dankaur Sikandrabad crossing. Nine groundwater samples were collected within buffer zone of 10 Km from proposed site including one from the site itself. The Physico-chemical parameters are well within the prescribed limits for the drinking water standards. The water quality with respect to almost all was observed t6 be of good and acceptable quality.

Ground water Availability	The aquifer in the area is composed of brownish soil mixed with loose sand. The average depth to groundwater is about 3 to 5m. Groundwater flow is towards south west
Physiographiy	Physiographic ally, the study area is a nearly level to very gently sloping fluvial plain of the river Yamuna and its tributaries: However, the proposed site is relatively a micro depression site.
Soil Quality	According to Soil Map of the study Area (NBSS & LUP, I. C.A. R., 1999), the soils of this zone are old alluvium and are highly productive. Soil order at proposed site is Alifsols, sub order Haplaquents (Older Alluvial soil). The proposed site is underlain by Alifsols, sub -classification Older Alluvial soils. To assess the baseline soil quality in the study region, ten soil samples were collected and analyzed at ten locations. Soil is found to be slightly alkaline. Iron content is in the range of 5000 - 9000 mg/kg. At the proposed site, Ni, Zn content is less than 10 mg/kg and Cu .is less than 0.01 mg/Kg. No Pesticide is detected in the soil: The depth of rock in the area is over about 100m,
Geology	The proposed site in Gautam Budh Nagar district is underlined by the alluvial deposits of Quaternary age. The alluvium sediments are made up of sequence of clay, silt and different grades of sand. At shallow depths kankars occurring as nodules are common.
Landuse / Cover	Land use in the 10 km radius area shows the dominance of Agriculture (90.4%) followed by built-up area (7%). The forest / jungles have very small coverage. The level II classification points out that the village area is dominant in built-up area. Similarly, double cropped area is a dominant in agriculture. (85.5%) Open forest, and waterlogged and marsh under wastelands are equally divided. Water bodies are few.
Seism tectonic appraisal	The proposed site at Greater Noida falls under Zone IV, Moderate hazard zone.

Socioeconomy	There are around 81 villages within 10 Km buffer zone around the proposed site in Village Astuali with a total population of 1,68,725 as per 2001 census. Agriculture is the dominant land use followed by built up area .. The economy of the area has shifted from agriculture to agro-industries, animal husbandry and industrial employment. However, age old wheat and rice rotation still holds a promise to the farmers. Textile, plastic and polythene products and automobile/tractor industries are common in the Greater Noida. A mix of food processing, households, drugs and electrical, breweries, leather, pharmaceuticals, fertilizer, paints, glassware, ceramics, pulp and paper industries are coming up along with the major industries.

AIR ENVIRONMENT

During the construction phase, operation of construction equipment's and vehicles will be the main sources of pollution. A dust control plan will be implemented and regular maintenance of vehicles and equipment will be carried out. During the operation phase, the main sources of pollution shall be emissions from fugitive dust and odor emissions from waste handling and processing and emissions due to vehicular movement. Adequate mitigation measures shall be implemented. Emissions from waste handling areas shall be controlled by provision of covered areas, proper ventilation. Herbicides will be sprayed to discourage further decomposition of MSW

NOISE ENVIRONMENT

During the construction phase , adequate imitative measures such as controlled time of construction , job rotation etc. Will be implemented Noise enclosures shall be provided wherever possible and workers shall be provided with earplugs

WATER ENVIRONMENT

Construction activities for the proposed development can have minor impact on hydrology and water quality of the area as the construction waste will not be leached into ground or any surface water body. During the operation phase, activities responsible for the impact on the ground/surface waters are, uncontrolled discharge of surface waters, leakage from the engineered

drainage systems, runoff from the raised landfill areas, deposition of air pollutants and removal of vegetated areas. During this phase, these activities may cause significant change in the ground or surface water quality.

LAND ENVIRONMENT

The proposed site is presently being used for agriculture purpose. Development of MSWP&DF at the proposed site will change the existing land use. The aesthetics of the area will be changed. However, green belt of 15 m wide around the periphery of project site would be developed creating overall positive impact on the aesthetics of the site.

SOCIO ECONOMIC ENVIRONMENT

The proposed project will lead to employment generation and will have a positive impact on the socio economic environment. Preference to local population shall be given .in employment opportunities. Adequate mitigation measures will be put in place or implemented to reduce odor emissions and disease vectors from proposed site.

EMERGENCY MANAGEMENT PLAN

For the effective & safe implementation of Municipal Waste Processing and Disposal project, it is important to identify associated safety hazards and carry out a basic risk assessment. An effective emergency management plan has been proposed as part of EIA report. This Emergency Management plan seeks:

- Critical aspects including safety culture, training and awareness relationships and training of contractor staff and many others.
- Safety measures, possibility of accidents either due to human errors and/ or due to equipment! system failure.

Disaster management and response plan to minimize the advance impacts due to an unfortunate incident and disaster Management aspects.

CHAPTER 4

Recommended system of transportation from transfer station to landfill

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Specifications of Transfer Station, Vehicles & Equipment's

The scope of the project is to "Design, Build, Operate, Maintain and Transfer of MSW from Mechanized Refuse Transfer Station to Landfill for segregation and processing. The Transfer Station shall be of Ramp type, containing hopper, static compactor and closed bulk container system.

Following facilities must be constructed and operated in the proposed

1. Mechanized Transfer Station:

a. **Refuse Transfer Station Compactors**

I. There needs to be one number of Refuse Transfer Station Compactor units to cater the load of at least 400 MT per day and design the transfer station accordingly.

II. In addition to this there needs to be one stand by Refuse Transfer Station compactor unit for use during maintenance/ failure of any of the operating units.

III. The proposed refuse transfer station compactor shall be capable of handling municipal solid waste garbage

IV. The compaction unit shall be the proven and established product of the principle manufacturer and shall be tested for relevant characteristics like cycle time, minimum and maximum pressure and pump capacity. The test certificates shall be produced prior to installation as well as after the test run before final commissioning of the units.

b. Container Handling Unit

I. The Transfer Station Compaction unit shall have hydraulically operated container handling unit to align the container & Refuse Transfer Station Compactor unit in proper position to avoid spillage of waste during compaction.

II. Container handling unit shall have arrangement for lifting the rear side guillotine type sliding door of the container using its hydraulic system.

III. The container handling unit shall be the proven and established product and shall be tested for relevant characteristics. The test certificates shall be produced prior to installation as well as after the test run before final commissioning of the units.

c. Weigh Bridge

I. The should be one weigh bridge, having capacity of not less than 40 MT and shall ensure that the weighment of outgoing vehicles shall not exceed "GVW – Gross Vehicular Weight" of the vehicle.

II. The weighbridge shall have minimum 4 load cells and digital interface; direct and print out type.

III. The main beam and the cross beam of each weigh bridge shall be of the size of ISMB – 500 & ISMB – 200 minimum respectively.

IV. Weighbridge shall be provided with separate lightening arrestor. Cables from load cells to cabin shall be in close conduit.

V. For installation of Weigh Bridge pit less foundation shall be provided.

VI. There should be a cabin having minimum horizontal dimensions of 10' x 15' near the weighbridge along with sitting arrangement for 5 persons. Services such as computer, air-conditioner, telephone, electrical power, drinking water and any other facility as per the prudent industrial practices shall be made available in this cabin.

VII. A separate record of the incoming vehicles, their arrival and departure time, weight of the refuse, nature of waste, and the region from where the waste is collected should be maintained

VIII. The should be an arrangement to spray disinfectant/ deodorant on vehicles leaving the transfer station after unloading the waste.

d. Computer System

I. There should be at least three computers with minimum two laser printers at the transfer station will all the necessary software's and hardware's. One computer at the weighing machine, one in the office and one for examining/ checking data shall be provided. The entire system shall be interconnected with LAN. Internet, e-mail, fax facility shall be at the transfer station.

e. Hopper and Feeder Arrangement

I. There needs to be mild steel hoppers at the transfer station having garbage holding capacity not less than 40 cu.m.

II. The hopper opening area at the top shall be designed in such a way that unloading of minimum two refuse vehicles at a time is possible.

III. The hopper shall be well supported by MS structure of appropriate size to take self-weight and weight of the garbage. The design and drawing for the structure shall conform to National / International Standards and the compliance certificates shall be submitted. The hopper and feeder arrangement shall be sand blasted and painted with epoxy paint.

IV. The hopper and feeder arrangement shall be maintained with regular painting and cleaning.

f. Container

I. A mild steel container of 25 cu.m Capacity (inside volume) and take 15 MT of load needs to be provided.

II. The container shall be made of high quality steel, with one coat of epoxy, spray painted from outside.

III. Upward sliding door (Guillotine type) arrangement to the container to fit the lifting arrangement of the container handling unit. The container shall have facilities in line with / beneficial to container handling unit.

IV. The design of the container shall be such a way so as to able the hook-lift vehicle to lift the same for transportation and shall have arrangement to lock to the hook lift vehicle during transportation.

V. The container shall have arrangement to collect Leachate formed during compaction and the same shall not spill on road during transportation.

VI. The container shall be painted with anti-corrosive paint from inside. The containers shall be painted from outside every 12 months. .

VII. All the containers shall be numbered for an identification and record purpose provided with Radio Frequency Identifier (RFID).

VIII. The materials used shall be as per IS standards and container drawings and designs shall be submitted for approval before commencing the fabrication work.

g. Hook – Lift Vehicle

IX. Adequate number of hook-lift brand new vehicles of reputed makes need to be provided after approval of Authority, having GVW not more than 25 MT. These vehicles shall be used for transportation of container with compacted refuse from the transfer station to the assigned landfill site.

X. The vehicles shall be diesel operated having power steering.

XI. The hook-lift installed shall have lifting capacity of minimum 15 Metric tonne (MT) with 10% safety factor with appropriate hook height, for ease of operation.

XII. The hook-lift vehicle shall have arrangement to secure loaded / unloaded container at the proper position during transportation and unloading of container at the landfill site for safety purpose.

XIII. The hook-lift vehicle shall be roadworthy all the time and certified by Regional Transport Authority (R.T.A), Greater Noida conforming to the rules of fuel or pollution control norms or other relevant modifications

i. Washing Facility

An arrangement shall be made for washing of hook-lift Vehicles, & containers at the transfer station.

j. Disinfectant and Odour Control

I. There shall be a system for odour control to neutralize foul, nauseating smell. Eco-friendly disinfectants shall be sprayed on all refuse vehicles, leaving the transfer stations.

II. The chemicals used for disinfections, Leachate treatment etc. shall be eco-friendly products preferably using essential oils and plant extracts and having deodorant properly, which shall be stable for at least 10 hours.

III. A working platform, of appropriate height needs to be provided near the exit gate for effective spraying of disinfectants / deodorants with the help of portable spray pumps on outgoing vehicles

k. Electric Supply

The electrical work and inter connections need to be set up of the best quality and the electrical goods used for the project shall be of ISI Standard.

GNIDA will issue No Objection Certificate to obtain electricity connection for the project.

l. Water Supply

All arrangements of water requirements of the project need to be made. There need to be sufficient water consumption lines and storage facilities which shall be maintained periodically in sound and hygienic manner..

GNIDA will issue No Objection Certificate to obtain water connection for the project.

m. Civil Works

I. A ramp of adequate size and length needs to be constructed at site.

II. Internal roads required for the transfer station also need to be constructed

III. An office of sufficient size for supervisory staff , as well as for owns staff on duty at the transfer station needs to be constructed.

IV. There need to be sufficient washing places and W.C. blocks for the operating staff and supervisory staff.

V. A rest room of appropriate size for ladies and gents separately needs to be constructed for running and operational staff of transfer station and municipal staff on duty.

VI. Construction of necessary storeroom of appropriate size for storage of spare parts, materials, and oils etc. needs to be completed for day-to-day maintenance of vehicles.

VII. A shed of appropriate size for day-to-day maintenance of hook-lift vehicles and containers needs to be constructed

n. Tools and Tackles

All the required tools and tackles for the operation and maintenance of the equipment's and vehicles at the transfer station need to be provided

o. Transporting of Solid Waste

The necessary closed container vehicles for transporting the solid waste collected at Refuse Transfer Station to the designated landfill site shall be provided

p. Others

I. Communication system / equipment's shall be provided so as to have effective communication between weigh bridge operator, floor attendant, static compactor operator and container handling unit operator.

II. Advisory / directional signboards shall be provided at all the necessary locations at the (Refuse Transfer Station) REFUSE TRANSFER STATION so as to avoid any ambiguity and confusion.

III. The entire REFUSE TRANSFER STATION shall be well equipped with fire prevention and safety system satisfying all the conditions, rules and regulations as recommended by the Chief Fire Officer. A certificate from the Chief Fire Officer shall be displayed in the REFUSE TRANSFER STATION office, and a copy of the same shall be submitted to Authority. At least one person in each shift, in each work area shall have completed basic training in fire fighting and it will form part of the duties of those persons.

IV. Small size plantations wherever possible inside the REFUSE TRANSFER STATION for better and clean environment shall be planned and implemented.

CHAPTER- 5

Landfill
Waste Processing

5.1 Introduction

Accelerated Aerobic Bioconversion Under Controlled Conditions:

This is the most practical, energy conserving and least cost technology option for recovery of value added organic fertiliser from the biomass. The technology is suitable for tropical, subtropical and arid climatic conditions.

The recovered products will be of special importance to conserve irrigation water/saline soils, improve the efficiency of chemical fertiliser and reduce incidence of insects and diseases in crop plants.

KEY FEATURES OF TECHNOLOGY:

1. Waste is sanitized with herbal extracts.
2. It is bio stabilised with enzymes.
3. Rapidly fermented in compressed time cycle.
4. MSW is processed through mechanical methods.
5. Various grades of compost are recovered for use under different soil/crop conditions as per requirement of Govt.
6. Over 90% organic waste which is main pollutant is utilised fully.
7. The natural carbon energy is put to use for further plant growth.
8. Space required as per details given table.

In the simplified design, which has become increasingly popular in India as per
MSW Rule 2000, the steps are as follows:

- Transportation of raw material / feed to the compost pad.
- Material and its deposit directly in the windrow area after inspection
- Stacking of the material in windrows, hand sorting of large items
- Regular turning of windrows (0-7 days interval) using front end loader or a skid steer loader
- Screening of the stabilized material after 35 days.
- Curing for further 21 days.
- Packing and Storage

- Removal and disposal of residual waste at the designated site.

5.2 Legal Compliances and Regulations

The 'Municipal Solid Waste (Management and Handling) Rules, 2000' has stipulated certain guidelines to bring about uniformity in practice and to minimize any environmental and health hazards from application of compost particularly to food crops. Accordingly, composting facilities should meet the following criteria:

- The incoming wastes at site will be maintained prior to further processing. To the extent possible, the waste storage area should be covered. If, such storage is done in an open area, it will be provided with impermeable base with facility for collection of leachate and surface water run-off (during rainfall) into lined drains leading to a leachate treatment and disposal facility.
- Necessary precautions will be taken to minimize nuisance of odour, flies, rodents, bird menace and fire hazard;

- In case of breakdown or maintenance of plant, waste intake will be stopped and arrangements be worked out.

- Pre-process and post-process rejects will be removed from the processing facility on regular basis and will not be allowed to pile at the site. Recyclables will be routed through appropriate vendors. The non-recyclables will be sent for well-designed landfill site.

- In case of compost plant, the windrow area will be provided with impermeable base. Such a base will be made of concrete or compacted clay, 50 cm thick, having permeability coefficient less than 10^{-7} cm/sec. The base will be provided with 1 to 2 per cent slope and circled by lined drains for collection of leachate or surface run-off.

- Ambient air quality monitoring will be regularly carried out particularly for checking odour nuisance at down-wind direction on the boundary of processing plant.

- In order to ensure safe application of compost, the following specifications for compost quality will be met:

Quality Standards of Compost Produced (as per MSW Rule, 2000)

Parameters	**Maximum Acceptable Concentration parts per million (p m)**	
	A	*B
Arsenic	10.00	20
Cadmium	5.00	20
Chromium	50.00	300
Copper	300.00	500
Lead	100.00	100
Mercury	0.15	10
Nickel	50.00	100
Zinc	1000.00	2500
C / N ratio	20-40	15-20
pH	5.5-8.5	6.5 to 7.5

Compost (final product) exceeding the above stated concentration limits should not be used for food crops. However, it may be utilized for purposes other than growing food crops.

Plant Components and Civil & Mechanical Requirements

5.4.1 Inspection

Inspection of the Fresh Garbage is required to ensure that only the specific constituents of the waste is received at the Composing Facility. This helps in production of the right quality Organic Manure. Furthermore, if the construction debris and inert are coming with the Garbage, they will be directed to sanitary landfill site without having to process them with rest of the garbage.

a. Weighing – Once visually inspected and found OK, the vehicle containing fresh garbage will be weighed. After unloading the garbage at the inspection platform, the same vehicle will be weighed again to record the quantity of fresh garbage received.

b. Inspection – The fresh garbage will be unloaded at the inspection platform and spread in the form of thin layers (not more than 250 mm). After inspection from an inspector, if the material is found not suitable for composting it will be reloaded and sent to the sanitary landfill. Material fit for composting is sprayed with deodorizer and sent to Sorting Station.

Civil Requirements

The approach to the inspection platform would have a proper gradient to allow easy movement of vehicles. Provision of reloading point is provided to facilitate easy reloading of rejected lot.

5.4.2 Pre-processing Section

Pre-processing Section is provided to remove large sized inorganic matter such as tyres, plastics, rubber, boxes etc. These materials occupy space and also retards the digestion process.

a. Sorting Station – Here manual sorting (CPHEEO Manual) objects such as recyclable tyres, boxes, plastics, glass, metals etc.

Civil Requirements

A RCC structure with 6m high platform is required for manual sorting. The floor must contain proper openings for dropping sorted material in collection bins.

5.4.3 Yard Management

Appropriate yard management is the first important step towards successful operation of compost plant.

a. Compost windrow Pad – It is a non-permeable concrete platform where Windrows of the waste are formed to accomplish composting process. Waste coming to the Compost Pad is sprayed with inoculums and water to accelerate the digestion process. This waste is then stacked in a form of Windrows. The cross section of the windrows is so adjusted that it would get optimum surface area to volume ratio.

b. Digestion – A windrow will be kept at the same place for 7 to 10 days and aerobic conditions will be maintained to aid in digestion process.

c. Turning – On every 7th day the windrow is turned to an adjacent location using backhoe unit. After two turnings sanitisation and decomposition phase of the fresh garbage is over. Every day there will be one windrow which requires shifting to Monsoon Shed and two windrows which requires turning .

Civil Requirements as per Design Parameters

Windrow pad: - An impervious concrete platform with proper gradient is required to accommodate fresh as well as digested garbage. The concrete platform is provided with peripheral drain of size* 0.3X0.3 m to collect the leachate and rainwater over flow.

5.4.4 Monsoon Shed

Material after digestion needs further stabilisation and lose of moisture so that it can be segregated in to different fractions. Also this shed protects feed material from rain. A monsoon shed to accommodate the last seven days waste on windrow.

Civil Requirements

A minimum 6 mtr high open shed covered with PPGI sheet roof. It enables lot of storage of the digested material, thus, allows operation of the plant during rainy season. The shed must be open from all sides for easy vehicle movement

5.4.5 Coarse Segregation Section

Waste coming from the monsoon shed is lumpy, heterogeneous and slightly moist. This section comprises of Trommel Screen which due to its cascading action helps loosening the lumps and screen the waste efficiently.

a. Trommel-30 – This is first screen in the section. It rejects the material having the overall size of more than 30 mm. Organic material which is by now digested, break down in to pieces and screen out of the Trommel . Screened material coming out of the Trommel contains mostly organic material and small size inorganic material. Rejection coming from Trommel Screen mainly consists of plastics, textile etc. The rejected material coming out of the Trommel Screen is discharged at an suitable height in order to facilitate material movement. Heap of the rejected material formed on the rejection yard will be removed periodically and can be sent to the Landfill.

b. Trommel-16 – This screen further segregate the material having the overall size more than 16 mm. Screened material coming out of this section is below 16mm, uniform in texture and contains semi – stabilised organic compost . This material is used for further processing in the refinement section but before that it is kept in the curing section for further stabilisation. Rejection from Trommel mainly consists of undigested organic matter and inert material .This material can be used as masks on the fresh garbage windrows. This masking prevents bird attraction and also assist in digestion process.

Civil Requirements

A RCC structure with minimum 6 mtr height PPGI roofing and concrete flooring is required for placement of coarse segregation equipment's. The building must be properly ventilated for sufficient light & air circulation. Proper side cuts are to be provided to allow removal of rejects off – line.

5.5.6 Curing Section

Material coming out of the coarse segregation section is semi-stabilised and it requires further stabilisation. Furthermore it contains certain amount of surface moisture which needs to be removed before refinement of the product.

Material coming out of the Coarse Segregation Section is conveyed through a series of conveyors and dropped at different locations in curing area. These conveyors are kept at a suitable height to allow heap formation below the drop point. These heaps are kept in the area for 35 days for further stabilisation and are occasionally stirred to provide aeration. The temperature within the heap may go up to as high as 65^0C, so moisture content of the material reduces and final refinement becomes easier. Here some quality enhancing additives like Rock Phosphate can be added to the material.

Civil Requirements

A RCC structure with minimum 6.0 m high PPGI roofing and concrete flooring is required for storage of material. The building must be properly ventilated for sufficient light & air circulation.

5.5.7 Refinement Section

Refinement section serves the purpose of final dressing of compost. Here we remove fine impurities as sand pebbles small glass etc. This section includes ;

a. Trommel Screen 6/4 - This Screen rejects the material with overall size more than 6-4 mm. Screened material coming out of the screen is sent ahead for further processing whereas rejected material which contains some undigested organic matter is sent to the Grinding section.
b. Gravity Separator - Screened material coming out of the Rotary Screen is sent to the gravity separator which removes the impurities such as glass, metals, sand, silica etc. from the organic manure.

5.5.8 Grinding Section

Grinding Section ensure recovery of material which is otherwise rejected from the Plant. Here undigested organic material are fractionised and re-added to the windrow for further digestion.

a. Grinding Section – Rejects containing organic matter can be passed through this section for recovery of useful material. Grinded material will be added to the curing section material and passed through the refinement section to recover Organic Compost.

Civil Requirements

A strong RCC structure with 6 m high floor is required for placement of grinding section equipment's. The structure must be properly designed for dynamic loads. Proper louvers must be provided to avoid dusty atmosphere.

5.5.9 Packing & Storage

a. Packing – High quality organic manure is passed through a packing spout and final packing of the product takes place. Material is packed in 50 kg bags and then weighed. Bags are then stitched using a portable sewing machine.

b. Storage – Packed material is finally stacked in the finished goods go down by using Pellet Trucks.

Civil Requirements

A RCC structure 6m high PPGI roofing is required for storage of finished goods. Proper louvers must be provided to have sufficient light and air circulation.

5.5.10 Testing Laboratory

To achieve efficient composting various process parameters must be periodically monitored so that they may be controlled in time. A well-equipped laboratory helps in in-house testing of parameters such as temperature, moisture, C:N Ratio etc.

The following equipment's are required for Laboratory set up

S. No.	Equipment	Qty.
i)	Kjeldahl's Apparatus	1 No.
ii)	pH Meter	1 No.
iii)	Weighing Balance (Digital - 300 Gm / 0.01 Gm)	1 No.
iv)	Oven (Electrical , 700 °C)	1 No.
v)	Water Distillation Unit	1 No.
vi)	Conical Flasks	1 Set
vii)	Volumetric Flasks (50 , 100 Ml)	1 Set
viii)	Measuring Cylinder (50 , 100 Ml)	1 Set
ix)	Burette	1 Set
x)	Pipettes (Volumetric & Gravimetric)	1 Set
xi)	Beakers	1 Set
xii)	China Dish	1 Set
xiii)	Stirrers	1 Set
xiv)	Chemicals & Reagents	1 Set

5.5.11 Other Miscellaneous Components

There are various other systems which are needed to be incorporated for trouble free working of the plant, e.g.

1. Internal roads

2. Green belt

3. Boundary wall

4. Open drains

5. Security and gate

Storage Go down:

For storage of finished goods in packed form an existing building, which was previously used as motor garage, is used. The area of building is sufficient for 60 Day material stock. Minor repair work is required for renovation on building

Leachate Drains & Tank:

For collection of Leachate and run – off water open peripheral drains are required which are present on compost pad. Some extension is required and one RCC Leachate collection tank is to be constructed for collection of all Leachate. The location of tank is so positioned so as to allow easy removal of excess Leachate from site.

Internal Roads:

New road developed according to plant layout Basic.

Green Belt:

To prevent air borne litter we need thick plantation. Some trees are there but more are required especially on side with residential colonies.

5.6.1 Yard Management Equipment

Table 5.6.1.1 Details of Machinery and Equipment

S. No.	Machinery & Equipment	Quantity	Details
1	**Yard Management**		
i)	Loader - Backhoe / Turning Equipment	1 No.	Turning of Windrow / Material shifting
ii)	Water Tank with slurry pump (30 KLD)	1 No.	For sprinkling of water & slurry on garbage and other activity
iii)	Front Wheel Loader (0.4 m^3)	2	For shifting , stacking & loading of material in different sections
iv)	Other Utilities like Sprayer, Wheel Barrows, etc.	Lump Sum	

Technical Details of Equipment's to be used for Compost Plant

Sr. No	Particular
1	**Prefeed Heating Device with conveyor**
	Spec. : Vertical centrifugal Drying machine . High Efficiency motor with Inverter system complete S.S. body and case. Minimum practional and no stringing. Virtually pulsation free (suitable designed) Capacity : 15 Tons per hour
2	**Auto Feed Conveyor with Vibro Feeder**
	Conveyor to Secondary Segregation :
	Belt width : min 60" (1500 mm) 5 set

	Conveyor Length	:	30 -50 Feet (recommended 50 feet)	
	Discharge Height	:	05 Feet	
	Carrying Idler	:	3 Roll Type	
	Return Idler	:	Single Roll , Flat Type	
	Drive Unit	:	5 HP, with Reduction Gear box	
3	**Screening Trommel**			
	A 2.0 m X 7.7 m Screen drum (or suitable designed for dia 4 feet to 10 feet and length 10 feet to 20 feet), generating a screen area of minium 15.4 m2 with a variable speed control,& 30 Nos. of 1380 mm x 1265 mm meshes with nylon brushes adjustable to ensure efficient clearing of the meshes. The tumbling action of the drum should break any dirt or loose particle for the material thus ensuring a much cleaner and solid oversize. A Feeder Motor and trommel drive Motor and suitable reduction gear Box shall be provided . (Refer general specification of Trommels).			
4	**Vibro Sieve**			
	A 2.8 mtr X 5.5 mtr Vibrating screen working on mechanical System, and a variable speed control. The Vibrating action of the machine breaks dust & segregates the fluff from the heavy material . With Feed motor & vibrator and suitable reduction Gear Box.			
5	**Trommel Feed conveyor :**			
	Belt width	:	min 36" (900 mm) 3 set	
	Conveyor Length	:	60 - 90 Feet (suitable designed)	
	Discharge Height	:	suitable designed from Ground Level	
	Carrying Idler	:	3 Roll Type , 30 Deg. Trough	
	Return Idler	:	Single Roll , Flat Type	
	Drive Unit	:	10 HP, with Suitable reduction Gear box	
6	**Vibro Feed Conveyor :**			
	Belt width	:	min 36" (900 mm) 3 set	
	Conveyor Length	:	60 - 90 Feet (suitable designed)	
	Discharge Height	:	suitable designed from Ground Level	
	Carrying Idler	:	3 Roll Type , 30 Deg. Trough	
	Return Idler	:	Single Roll , Flat Type	
	Drive Unit	:	10 HP, with Suitable reduction Gear box	
7	**Silo :**			

	Specification : S.S. make , 4 Feet x 4.5 Feet cone container of min 12 feet length with auto opening cover at top and bottom. Hydraulic piston to operate the Covers. Capacity : min 1 Ton Storage each			
8	**Conveyor to Silo**			
	Belt width	:	min 36" (900 mm) 3 set	
	Conveyor Length	:	50 - 75 Feet (recommended 65 feet)	
	Discharge Height	:	20 Feet (6.10 Mtrs.) From Ground Level	
	Carrying Idler	:	2 Roll Type , 20 Deg. Trough	
	Return Idler	:	Single Roll , Flat Type	
	Drive Unit	:	5 HP, with Reduction Gear box	
9	**Reject Conveyors (Line A & B)**			
	Belt width	:	min 36" (900 mm) 3 set	
	Conveyor Length	:	50 - 90 Feet (recommended 70 feet)	
	Discharge Height	:	20 Feet (6.10 Mtrs.) From Ground Level	
	Carrying Idler	:	2 Roll Type , 20 Deg. Trough	
	Return Idler	:	Single Roll , Flat Type	
	Drive Unit	:	5 HP, with Reduction Gear box	
10	**Drier Complete :**			
	A 3 stage rotary drier with heating capacity of 3 Tons / Hour, made from SS 316, suitable inlet & outlet of material with Hot air fan motor of 7.5 and 10 H.P Drive motor with suitable reduction gear box and temperature controller. Overall length 120 feet to 200 feet.			
11	**Conveyor to Bag Movements :**			
	Belt width	:	2 feet to 4 feet	
	Conveyor Length	:	50 feet to 75 feet	
	Discharge Height	:	As per Design	
	Carrying Idler	:	2 Roll Type , 20 Degree. Trough	
	Return Idler	:	Single Roll , Flat Type	
	Drive Unit	:	3 HP, with Suitable Gear box	
12	**Finish Conveyor**			
	Belt width	:	min 36" (900 mm) 3 set	
	Conveyor Length	:	15 - 30 Feet (recommended 25 feet)	
	Discharge Height	:	As per Design For Ground Level	
	Carrying Idler	:	2 Roll Type , 20 Deg. Trough	
	Return Idler	:	Single Roll , Flat Type	

	Drive Unit	:	5 HP, with Reduction Gear box
13	**Raw Material Deflector Conveyor (Line A & B)**		
	Belt width	:	min 36" (900 mm) 3 set
	Conveyor Length	:	60 - 90 Feet (recommended 70 feet)
	Discharge Height	:	As per Design For Ground Level
	Carrying Idler	:	2 Roll Type , 20 Deg. Trough
	Return Idler	:	Single Roll , Flat Type
	Drive Unit	:	5 HP, with Reduction Gear box
14	**Finish Material Deflector onveyor (Line A & B)**		
	Belt width	:	min 36" (900 mm) 3 set
	Conveyor Length	:	50 - 75 Feet (recommended 65 feet)
	Discharge Height	:	As per Design For Ground Level
	Carrying Idler	:	2 Roll Type , 20 Deg. Trough
	Return Idler	:	Single Roll , Flat Type
	Drive Unit	:	5 HP, with Reduction Gear box
15	**Finish Material Conveyor**		
	Belt width	:	min 36" (900 mm) 3 set
	Conveyor Length	:	100 - 150 Feet
	Discharge Height	:	As per Design For Ground Level
	Carrying Idler	:	2 Roll Type , 20 Deg. Trough
	Return Idler	:	Single Roll , Flat Type
	Drive Unit	:	5 HP, with Reduction Gear box
16	**Plastic Separator :**		
	Space : Type : Blower + Air Denisty Type Capacity : 1 TPH Power : 15 HP		
17	**Bagging & Packing System :**		
	Space : Type : Auto Packing + Weight Capacity : 10 TPH or 200 Bags per day Power : 40 HP		
18	**Destoner :**		
	Space : Type : Pneumatic + Airdensity type Capacity : 5 TPH Power : 10 HP		

19	**Loader :**		
	Capacity	:	one cum bucket , 50 HP
20	**Innoculation Tanker**		
	5 to 10 KL Tanker with spraying system		
21	**Gantry Crane For Turning :**		
	Technical specification for 10 Tones capacity Gantry Crane Type : 10 Tones Double Girder Gantry Crane. Capacity : 10 Tones. Span : 60 Feet between center to center of Rail Line Heigth of Lift : 7 Meters. Operation : Floor operated Location : out door Duty : Class II medium duty Crane Structure : MAIN GIRDER BOX : Girder to be fabricated from 4 mm , 5 mm 10 mm , plates suitable chamber shall be provided on the Griders to Compensate deflection maximum deflection.		
23	**Conveyor to Final Deduster A :**		
	Belt width	:	2 feet to 3 feet
	Conveyor Length	:	50 feet to 70 feet
	Discharge Height	:	suitable designed from Ground Level
	Carrying Idler	:	3 Roll Type , 20 Degree. Trough
	Return Idler	:	Single Roll , Flat Type
	Drive Unit	:	3 HP, with Suitable Gear box
24	**Conveyor to Final Deduster B :**		
	Belt width	:	2 feet to 3 feet
	Conveyor Length	:	50 feet to 70 feet
	Discharge Height	:	suitable designed from Ground Level
	Carrying Idler	:	3 Roll Type , 20 Degree. Trough
	Return Idler	:	Single Roll , Flat Type
	Drive Unit	:	3 HP, with Suitable Gear box
25	**Feed Drier System :**		
	3 stage heating drier each 120 feet to 150 feet		

	8, CHAMBERS Dryer, Each chamber having 5 H.P. X. 1440 RPM Electric Motor 2 nos coupled with centrifugal fan , vee Belt driven , chamber consists of insulated m.s pannel . Each fan connected with top bottom nozzles for hot air flow having mechanical driven conveyor with suitable electric drive motor coupled with reduction gear box & coal /wood/husk/ muncipal solid waste fired hot air generator having capacity 8 lakh coal/hr having grate area 4'X4' with furnace made from fire brick & insulted brick with suitable exhaust fan motor

Refuse Derived Fuel (RDF)

Pelletization of municipal solid waste involves the processes of segregating, crushing, mixing high and low heat value organic waste material and solidifying it to produce fuel pellets or briquettes, also referred to as Refuse Derived Fuel (RDF). It is a fuel produced by shredding and dehydrating municipal solid waste (MSW) in a converter. Therefore, the by-products of the compost plant are taken as the input to the RDF pellets manufacturing plant. The process is essentially a method that condenses the waste or changes its physical form and enriches its organic content through removal of inorganic materials and moisture. The calorific value of RDF pellets can be around 3000 to 4000 kcal/ kg depending upon the percentage of organic matter in the waste, additives and binder materials used in the process. ...

The process starts with the delivery of MSW to the plant by the garbage pick-up trucks to the waste processing facility. The raw waste is dropped on to a tip floor, with the overhead grapple operator moving any obvious hazardous or large materials to the side for either later use or disposal. The remaining materials are then moved to the incoming material hoppers, where they are transferred to transverse conveyors, which feed onto the incline conveyors, and subsequently to the manual sorting station. The materials are then passed through a trommel, where smaller items are screened and separated. Rest of the waste is passed through separators, screens and plastic removal systems to positively select those materials that are to either be used in the pellet or sold as recyclable product. The remaining materials that require disposal is stored until sufficient amounts are retained to send via truck to the selected landfill site. ...

During the pelletization process, eddy current separation and magnets are used in several locations to select both ferrous and non-ferrous materials for delivery to the recycling markets. The materials suitable for manufacture of fuel pellets are shredded, fiberized and stored in a silo. This stored material is then mixed with high BTU materials such as carpet waste, polyfilm etc and then pelletized and stored for sale and transportation to their final destination for use as an alternate fuel. Pellets can be stored on-site in bags or in bulk in interior bins or storage rooms, or in exterior storage silos. ...

Various qualities of fuel pellets can be produced, depending on the needs of the user or market. A high quality of RDF would possess a higher value for the heating value, and lower values for moisture and ash

contents. The quality of RDF is sufficient to warrant its consideration as a preferred type of fuel when solid waste is being considered for co-firing with coal or for firing alone in a boiler designed originally for firing coal. ...

Fly ash which is produced as by-product in the process is commonly used as an additive for brick manufacturing. A biological air filtration system is installed to ensure air exhaust within the MSW receiving and sorting section of the facility is cleaned prior to exhaust to atmosphere. Dust, odour and debris emissions are minimized in the process facility by maintaining a negative pressure in the tipping floor and pit area and continuously introducing fresh air. ...

Civil Requirements

A RCC structure 6 m high with PPGI roofing is required for placement of RDF related equipment's and storage of finished goods.

Technical Details of Equipment's to be used for RDF Plant

RDF PROC.& PELLETISATION SYSTEM					
Sr. No	**Particular**				
1	**Auto Feed Conveyor with Vibro Feeder**				
	Belt width		:	min 60" (1500 mm) 5 set	
	Conveyor Length		:	30-50 Feet (recommended 50 feet)	
	Discharge Height		:	05 Feet	
	Carrying Idler		:	3 Roll Type	
	Return Idler		:	Single Roll , Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
2	**Drier Feed Conveyor A & B**				
	Belt width		:	min 36" (900 mm) 3 set	
	Conveyor Length		:	60-90 Feet (recommended 70 feet)	
	Discharge Height		:	as per design From Ground Level.	
	Carrying Idler		:	2 Roll Type , 20 Deg. Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	

3	**Drier Feed Conveyor A & B**				
	Belt width		:	min 36" (900 mm) 3 set	
	Conveyor Length		:	50-70 Feet (recommended 60 feet)	
	Discharge Height		:	as per design From Ground Level.	
	Carrying Idler		:	2 Roll Type , 20 Deg. Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
4	**Destoner**				
	Space : Type		:	Pneumatic & Air density	
	Capacity		:	8 TPH (20 to 40 TPD)	
	Power		:	15 HP	
5	**Vibro sieve / Trommel:**				
	A 3 feet to 5 feet dia X 15 feet to 30 feet (Vibrating screen or				
	Trommel working on mechancial System , and a variable speed control				
	The Vibrating acction of the machine breaks dust & segregates the fluff				
	from the heavy material . With Feed motor & vibrator motor and suitable				
	reduction Gear Box.				
6	**Reject Conveyor A**				
	Belt width		:	min 36" (900 mm) 3 set	
	Conveyor Length		:	3-8 Feet (recommended 6 feet)	
	Discharge Height		:	as per design From Ground Level.	
	Carrying Idler		:	2 Roll Type , 20 Deg. Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
7	**Reject Conveyor B**				
	Belt width		:	min 36" (900 mm) 3 set	
	Conveyor Length		:	3-8 Feet (recommended 6 feet)	
	Discharge Height		:	as per design From Ground Level.	
	Carrying Idler		:	2 Roll Type , 20 Deg. Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	

8	**Drier Delivery Conveyor A**				
	Belt width		:	min 48" (1200 mm) 4 set	
	Conveyor Length		:	30-50 Feet (recommended 60 feet)	
	Discharge Height		:	as per design From Ground Level.	
	Carrying Idler		:	2 Roll Type , 20 Deg. Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
9	**Drier Delivery Conveyor B**				
	Belt width		:	min 36" (900 mm) 3 set	
	Conveyor Length		:	50-70 Feet (recommended 60 feet)	
	Discharge Height		:	as per design From Ground Level.	
	Carrying Idler		:	2 Roll Type , 20 Deg. Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
10	**Drier Delivery Conveyor C**				
	Belt width		:	min 36" (900 mm) 3 set	
	Conveyor Length		:	50-70 Feet (recommended 60 feet)	
	Discharge Height		:	as per design From Ground Level.	
	Carrying Idler		:	2 Roll Type , 20 Deg. Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
11	**Conveyor to Pre-Crusher**				
	Belt width		:	2 feet to 3 feet	
	Conveyor Length		:	50-70 Feet	
	Discharge Height		:	as per design From Ground Level.	
	Carrying Idler		:	3 Roll Type , 20 Deg. Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
12	**Primary Crusher :**				
	Space		:	Horizontal rotor type, Crushing size of 100 mm X 1300 mm, directly coupled with a Belt	

				driven motor,capable of crushing raw Municipal Solid waste.
	Capacity		:	5 TPH crushing
	Motor Cap		:	50-100 HP Capacity
13	**Conveyor to secondary Crusher :**			
	Belt width		:	2 feet to 4 feet
	Conveyor Length		:	50-75 Feet
	Discharge Height		:	as per design From Ground Level.
	Carrying Idler		:	3 Roll Type , 20 Deg. Through.
	Return Idler		:	Single Roll, Flat Type
	Drive Unit		:	5 HP, with Reduction Gear box
14	**Secondary Crusher :**			
	Space		:	Horizontal rotor type, Crushing size of 100 mm X 1300 mm, directly coupled with a Belt driven motor,capable of crushing raw Municipal Solid waste.
	Capacity		:	5 TPH crushing
	Motor Cap		:	30 HP
15	**Conveyer under Trommel**			
	Belt width		:	2 feet to 3 feet
	Conveyor Length		:	50-75 Feet
	Discharge Height		:	as per design From Ground Level.
	Carrying Idler		:	3 Roll Type , 20 Deg. Through.
	Return Idler		:	Single Roll, Flat Type
	Drive Unit		:	5 HP, with Reduction Gear box
16	**Conveyer for Trommel Feed**			
	Belt width		:	2 feet to 4 feet Length
	Conveyor Length		:	50-75 Feet
	Discharge Height		:	as per design From Ground Level.
	Carrying Idler		:	3 Roll Type , 20 Degree Through.
	Return Idler		:	Single Roll, Flat Type
	Drive Unit		:	5 HP, with Reduction Gear box
17	**Conveyer to Silo**			
	Belt width		:	2 feet to 3 feet Length

	Conveyor Length		:	60-90 Feet	
	Discharge Height		:	suitable designed from Ground Level	
	Carrying Idler		:	3 Roll Type , 20 Degree Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
18	**Finish Conveyor to Godown A**				
	Belt width		:	2 feet to 3 feet Length	
	Conveyor Length		:	100-150 Feet	
	Discharge Height		:	suitable designed from Ground Level	
	Carrying Idler		:	3 Roll Type , 20 Degree Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
19	**Finish Conveyor to Godown B**				
	Belt width		:	2 feet to 3 feet Length	
	Conveyor Length		:	100-150 Feet	
	Discharge Height		:	suitable designed from Ground Level	
	Carrying Idler		:	3 Roll Type , 20 Degree Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
20	**Auto Feed Conveyor : Finish material**				
	Belt width		:	2 feet to 4 feet	
	Conveyor Length		:	50-75 Feet	
	Discharge Height		:	suitable designed from Ground Level	
	Carrying Idler		:	3 Roll Type , 20 Degree Through.	
	Return Idler		:	Single Roll, Flat Type	
	Drive Unit		:	5 HP, with Reduction Gear box	
21	**Conveyor to Finish Drier A**				
	Belt width		:	2 feet to 3 feet	
	Conveyor Length		:	60-90 Feet	
	Discharge Height		:	suitable designed from Ground Level	
	Carrying Idler		:	3 Roll Type , 20 Degree Through.	

	Return Idler		:	Single Roll, Flat Type
	Drive Unit		:	5 HP, with Reduction Gear box
22	**Conveyor to Finish Drier B**			
	Belt width		:	2 feet to 3 feet
	Conveyor Length		:	60-90 Feet
	Discharge Height		:	suitable designed from Ground Level
	Carrying Idler		:	3 Roll Type , 20 Degree Through.
	Return Idler		:	Single Roll, Flat Type
	Drive Unit		:	5 HP, with Reduction Gear box
23	**Feed Drier System :**			
	3 stage heating drier each 120 feet to 150 feet			
	8, CHAMBERS Dryer, Each chamber having 5 H.P. X. 1440 RPM Electric Motor 2 nos coupled with centrifugal fan , vee Belt driven , chamber consists of insulated m.s pannel . Each fan connected with top bottom nozzles for hot air flow having mechanical driven conveyor with suitable electric drive motor coupled with reduction gear box & coal /wood/husk/ muncipal solid waste fired hot air generator having capacity 8 lakh coal/hr having grate area 4'X4' with furnace made from fire brick & insulted brick with suitable exhaust fan motor			
24	**Magnetic Separator**			
	Parmanent Over band magnetic separator foe belt conveying system. Belt width (Self cleaning type) : min 1000 mm Belt length : min 2000 mm : Operating height :500 mm electric magnetic field providing 2000 to 25000 gaus magnetic value & Capacity : 6 " to 12" deep magnetic power			
25	**Plastic Separator :**			
	Type : Blower + Air Denisty Type Capacity : 750 kgs per hour (5 to 10 TPD) Power : 10 to 15 HP Blower			
26	**<u>Silo</u> :**			
	Specification: S.S make , 4 feet x 4.5feet cone container of minimum 12 feet length with auto opening cover at top and bottom hydraulic piston to operate the covers. Capacity: min 1 tone storage each			

27	**Deduster :**			
	Belt width	:	4 feet to 8 feet	
	Conveyor Length	:	15 feet to 30 feet	
	Discharge Height	:	suitable designed from Ground Level	
	Carrying Idler	:	2 Roll Type , 15 Degree. Trough	
	Return Idler	:	Single Roll , Flat Type	
	Drive Unit	:	3 HP, with Suitable Gear box	
28	**Hopper : Suitably Designed**			
29	**Pelletisation / Bale Press Feed Conveyor**			
	Belt width	:	2 feet to 4 feet	
	Conveyor Length	:	50 - 100 Feet	
	Discharge Height	:	suitable designed from Ground Level	
	Carrying Idler	:	3 Roll Type , 20 Degree. Trough	
	Return Idler	:	Single Roll , Flat Type	
	Drive Unit	:	5 HP, with Suitable Gear box	
30	**Deduster to hopper conveyor A**			
	Dia of Trommel : 5 Feet to 10 Feet Trommel Length : 15 To 25 Feet Discharge Height : Suitable Designed From Ground Level			
31	**Deduster to hopper conveyor B**			
	Dia of Trommel : 5 Feet to 10 Feet Trommel Length : 15 To 25 Feet Discharge Height : Suitable Designed From Ground Level			

Waste-water Management

The wastewater generates from the compost & landfill is known as Leachate. In addition, the wastewater is also generated from Domestic sources and other sources (boiler blowdown, cooling-tower blowdown, treatment plants). Though only the inert are going to be disposed of in the landfill however, as a precautionary measure, the wastewater generated from the landfill operation will be taken to the Effluent Treatment Plant. Quantity of waste-water/leachate will be produced from Phases-I&II.

Waste water will be generated from the following sources:

- Leachate from Landfill. Though only the inert are going to be disposed of in the landfill however, as a precautionary measure, the wastewater generated from the landfill operation will be taken to the Effluent Treatment Plant.
- Leachate from compost windrows.
- Waste water from Domestic Demand.
- Waste water from Other usage

In order to provide effective treatment, a two stage biological treatment has been suggested for the leachate treatment. In the first stage anaerobic treatment system followed by aerobic treatment activated sludge process in extended mode has been provided. The leachate and other wastewater going to ETP of Phase-I has been estimated to be about 154.16 m3 per day. However, on the safer side, the Effluent Treatment Plant (ETP) for Phase-I has been designed.

PHASE – II:

Waste water will be generated from the following sources:

• Leachate from Landfill. Though only the ash is going to be disposed off in the landfill however, as a precautionary measure, the wastewater generated from the landfill operation will be taken to the Effluent Treatment Plant.

• Waste water from Water Treatment Plant.

• Waste water from RO/DM plant.

• Blow down water from Boiler & Cooling tower

• Waste water from Domestic Demand.

Similar to Phase - I, a two stage biological treatment has been suggested for the Effluent treatment. In the first stage anaerobic treatment system followed by aerobic treatment activated sludge process in extended mode has been provided. The disinfection will be carried out with the help of UV treatment.

CHAPTER 6

SANITARY LANDFILLING/ DISPOSAL

INTRODUCTION

Sanitary Land filling is a necessary component of solid waste management for the ultimate disposal of the rejects from resource recovery and recycling facilities as well as a repository for items which cannot be used in a viable manner for any other purpose taking care that the environment is not affected in an adverse manner. At the same time, landfill gas, containing methane, is generated, which can be used for harnessing energy in the form of heat or electrical power.

6.1.0 Approach and Methodology

The approach to the study is framed to meet the objective of preparing design and drawings, technical specifications and cost estimates of sanitary landfill for Greater Noida. The entire study is organised into the following stages.

6.1.1 Reconnaissance Survey

The proposed site for sanitary landfill development for disposal of municipal solid waste from Greater Noida was visited by the team comprising Landfill design engineers. The team carried out a rapid appraisal of the site and study of the site conditions. As a part of the reconnaissance survey related map from City Planning Department is also collected.

The reconnaissance survey is conducted mainly to prepare an appraisal for the proposed site and develop a concept plan for the landfill site. Reconnaissance survey was carried out before carrying out the work at the site. At present land is almost barren and no activities is being carried out at the land.

6.1.2 Development of Concept Plan

The basic requirement before detailed design of sanitary landfill is development of concept and finalising the lay out. The result of this task is evolution of footprint of the landfill for further design. The basic inputs for developing concept plan are reconnaissance survey carried out and discussions with the concerned authorities.

The concept plan, which represents the footprint of the landfill include, layout of the main deposit area, infrastructure, office space, washing facility for outgoing vehicles, shed for equipment, vehicle parking area, surface drainage, extraction and use of landfill gas, control of airborne litter and pollution control measures as per the MSW Rules 2000.

6.1.3 Assessment of Landfill Area Requirement

Based on the future waste generation trends and topographical survey results land requirements for disposal of Municipal Solid Waste would be assessed. The land required is also assessed for the unusable portion of the waste and rejects of the compost plant.

Landfill development is planned in two phases 1) 2010-2020 and 2) 2020-2030. The projections and land requirements are estimated and phase-I is designed on the basis of population of year 2020 and Phase-II is designed on the basis of population of year 2030.

6.1.4 Sanitary Landfill Design

Field investigation inputs as Central Public Health And Environmental Engineering Organisation CPHEEO guidelines as basis, design concepts for different components of landfill are developed under this task. Apart from CPHEEO guidelines other manuals

like EPA Design Manual on landfill design was also referred. The concepts are developed for each of the landfill component in line with stipulated guidelines.

Engineering Design and Performance Specifications

These tasks include preparation of detailed engineering design of sanitary landfill, drawings and development of operation and performance specifications. Various components that would be included in the engineering design are,

- Development of necessary scale and capacity of the facility based on the projected quantity and characteristics of the waste
- A recommended layout of the facilities including buffer zones will also be prepared
- Performance standard for different facilities would be developed
- Emission norms as stipulated by different guidelines for different environmental parameters with reference to mitigated measures
- A comprehensive monitoring system will be designed for performance evaluation of different units of sanitary landfill

Land Fill Design and Specification

As a part of this task basic design, construction and operation specifications for sanitary landfill in accordance with CPHEEO criteria and guidelines are developed.

This should include the following: -

- Development of grading plan (phasing of landfill facility) showing sequence of cell development over time, including the necessary earthwork to accomplish the same. This task shall also include cell closure and post-closure restoration
- Estimating and preparing drainage plans for the leachate and surface runoffs as a part of site development measures that minimise leachate generation
- Design of leachate collection and conveyance system, together with method for determining effectiveness of the system so as to ensure that the landfill will be functioning properly

- Designing system for disposal of leachate and surface runoffs, including likely drop inlets, piping, holding tanks and connection to the inlet / sumps of physical – chemical treatment system within main facility area
- Design of bottom liner system
- Recommending suitable construction techniques and materials
- Developing waste placement and handling plan
- Designing suitable cover system to minimise infiltration of surface runoff and check sub-surface contamination
- Estimation of landfill gas generation and detail plan for extraction and utilisation of landfill gas
- Designing monitoring well system
- Development of environmental monitoring plan
- Development of complete operation plan of sanitary landfill
- Design of closure, post closure plan and landscaping plan

Preparation of Site Layout and Access

Under this task a comprehensive site layout plan is prepared and the plan include,

- Developing a recommended site layout of storage, treatment and disposal facility including land occupied, floor area, plant layout, transportation, storage, power supply, water supply and sewage system
- Recommended suitable site access system

Design of Support Facility

Any landfill facility requires supporting facilities like maintenance building, unloading area, storage area, equipment, leachate treatment, etc. and this includes the development of specifications for support facilities.

- Preparation of conceptual design and performance specifications for all necessary

supporting facilities such as maintenance building, reception area, storage facility, etc.

- Determining the requirements of on-site packing, loading and storage facilities, any necessary treatment and disposal facilities for major waste generators

- Preparing equipment and vehicles list required for the operation of sanitary landfill

- Providing details on appropriate analytical methods, instruments and onsite laboratory facilities

6.1.5 Estimation of Capital Cost

Detailed cost estimation is one of the major tasks of the project. For this purpose different components of the sanitary landfill are identified and each component is again divided into sub-components for accurate and detailed cost estimates. The cost of each sub-component is worked out based on Schedule of Rates and BOQs for civil construction.

However the equipment and machinery cost are estimated based on available information. The cost of land proposed for the facility is not considered as the land is already acquired by Greater Noida.

The experience and cost estimates of the other similar facilities elsewhere in India is also considered and will form the basis for estimations.

6.1.6 Structure of the Report

The Draft Final Report entitled 'Design and Drawings for Sanitary Landfill for Greater Noida' is divided into five sections. The first section of the report presents the introduction and methodology & approach adopted for the study. The second section describes the profile of Greater Noida City and the existing situation of proposed landfill site.

The third section of the report discusses in detail the design concepts adopted for the design of the landfill and the forth section presents the comprehensive design and drawings of various components of the landfill complying MSW Rules, 2000. The fifth and final section discusses about the operational procedures for developing a scientific sanitary landfill.

CHAPTER 7

SOCIAL, HEALTH & ENVIRONMENTAL ASPECTS

Inefficient storage, collection, treatment and disposal of waste lead to pollution of ground, water and air which result in creation of breeding grounds for vectors, pasts, rodents, etc., causing public health problems. Proper planning for collection, transportation, treatment and disposal of solid waste is, therefore, extremely essential for the protection of environment and health and for the social wellbeing of the people.

The urban poor often residing in informal settlements and slums having very little access or no access to solid waste management services suffer the most on account of improper solid waste management services. Many slum dwellers live close to the landfills in several cities; but fortunately situation in Greater Noida is far better and does not require any rehabilitation of people.

The challenges of solid waste management will increase in next ten years on account of rapid growth of the city and its peripheral urban areas as well as per capita increase in waste generation. This calls for concerted efforts on the part of administration and all stakeholders to reduce, reuse and recycle the waste.

10.2 Control of communicable diseases.

House flies play an important role in the transmission of enteric infections which cause diarrhea and dysentery, disease transmission by house flies is common when waste is not properly handled and more so when it is allowed to decay without any preventive measures. Presence of human excreta in the waste emanating from the slums adds to the problem. All these problems will get mitigated by closure of the existing dumps and construction of the engineered landfill.

10.3. Contamination due to heavy metals.

Poorly operated disposal sites invariably contaminates ground water with nitrates, heavy metals and other chemicals besides it emanates oxides of sulfur and nitrogen in the air due to incineration of waste. Construction of engineered landfill and closure of the open dumps would substantially control the situation and stop further contamination of ground water and soil with heavy metals,

chemicals, etc.

10.4. Impact of poor solid waste management.

There are many negative impacts that result out of improper solid waste management which are listed below and which are planned to be minimized through improved solid waste management system in the city.

- Uncollected waste often ends up in drains causing blockages which result in flooding and in sanitary conditions.
- Files, breeds in some constituents of solids waste and they spread diseases.
- Mosquitoes breed in blocked drains and cause malaria, dengue, etc.
- Rats find shelter and food in waste dumps and they spread diseases.
- Open burning of waste causes air pollution.
- Aerosols and dusts can spread fungi and pathogens from uncollected waste.
- Uncollected waste degrades the urban environment and aesthetic of the city.
- Dangerous items like broken glass, needles, health care waste mixed with municipal solid waste pose risk of injury and consequent health problems.
- Several health care items find their way in municipal dumps get recycled without sterilization and cause infection and serious health problems.
- Polluted water i.e. leachate growing from the waste dumps contaminate ground water.
- Liquids and fumes emanate from unauthorized dumping of chemical waste at the dump site cause problems of health.
- Landfill gas escapes in the atmosphere and quite often gets trapped resulting in fires at the landfills.
- Methane gas gives rise to green house gases and leads to climate change.
- Fires often take place at dumping grounds and cause air pollution in the surrounding areas.

All the above ill effects and adverse impacts are proposed to be controlled by scientifically managing the waste at the treatment plant and disposing of the rejects emanating from the treatment plant at the engineered landfill.

10.5 Aesthetic aspect.

Haphazard disposal of waste allover at the landfill, emission of foul odor emanating from the haphazard dump, smoke emanating from burning dumps and very unsightly appearance of the existing dumps will all be elimination closure of all the three dumping sites close to each other.

Environmental Management Plan

Environmental management plan is prepared in order to minimize adverse impact on the environment due to various activities of solid waste management. The following measures are planned to be adopted for the protection of environment.

- Waste collected from households shall be taken to scientifically designed transfer stations where waste will be directly transferred into a large hauling vehicle avoiding multiple and manual handling of waste.
- The entire waste brought to the transfer stations shall be transported on a day to day basis in large covered vehicle to the treatment plant.
- All the organic matter shall be treated at a scientifically designed compost plant and waste to energy plant well protected by a buffer so that it does not pose any problem of health and environment in the neighborhood.
- The rejects from the treatment plant and inert received from the city shall be scientifically disposed of at the engineered landfill on a day to day basis where waste shall be spread, compacted and covered as per the MSW Rules 2000 giving no rise to foul odor.
- Regular monitoring carbon monoxide, methane, hydrogen sulphide shall be carried out.
- Entire area surrounding the treatment plant and disposal site shall have a green cover to protect the environment.

CHAPTER 8

LEGAL ASPECTS

As per the legal requirements, it is binding on GNIDA to develop a Municipal id Waste Processing & Disposal facility (MSWP&DF) for scientific processing and disposal of municipal solid wastes generated within Greater Noida City area. Further, Land filling shall be restricted to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing. Land filling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from waste processing facilities. Land filling of mixed waste shall be avoided unless the same is found unsuitable for waste processing. Under unavoidable circumstances or till installation of alternate facilities, land-filling shall be done following proper norms.

(II) Siting Of Projects

The siting of developmental projects in India is managed by Sitting Guidelines for activities and projects delineated by the MoEF and the CPCB. The overall purpose of the guideline is to aid proponents in judiciously selecting project sites, keeping in mind various environmental sensitivities. However, the guidelines for siting are not legally enforceable except for areas, which are ecologically fragile (as notified by certain specific notifications) or are located in' the Coastal Regulation Zone as demarcated by the Coastal Regulation Zone Notification, 1991 and subsequent amendments. Additionally, State Governments sometimes formulate State wide siting guidelines for development planning.

(iii) Environmental Clearance

The requirement involved in the setting up of selected development projects (projects with potential to cause significant environmental impacts) in India is through the Environmental Clearance (EC) Process on the basis' 'of an Environmental Impact Assessment study/filling up of necessary forms. The EC' process is mandated by the EIA notification dated September 14, 2006.
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The project of developing integrated waste processing and disposal facility have /been categorized under Item 7(i) as per MoEF Notification dated September 14, 2006. This proposed project falls under Category B requiring clearance from the State Level Environment Impact Assessment Authority (SEIAA).

Solid waste management systems adopted in Indian cities are highly inefficient and outdated, lacking public participation. Overall public apathy is observed in the matter of handling and disposal of municipal waste. A system of throwing garbage on the streets by citizens and local bodies collecting the waste from the streets and disposing of it in the most unhygienic manner is in vogue. These systems can be corrected by taking concerted measures involving the public at large through their active participation in the process and by GNIDA performing its duties effectively.

Solid waste management practices can never reach the desired level of efficiency until the public participates and discharges its obligation religiously. The system therefore, can only be improved by modernizing the solid waste management system by the GNIDA and ensuring public participation through very serious motivational efforts along with adequate legislative support for taking punitive measures.

For improving solid waste management practices in city, the Supreme Court Committee has given wide ranging recommendations defining the roles and responsibilities of the citizens, NGOs, local bodies, etc. Subsequent to the aforesaid report, the Government of India, Ministry of Environment has notified municipal solid waste (Management & Handling) Rules 2000 under the Environment Protection Act 1986, these rules have clearly laid down the measures to be taken by the municipal authorities. Keeping in view both the above report and the rules it is necessary to incorporate suitable provisions in the state law to ensure public participation and for providing for minimum level of service.

Local law also needs to provide for punishment on the spot to those who do not adhere to the directions given for maintaining appropriate solid waste management system in the city giving adequate power to the Municipal Corporation to punish the offenders.

The following legal provisions may be incorporated by the State Governments in the law-governing GNIDA.

LEGAL PROVISION

11.1 Duty of occupiers of premises to store solid waste at source of generation It shall be incumbent on the occupiers of all premises to keep two receptacles, one for the storage of

food/organic/bio-degradable waste and another for re-cyclables and other types of solid wastes generated at the said premises. The domestic hazardous waste shown in Annexure E, shall however be kept separately in a suitable container as and when such waste is generated.

11.2 Duty of occupier not to mix recyclable /non-bio-degradable waste and domestic hazardous waste with food waste etc.

It shall be incumbent on the occupier of any premises to ensure that the recyclable waste as well as domestic hazardous waste generated at the said premises does not get mixed with the food/bio-degradable waste and that they are stored separately.

11.3 Duty of Societies/Associations/Management to provide community bins it shall be incumbent on the management of Co-operative Societies, Associations, Residential and Commercial Complexes, Institutional buildings, markets and the like to provide community bin/bins of appropriate size as may be prescribed by urban GNIDA for the temporary collection of waste other than recyclable waste and hazardous waste, to be stored at their premises for its primary collection by the municipal authorities. A separate community bin may also be provided for the storage of recyclable waste where door to door collection of recyclable waste is not practiced.

11.4 Receptacles to be kept in good repair

Receptacles as stated in 3 above shall at all times be kept in good repair and condition and shall be provided in such number and at such places as may be considered adequate and appropriate to contain the waste produced by the citizens supposed to be served by the community bins.

11.5 Duty of occupiers to deposit solid waste in community bins

It shall be incumbent on occupiers of all premises for whom community bins have been provided as per 3 above, to cause all segregated domestic waste, trade waste, institutional waste from their respective premises to be deposited in the appropriate community bins.

11.6 Duty of GNIDA to provide temporary Waste storage depots or provide door to door

collection. It shall be incumbent on the GNIDA to:

Provide and hygienically maintain adequate waste storage depots or provide door to door collection in the city and place large mobile receptacles at such places for the temporary storage of waste collected from households, shops and establishments as well as from streets and public spaces until the waste is transported to processing and disposal sites.

Make adequate provision for closed containers in various parts of the city for the deposition by citizens of domestic hazardous waste material listed in

11.7. Duty of occupier of households / shops / establishment to hand over the recyclable material / non-bio-degradable waste to the waste collectors / waste purchasers *I* recyclers

It shall be incumbent on households / shops / establishments to hand over their segregated recyclable waste / Non-bio-degradable waste to waste collectors, waste purchaser or recyclers as may be convenient or as may be notified by the Municipal Corporation from time to time. Such waste shall not be disposed of on the street or in municipal bins or open spaces along with the organic/food/biodegradable waste.

11.8 Duty of Municipal Corporation to collect waste' from community bins and to deposit it at Bulk Community Waste Storage Sites for onward transport

11.9 It shall be incumbent for GNIDA to remove all solid waste deposited in community bins on a daily basis and transfer it to the landfill site/containers identified in the city or arrange for its expeditious transport to processing or disposal sites.

11.10 Duty of GNIDA to clean all public streets, open public spaces and slums It shall be incumbent on GNIDA to arrange for cleaning of all public streets having habitation on both or either side, and all slums on all days of the year including Sundays and public holidays.

11.11 Duty of GNIDA to transport the waste stored at the waste storage depot regularly.

It shall be incumbent for the GNIDA to arrange for the transportation of waste stored at waste storage depots daily even where close containers are placed.

11.12 Duty of GNIDA to arrange for composting of organic/food/bio-degradable waste and disposal of rejects

It shall be incumbent for the GNIDA to arrange for the composting of food/organic/bio-degradable wastes produced in the city and dispose of the rejects and non-biodegradable in an environmentally acceptable manner.

11.13 Prohibition against littering the street and deposit of solid waste

No person shall litter public streets or public places or deposit or cause or permit to be deposited or thrown upon or along any public street, public place, land belonging to the GNIDA or any unoccupied land or on the bank of a water-body any solid waste except in the receptacles specified in I, 5 and 7 above.

11.13 Prohibition against deposition of building rubbish

No person shall deposit or cause or permit to be deposited any building rubbish in or along any street, public place or open land except at a place designated for the purpose or in conformity with conditions laid down by the GNIDA.

11.14 Prohibition against flow of filthy matters on public places.

No owner or occupier of any building or land, shall allow any filthy matter to flow, soak or be thrown there from, or keep or suffer to be kept therein or thereupon, anything which is or can become a nuisance to any person, or negligently suffer any receptacle or place for the deposit of filthy matter or rubbish on his premises to be in such a state as to be offensive or injurious to health.

11.15 Punishment for littering on streets and depositing or throwing any solid waste in contravention of the provisions of this Act.

Whosoever litters the street /or public places or deposits or throws or causes or permits to be deposited or thrown any solid waste or Construction debris at any place in contravention of the provisions of this Act or permits the -flow of any filthy matters from his premises shall be punished on the spot with a fine not less than *Rs.501-* as may be Prescribed under the rules framed by the UP State Govt. from time to time. Such spot fines may be collected by officers authorized by the GNIDA not below the rank of Tax inspector. The amount of fine imposed shall be recoverable as arrears of property taxes. The amount of fine shall be kept higher for repeat offences.

CHAPTER 9

DESCRIPTION OF ENVIRONMENTAL SETTINGS OF THE STUDY AREA

The proposed 10 km radius study area lies in between 28° 17' 45" to 28° 28' 25" N Attitude and 77° 30' 50" to 77° 45' 55" E Longitude. It falls in Gautam Budh Nagar district and some part of district Bulandshahr. The total study area is 314.14 sq.km and the area of proposed site near village Astauli is 50 ha (126 acres). The Grand Trunk load passes through the study area from northwest to eastern side. The Northern Railway Main line (double and electrified) also pass through the Central portion of the study area. The north western boundary of the study area touches the Greater Noida industrial sectors near Kasna. There is a good network of Paved roads connecting almost all the villages within and outside the core area**.**

Salient features of the proposed site at village Astauli

Figure 3.1 displays a sketch of proposed site at Astauli. Geographically proposed site coordinates are 28° 22' 80" N latitude and 77° 40' 28" longitude. Some of the salient features are given below.

- The proposed site is approx 22 kms from Greater Noida township.
- The Site is 2.5 km away from the main Kasna-Sikandrabad Road (Dankaur Railway Station) and Railway line crossing.
- The proposed site can be approached by a paved road connecting Greater Noida and Kasna-Dankaur Railway Station. A small road bifurcating just near the railway / road crossing and going parallel to the railway line leads to the site. The proposed site lines across the Hirnauti Drain cum nala forming the south east corner of the site.
- The site is bounded by village chak road by two sides Le. north eastern sides by a cart track road from village Astauli to Makrandpur (Fatehpur) and south eastern side by another
- This proposed site is relatively a micro depression site.
- No human settlement is marked within 500 meters from. the site.

- The Proposed site lies at the' outskirts of village Astauli beyond 500 m distance.
- The ground water is around 5 m depth.
- It is double. cropped with intense agriculture activity with tube wells and approach roads
- A school playground is on the south of the MSWDS.
- Nearest. township. is Dhankaur Rly Station about 2.5 kms from the site.
- Road along the railway track is under construction

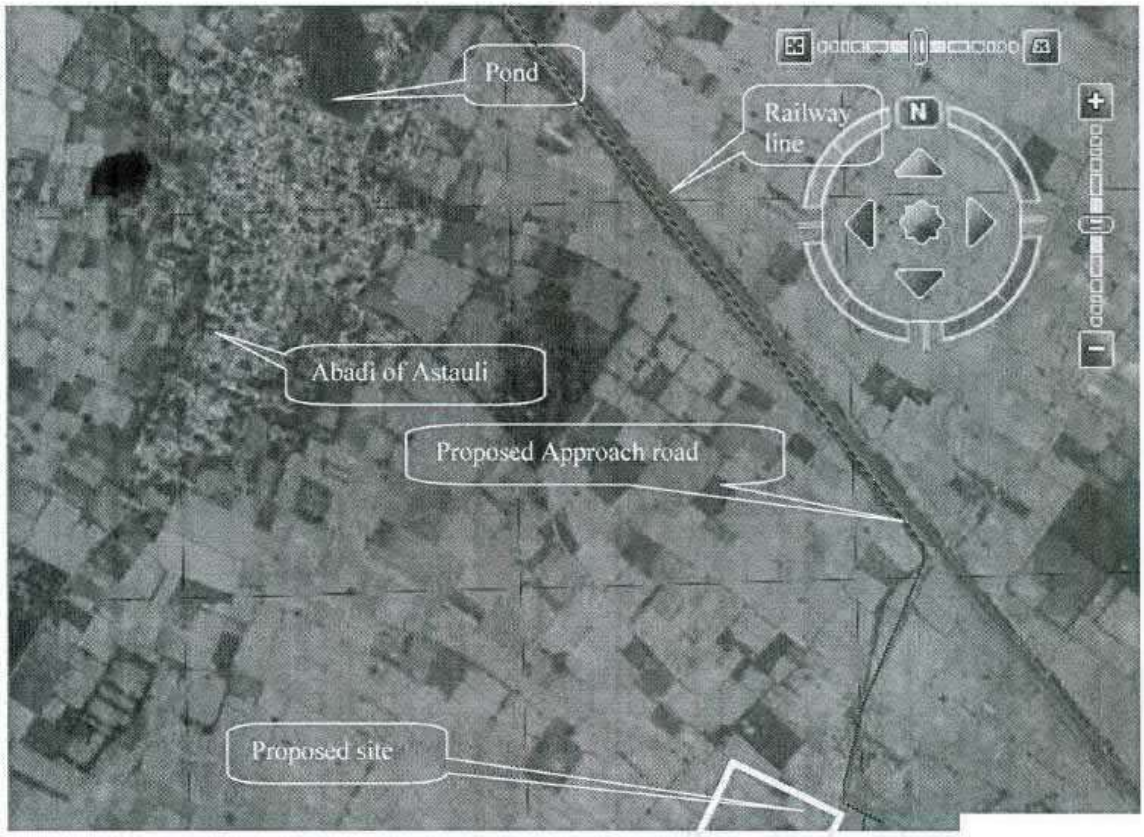
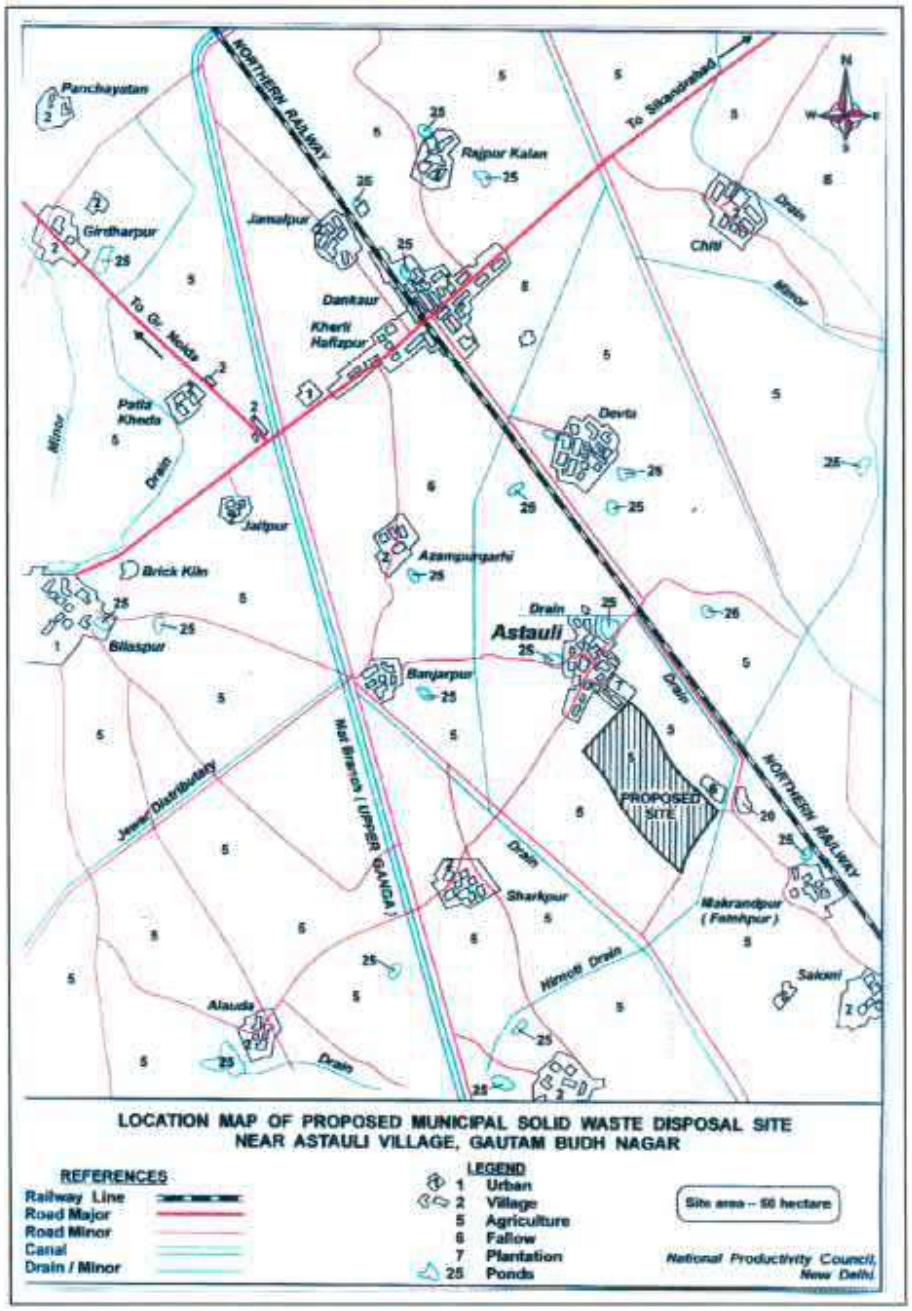


Figure 2.2 : Location of Proposed site wrt village Astuali

Location of Proposed Site on Map



LOCATION MAP OF PROPOSED MUNICIPAL SOLID WASTE DISPOSAL SITE NEAR ASTAULI VILLAGE, GAUTAM BUDH NAGAR

REFERENCES
- Railway Line
- Road Major
- Road Minor
- Canal
- Drain / Minor

LEGEND
- 1 Urban
- 2 Village
- 5 Agriculture
- 6 Fallow
- 7 Plantation
- 25 Ponds

Site area – 50 hectare

National Productivity Council, New Delhi

3.4.2 PHYSIOGRAPHY

Physiographic ally, the study area is a nearly level to very gently sloping fluvial plain of the river Yamuna and its tributaries. It has a discernible micro relief feat , such as levees, basins. Entire study area elevations range between 202 a 207 m above the mean sea level (msl). The highest spot height of 207,3 m. is observed near Biswana, which however, falls outside the core area; whereas -the highest spot height within core area is 206m near Saloni Village. The general slope direction is from northwest to south west.

In general, micro relief is normal, however, it is subnormal in micro depression viz. paddy lands, dug-outs for sandy materials of relics of brick kiln activity etc.

3.4.3 SOIL

According to Soil Map of the study Area (NBSS & LUP, I.C.A.R., 1999), the soils of this zone are old alluvium and are highly productive. Soil order at proposed site is Alifsols, sub order Haplaquents (Older Alluvial soil). The proposed site is underlain by Alifsols, sub classification Older Alluvial soils. These soils are formed by deposition of alluvial soils/ sediments. Alifsols are formed through podsolization and have an ·alkaline argillic horizon.· Soils in the Alfisol order are fertile, have a clay horizon,- and are either moist or dry during the growing season. **Figure 3.2** shows the soil type in the proposed site. As per FAO, the soil classification scheme, the soils in the proposed site and its surrounding is chromic Luvisols as can be seen from **Figure 3.3.** Chromic Luvisols have higher water holding capacity and higher organic content. **Figure 3.4** shows the water holding capacity of soils of the area around and at proposed site which is 200 mm WHC. According to 'Soll Taxonomy, the soils belong to Typic Ustochrepts-Fluventic Ustochrepts association or vice-versa with occasional inclusions of Typic Haplustalfs.

These soils have poor nutrient status Le. they are low in organic matter low to medium in available phosphorus and potash and at places are critical in zinc and copper Slight to moderate water erosion is common. Occasionally, high water table along the canal are experienced otherwise in most of the area it is below 5 meter or so. Problem in drainage line

alignments are experienced. 'Strikingly, the soils of Bhur area Le. old sand dunes are having coarse loamy soils underlain by sandy soils. Although, the coarse loamy soils predominate in the area somewhat moderately well drained calcareous fine loamy soils occur in nearly level to micro digressional area. A few pockets of moderate salinity and sodality problems are met with in western part of the outer core area.

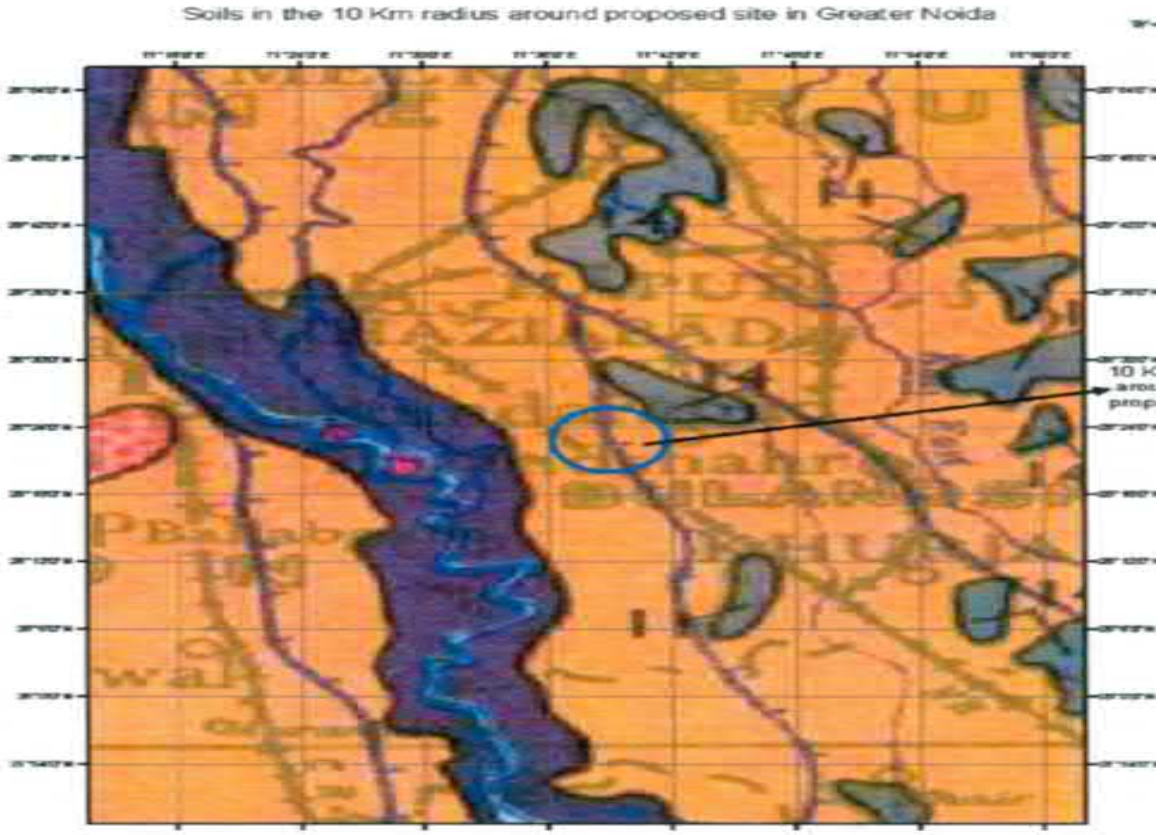
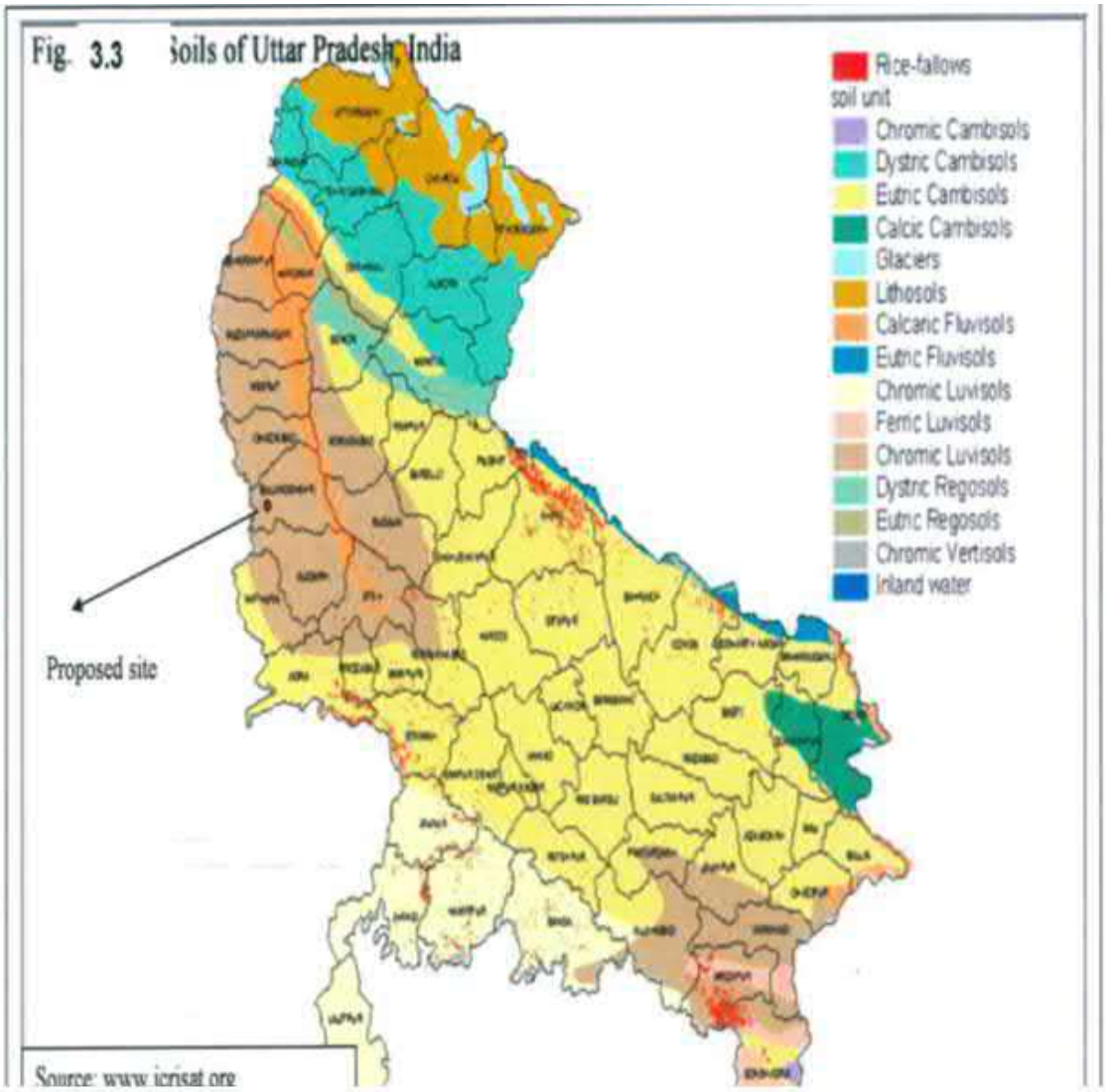


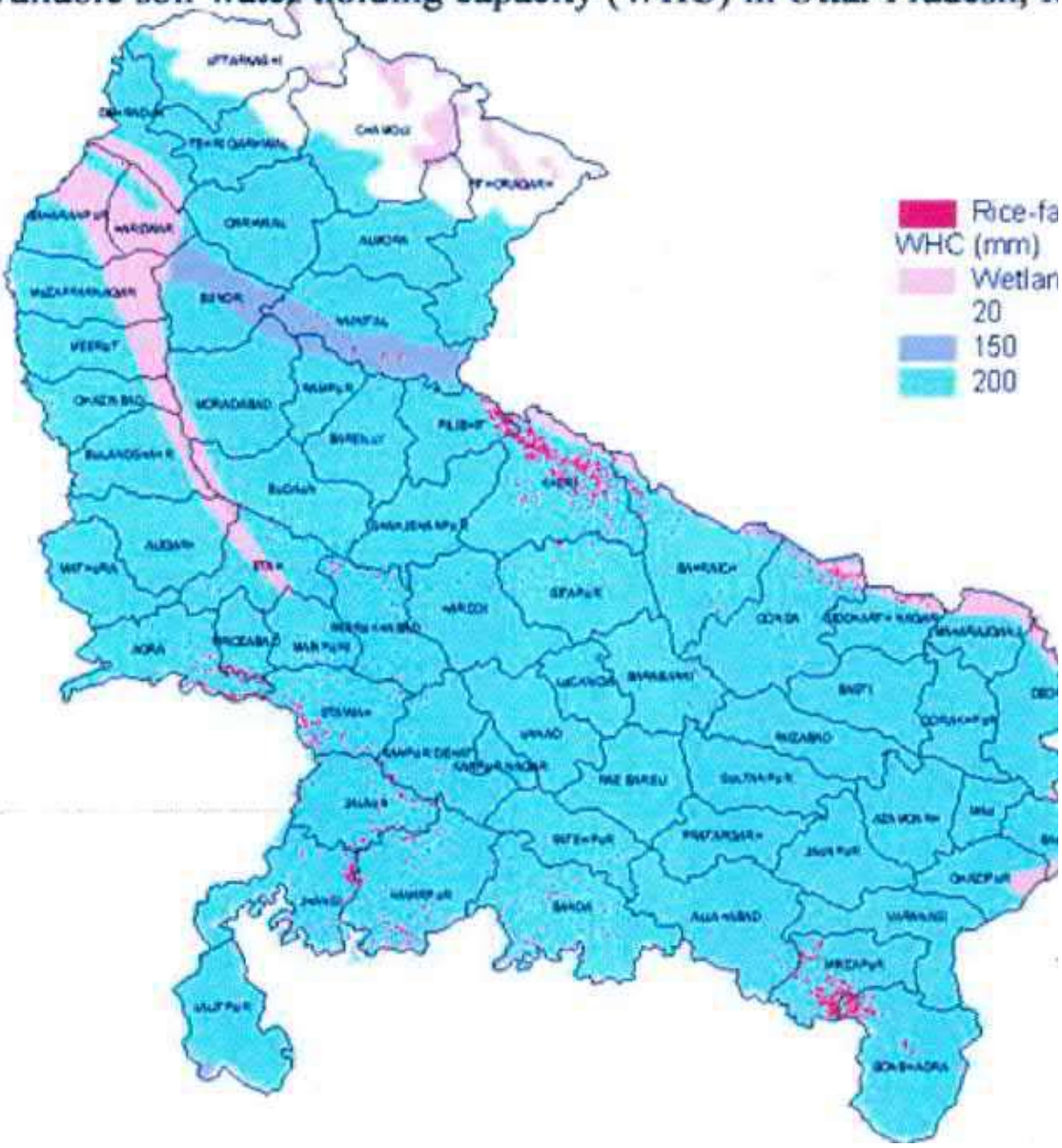
Fig. 3.3 Soils of Uttar Pradesh India.

Fig. 3.3 Soils of Uttar Pradesh, India



Source: www.icrisat.org

Fig. 3.4 Available soil water-holding capacity (WHC) in Uttar Pradesh, I



3.4.3.1 SOIL MONITORING STUDIES

Undisturbed soil samples were collected from 10 locations the samples were analyzed for physical and chemical properties and the results of analysis are presented below in table 3.1. The sampling locations and photographs are shown in Figure 3.5 and photo plates 3.1-3.4 Soil samples were collected up to a depth of 30 cm.

At the site

village Astuali

village Devta

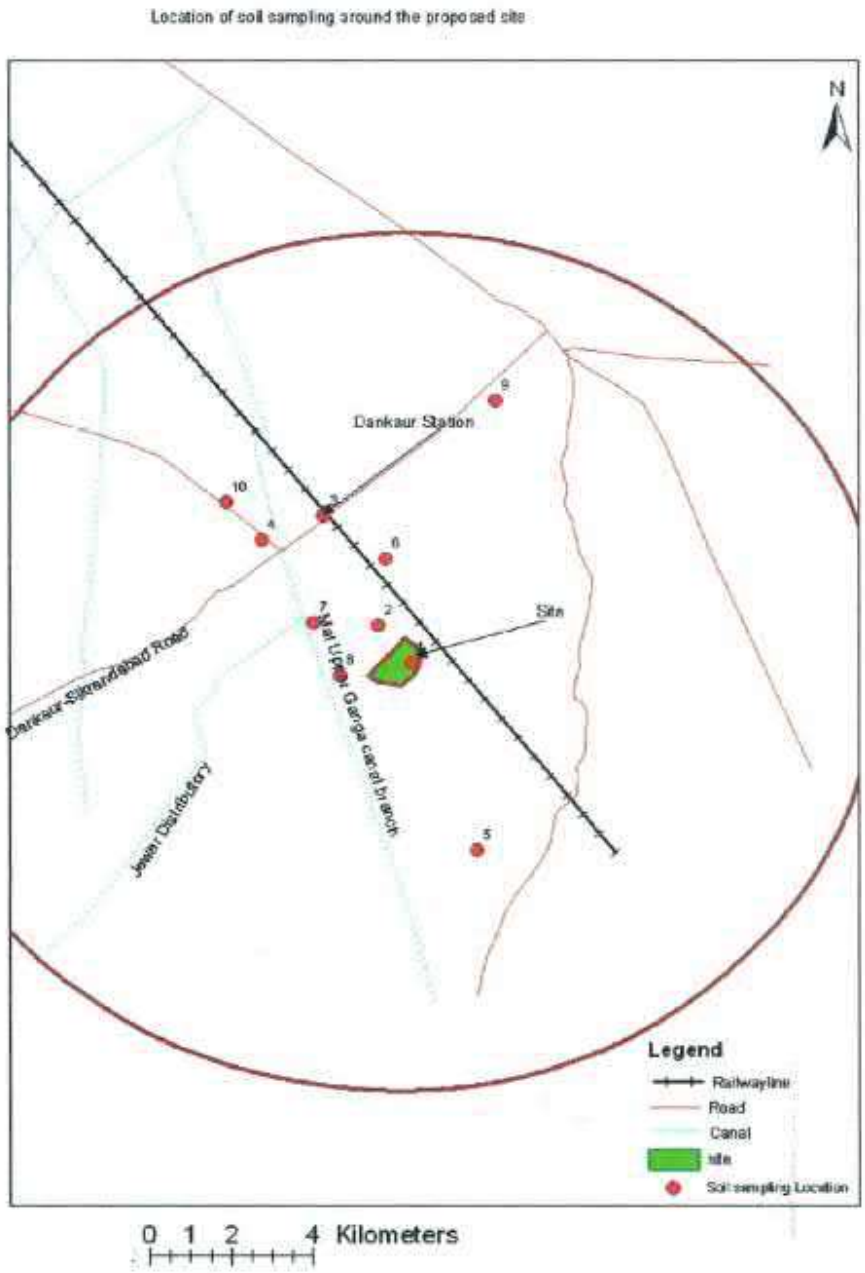
Near Nizampur

Table 3.1: Analysis report soil samples around the proposed site in village Astuali.

S.No.	Location	pH	Conductivity	TOC	Ni	Fe	Cu	Zn	C
			mm hos/cm	%W/W	Mg/Kg	Mg/Kg	Mg/Kg	Mg/Kg	M
1	Site	8.29	0.128	.22	6.58	6750.82	<0.01	7.13	<0
2.	Village Astuali	8.28	0.15	14.5	0.186	6950	5	20	<0

3.	**Near Dabkaur Station**	**8.28**	**0.86**	**.15**	**13.08**	**6272.56**	**2.7**	**18.05**	**<0**
4.	**Near Hassanpur**	**8.04**	**0.145**	**0.16**	**14.48**	**8035.88**	**2.8**	**24.89**	**<0**
5.	**Village Bilaspur**	**8.26**	**0.161**	**0.21**	**7.94**	**9795.36**	**5.81**	**24.24**	**<0**
6.	**Village Deora**	**7.63**	**0.116**	**.32**	**10.5**	**7123.93**	**1.82**	**21.91**	**<0**
7.	**Village Banjerpur**	**8.49**	**0.088**	**0.19**	**12.98**	**7791.45**	**2.4**	**16.35**	**<0**
8.	**Village Shakarpur**	**8.16**	**0.2**	**0.19**	**5.74**	**834.62**	**<0.01**	**11.04**	**<0**
9.	**Village Nizampur**	**8.2**	**0.2**	**0.12**	**16.81**	**8999.18**	**6.36**	**34.54**	**<0**
10.	**Village Girharpur**	**8.19**	**0.185**	**0.1**	**7.94**	**4726.25**	**0.37**	**11.34**	**<0**

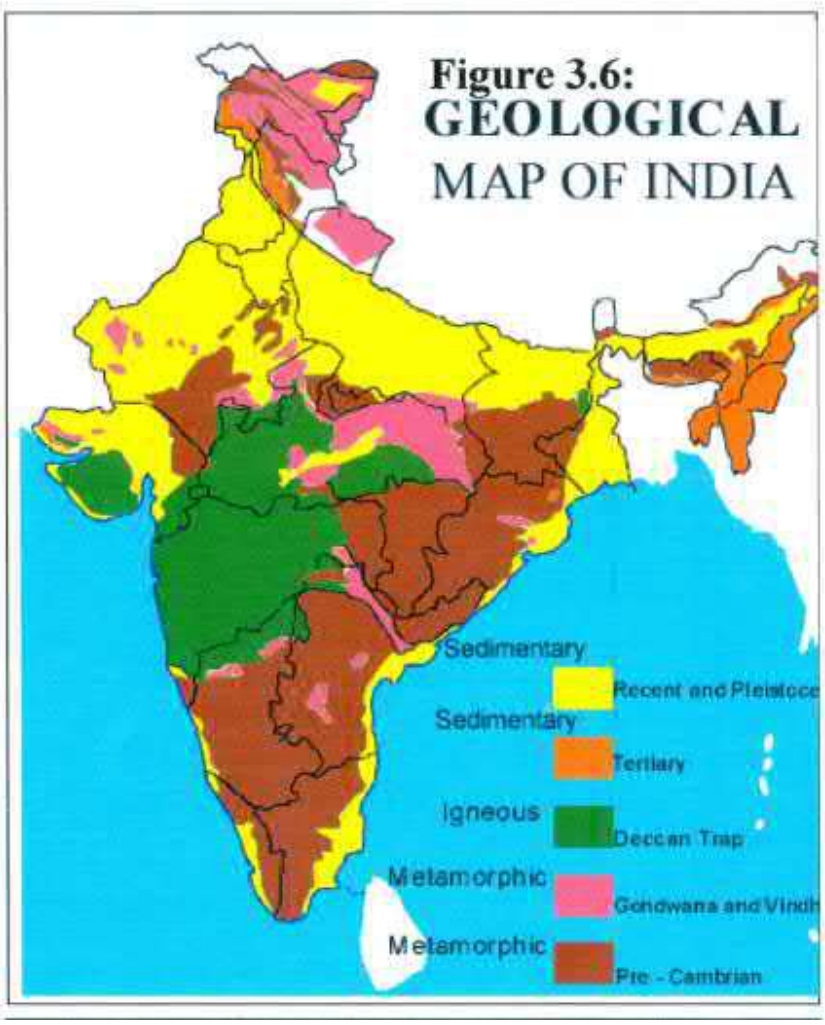
Fig. 3.5 Sampling Location of Soil around the proposed site.



3.4.4 GEOLOGY

The geological map of India is shown in Figure 3.6. The proposed site in Gautam Budh Nagar district is underlined by the alluvial deposits of quaternary age. It comprises undifferentiated quaternary sediments of pleistocene to Holocene period (Geological Map of India, 1993). The depth exceeds hundreds of meters at various places and consists of interfering lances of sand, silt and clays and kankars of varying thickness are met with in this area.

Fig. 3.4.4 Geology



Land Use/ Land Cover Categories						
S.No.	Level-I	Area (sq.km.)	%	Level-II	Area (sq.km.)	%
1.	Build-up- area	22.15	7.0	▪ Town	5.97	1.9
				▪ Industrial	2.15	0.7
				▪ Villages	14.03	4.4
	Total	22.15	7.0		22.15	85.5
2.	Agricultural land	283.87	90.4	▪ Double cropped	268.70	85.5
				▪ Fallow	13.87	4.4
				▪ Plantation	1.46	.05
	Total	283.87	90.4		283.87	90.4
3.	Forest/ Jungle	0.79	0.3	▪ Open	0.79	0.3
	Total	0.79	.03		0.79	0.3
4.	Wasteland	5.96	1.9	▪ Salt affected	5.26	1.7
				▪ Waterlogged area	0.70	0.2
					5.96	1.9
5.	Water bodies	0.73	0.2	▪ Tank	0.73	0.2
6.	Site	0.50	0.2		0.50	0.2
	Grand Total	314.00	100.00		314.00	100.00

FIG. 3.7 LAN USE/ LAND COVER MAP OF PROPOSED MUNICIPAL SOIL WASTE DISPOSAL SITE NEAR ASTUALI, DISTT. GAUTAM BUDH NAGAR (U.P.)

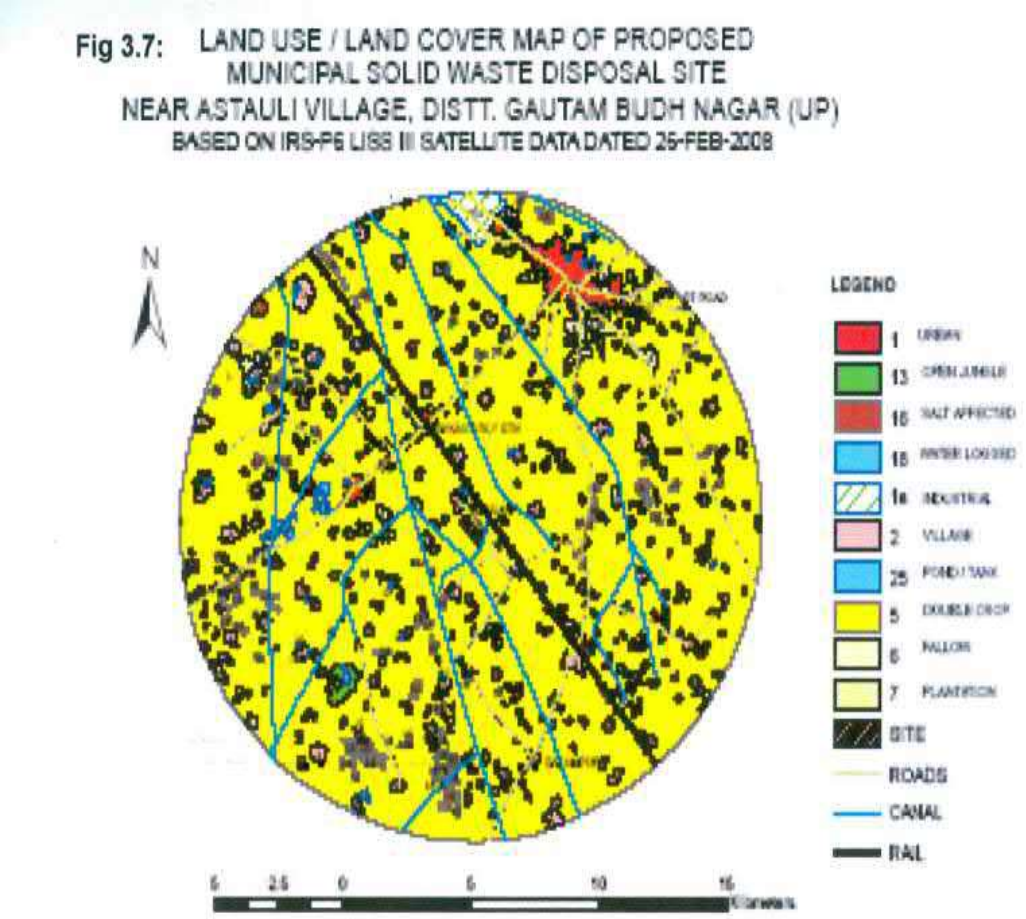
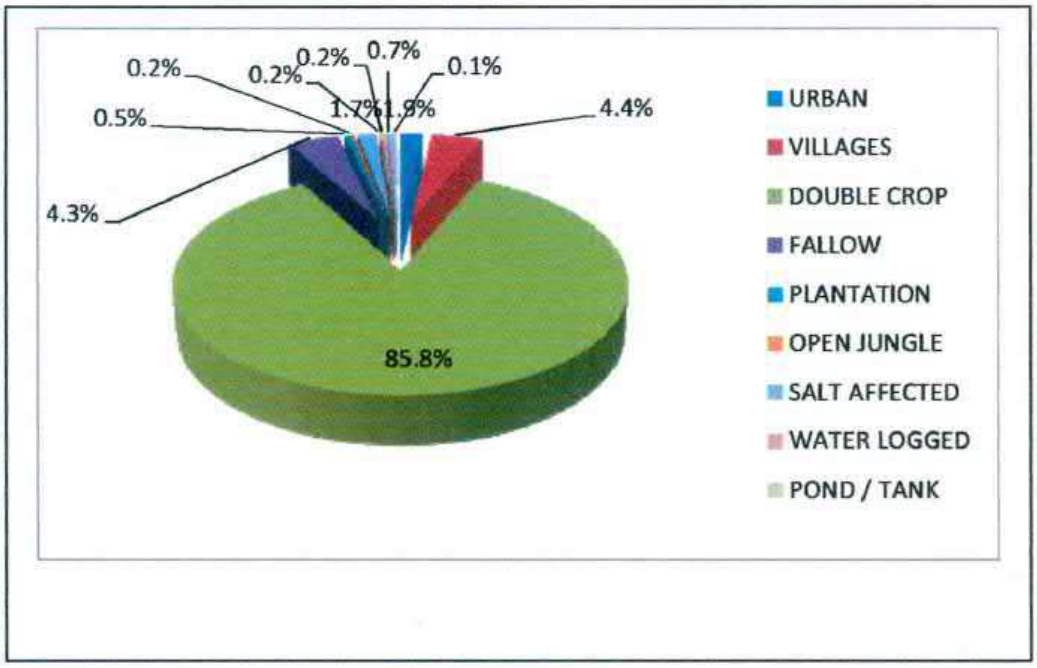
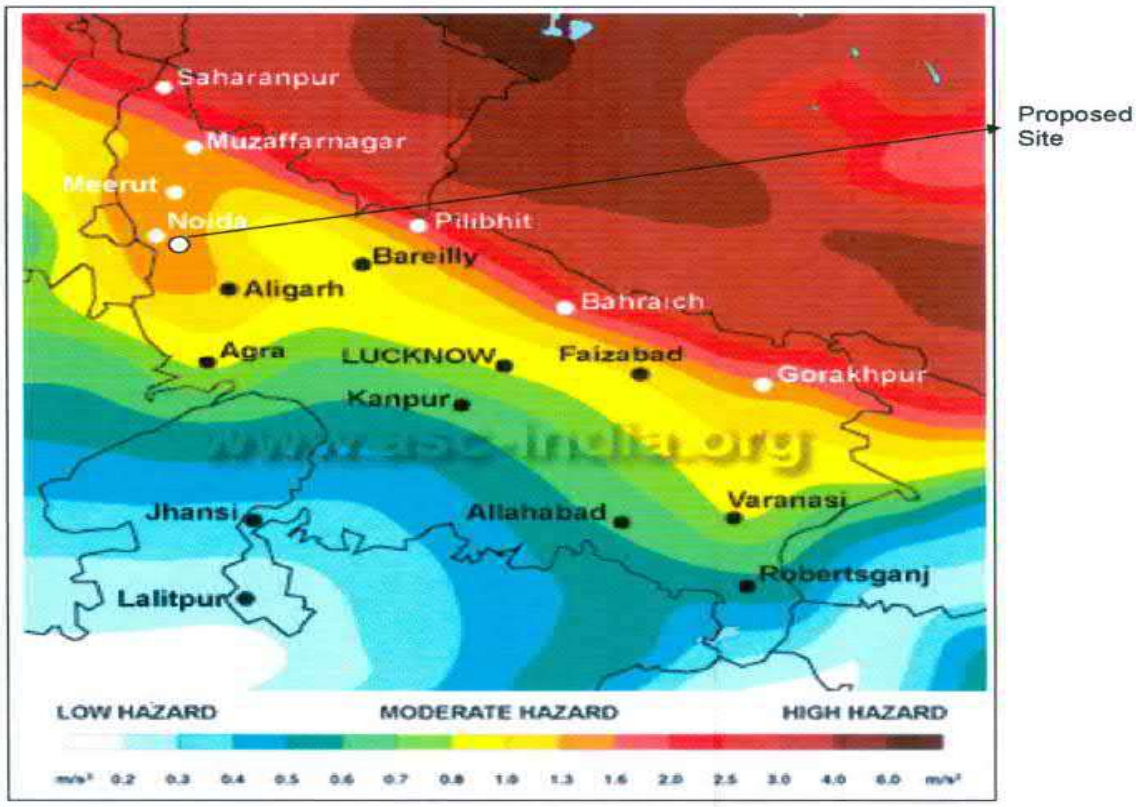


Figure 3.8: Land use classification in 10 km radius around proposed site in village Astauli



3.4.6 SEISMO- TECTONIC APPRAISAL OF THE AREA



3.5 WATER ENVIRONMENT

This section documents the baseline scenario of the water environment in the set y area and discusses both water resources and quality. These details include alter availability, the quality of ground & surface water, drainage pattern in the study area. The data has been collected from various secondary sources mainly CGWB and primary survey carried out in the impact zone.

3.5.1 DRAINAGE

The Mat Branch Canal of the Upper Ganga Canal is passing from north to south in Central portion of the study area (10 Km buffer zone around the proposed site). There are many canal distributaries and minors within the study area namely 'Kald , Hasanpur, Nizampur, Jiwar, Wair. Some of the minors and distributaries are disused. The canal network appears to cater the irrigation need of the agriculture. The approximate distance from the canal to the proposed site is 1.2 km. River Yamuna is around 15 Kms from the proposed site on western side. The proposed site is drained by Hironti drain originating from a pond in village Astauli. The drain is however dry in most part of the year .. During monsoon, excess water from the pond is drained out through this drain.

CHAPTER 10

ADMINISTRATIVE FRAMEWORK

LOCATION OF THE PROJECT

In order to process and dispose the municipal solid wastes generated from Greater Noida, GNIDA has identified a site in village Astuali, extreme south of the township. Figure 2: 1 shows the location of site in Greater Noida. Greater Noida city falls under Gautam Budh Nagar district. The proposed site is located near Northern Railway line around 2.5 Km from Dankaur Railway station. Figure 2.2 shows the location of the proposed ·site near the main railway line in village Astauli. The total area of the site is 126 acres.

Location & Extent
Geographically the study area lies at 28° 22' 36.75" N , 77° 39' 42.26" E and is covered by Survey of India top sheet Nos. 53 H/11 on 1 :50,000 scale. The 10 km radius from the center of the site covers the following SOl topo sheet wise villages.

A photo plate 2.1, 2.2, 2.3 gives an overview of the site.

2.5 MUNICJPAL SOLID WASTE GENERATIONS IN GREATER NOIDA

As per the information available with GNIDA, projected urban population for the ear 2021 is 12 Lakhs. The present population of the city (urban sectors) is 2,15,000. GNIDA manages municipal solid wastes generated from 20 urban sectors and 26 urban villages of Greater Noida as listed below:

Sl.No.	Villages	Population as per census 2001	Projected population for 2010*	Urban sector	Population as per GNIDA
1.	Aichcher	1735	1822	Alhpa-I	
2.	Bagampur	522	548	Alpha-II	
3.	Bironda	655	688	Beta-I	
4.	Birondi	1885	1979	Beta-II	
5.	Brahmpur Gajraula	704	739	Gamma-I	

6.	Chuharpur Bangar	1205	1265	Gamma-II	
7.	Chuharpur Khadar	823	864	Delta-I	
8.	Dadha	2389	2508	Delta-II	
9.	Gharbara	1486	1560	Delta-III	
10.	Habibpur	1389	1458	KP-I	
Sl.No.	**Villages**	**Population as per census 2001**	**Projected population for 2008***	**Urban sector**	**Population as per GNIDA**
11.	Haldauna	1346	1413	KP-II	
12.	Jaitpur-Vaishpur	1484	1558	KP-III	
13.	Kasna	3437	3609	P-3	
14.	Kayampur	212	223	Builders Area	
15.	Khera Chauganpur	1760	1848	Sec-32	
16.	Kulesra	2800	2940	Sec-33	
17.	Lakhanawali	1755	1843	Sec-36	
18.	Malakpur	806	846	Sec-37	
19.	Mubarakpur	553	581	Sec-41	
20.	Mushedpur	715	751	Sec-42	
21.	Nawada	3425	3596	Swarn Nagri	
22.	Rampur Jagir	160	168		
23.	Sakipur	4620	4851		
24.	Surajpur	5569	5847		
25.	Suthyna	1911	2007		
26	Tugalpur	2189	2298		
27.	Tusiyana	1366	1434		

	Subtotal	**46901**	**49246**		**1,75,000**
	Total				**2,71,147**

*Projected population calculated based on average growth rate estimated from 1991-2001 censuses (10% growth rate average)

As per the information of GNIDA, per capita waste generation in Greater Noida approximately is 2.5 Kg/house/ day.

Total waste collected at present is average approx 150 to 170T/day.

Considering an average of 4 individuals per house and based on the per capita data by GNIDA, total waste generation (I) = (Population/ 4) * (waste generated/ house/ day)

I = (271147/4 ×2.5)= 169 TPD.

The general composition[1] (in %) of municipal solid waste in India cities are presented below:

WASTE COMPONENTS	% CONTENT
LEAVES, FRUITS, VEGETABLES, MEAT, FISH, FOOD WASTE	62.8
PAPER & PAPER PRODUCTS	5.6
COTTON TEXTILES	2.2
JUTE	0.9
COCONUT	1.2
TREE PRUNES,WOOD, BAMBOO & OTHER LIGNIN WASTE	4.9
SUB TOTAL SHORT TERM BIODEGRADABLE LONG TERM BIODEGRADABLE	 62.8% 14.8%

NON BIODEGRADABLE	
SYNTHETICS TEXTILES	0.7 %
RUBBER	0.8 %
PLASTIC & PVC	4.3 %
LEATHER	2.1 %
METALS	0.4 %
GLASS	1.2 %
STONE, EARTH, BRICKS	12.9 %
SUB TOTAL	22.4%

The average biodegradable portion of MSW considering short and long term aspect will average out to 54 %. Therefore compostable waste generated in Greater Noida is about 91 TPD. The combustible material (RDF) would average out to about 21% of the total waste thus generating RDF of about 36TPD. About 15% remains and 10% rejects from process and non-biodegradable portion has to be sent to secured landfill facility which shall be estimated to about 42TPD.

For design capacity of waste generation up to 25 years life period is considered.

Conceptual design of common waste disposal Facility

Estimation of MSW quantity for disposal to landfill

Population in 2011 = **2,71,147**

Expected Population in 2035 = 9,21,899 (Applying linear extrapolation Population rise)

Total quantity of MSW generated at present = 169 T/ day

= 61685T in the first year

Total quantity of rejects going to landfill = 42 T/ day

= 15330 T in the first year

Total quantity of waste generated during aduration of 25 years has been estimated in the table below: Ref Tables 10.1 & 10.2 respectively.

Table : 10.1

Year	Population growth of yearly 10 % (calculated assuring linear rise in population)	Garbage Generation Tons/ Year
2011	271147	61855
2012	298262	68041
2013	325376	74226
2014	352491	80412
2015	379606	86598
2016	406721	92783
2017	433835	98969
2018	460950	105154
2019	488065	111340
2020	515179	117525
2021	542294	123711
2022	569409	129896
2023	596523	136082
2024	623638	142267
2025	650753	148453
2026	677868	154639
2027	704982	160824
2028	732097	167010
2029	759212	173195
2030	786326	179381
2031	813441	185566
2032	840556	191752
2033	867670	197937
2034	894785	204123
2035	921900	210308

NOTE: The growth rate of waste generation per annum (%), equals to the yearly population growth of 10 % (calculated assuring linear rise in population from the data with GNIDA).

Hence from the above equation , total MSW generated in the span of 25years (year 2011 to 2035) has been estimated as 3402048 Tons.

Assuming a stockpile type of landfill about 14 m high , area required for developing sanitary landfill facility for disposal of waste, administrative blocks, composting shed area, rdf shed area, internal roads and machine rooms for 25 years is 80 acres as per the tables below respectively.

Table : 10.2

Year	Waste TPD	Landfill Cap (25% of TPD)	Vol M3	Addl Vol for Soil 10%	Vol/Yr in M3	Phase Vol Reqd in M3
2011	169	42	48.72	53.59	19562	
2012	186	47	53.59	58.95	21518	
2013	203	51	58.47	64.31	23474	
2014	220	55	63.34	69.67	25430	
2015	237	59	68.21	75.03	27386	117371
2016	254	64	73.08	80.39	29343	
2017	271	68	77.95	85.75	31299	
2018	288	72	82.83	91.11	33255	
2019	305	76	87.70	96.47	35211	
2020	322	80	92.57	101.83	37167	166275
2021	339	85	97.44	107.19	39124	
2022	356	89	102.32	112.55	41080	
2023	373	93	107.19	117.91	43036	
2024	390	97	112.06	123.27	44992	
2025	407	102	116.93	128.63	46948	215180
2026	424	106	121.80	133.98	48904	
2027	441	110	126.68	139.34	50861	
2028	458	114	131.55	144.70	52817	
2029	475	119	136.42	150.06	54773	
2030	491	123	141.29	155.42	56729	264084
2031	508	127	146.17	160.78	58685	
2032	525	131	151.04	166.14	60641	
2033	542	136	155.91	171.50	62598	
2034	559	140	160.78	176.86	64554	
2035	576	144	165.65	182.22	66510	312988
			Total Vol Cum		**1075898**	

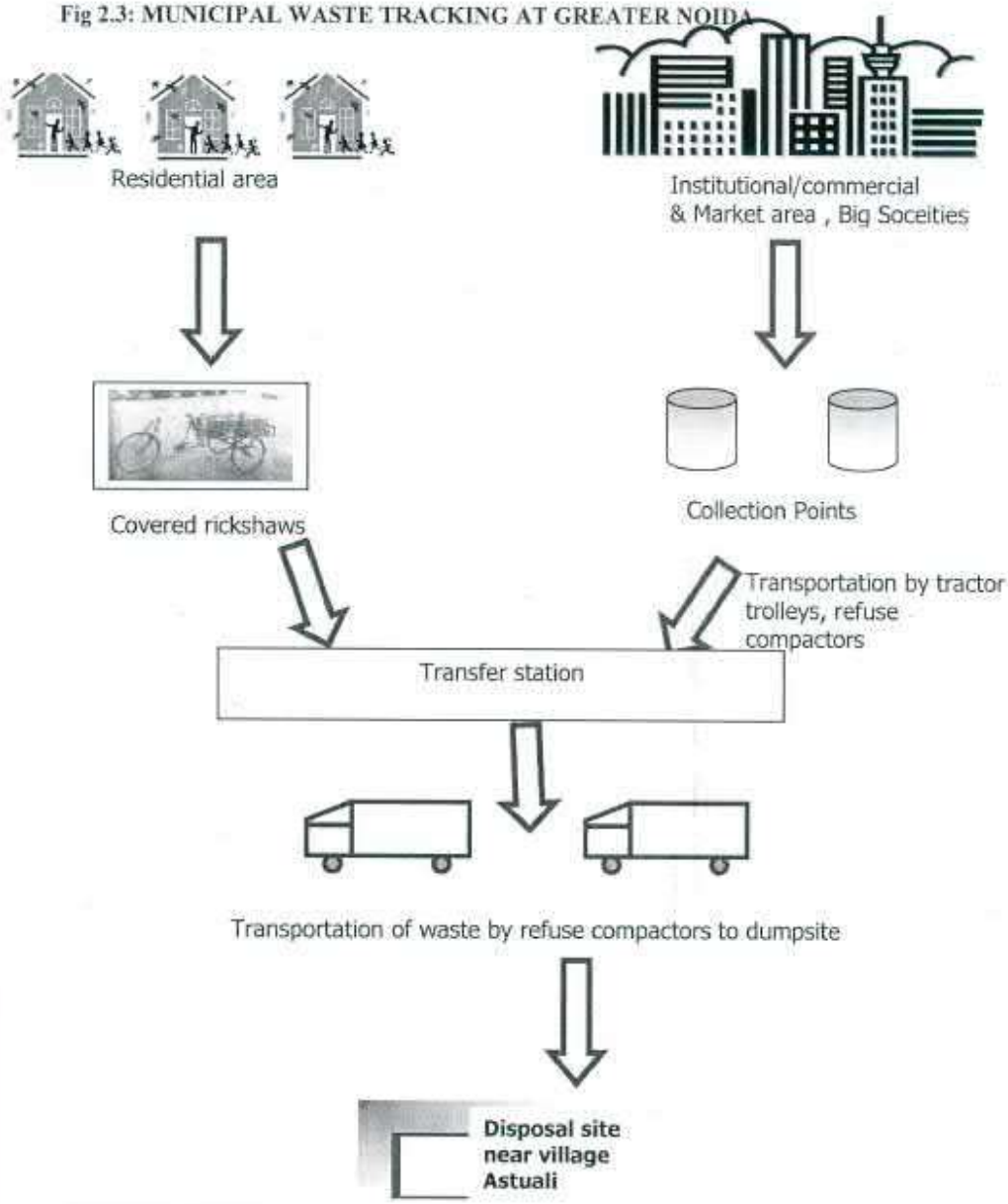
Photoplates 2.1 & 2.2 : Photographs of the site taken in the month of June, 2008

Photoplate 2.3: Photographs of the site taken in the month of June, 2008

The municipal solid waste tracking at Greater Noida is shown schematically in Figure 2.3 below.

The municipal solid waste tracking at Greater Noida is shown schematically in **Figure 2.3** below.

Fig 2.3: MUNICIPAL WASTE TRACKING AT GREATER NOIDA



2.6 AREA FOR RECOMMENDED MUNICIPAL SOLID WASTE POCESSING AND DISPOSAL

The organic content of Municipal solid waste tends to decompose leading to smell and odor problems. In addition, it leads to pollution of the environment. In order to ensure' safe disposal of the MSW, in Municipal Solid Waste (Management' & Handling) Rules, 2000, it has been made mandatory to first process the biodegradable portion of the waste and then dispose of the only inert portion into the landfill facility. This also helps in reducing the capacity of landfill facility required.

The area required for processing (composting) of 65 tons per day of biodegradable waste would be approximately 2.5 acres or 1.01 hectares,

For disposal of 98 Tons per day of non-biodegradable waste, assuming 0.85 T/m3 as bulk density of compacted waste, 27 acres of land is required for development of secured land fill facility for a life of 25 years.

Compost Plant:

It is proposed to develop 80 TPD (design capacity) 'compost plant to process segregated organic waste, waste collected directly from hotels, restaurants, vegetable markets etc. and transported separately to the site. Salient features of Integrated MSW Processing & disposal facilities are being described in subsequent sections:

2.7.1.1 Process Theory

The treatment of MSW is primarily performed to reduce the waste volume and ensure a safe disposal method. The waste characteristics, social requirements and financial means are important criteria in choosing the type of treatment process. Composting depends on the natural process of biological degradation of organic material. Traditionally, composting was adopted as a farming practice for recycling nutrients extracted from the soil by plant uptake.

Compost is considered a soil amendment, improving in nutrient base (soil fertility) and its physical characteristics.

In the MSW stream, a high portion is organic (approximately 60%), the remaining inorganic portion is composed of recyclables and non- recyclables. Initially, the separation of the organic fraction from the waste stream is performed after which the composting of the organic portion takes place. The quality of compost is directly related to the thoroughness ·of the separation process. Micro-organisms, naturally present in organic material will start the decomposition process, either aerobically or an aerobically. In anaerobic digestion of organic material, methane. “Gas is produced, while aerobic digestion produces carbon dioxide. In "'both" aerobic and anaerobic digestion, continuous agitation of organic material is essential to ensure microbial decomposition of all the material.

In the case of aerobic digestion, the provision of sufficient aeration is essential to inhibit anaerobic decomposition. During the digestion process, significant heat is produced. This rise in temperature may destroy the micro-organisms responsible for decomposition if the temperature rises are too high: However, continuous aeration and organic material agitation will reduce increases in temperature, sometimes too! Evils too low to maintain sufficient microbial decomposition. Therefore, it is essential to maintain temperatures levels, between 60 - 70^0 C that sustain appropriate decomposition. Once sufficient "basic digestion' has been reached within two weeks, the organic material is cured. This is a process where decomposition of organic material continues however at a lower rate since only a small fraction remains undigested.

The produced compost is graded according to different criteria. The most important of which are the leV€1 of impurities, the absence of unhygienic bacterial such as Salmonella, and the maturity. Maturity relates to the compost stability. The longer the curing phase, the lower the active microbial digestion, the more mature compost is considered. It is important to note that compost of different grades have different application! Utilization methods for safeguarding the environ end.

2.7.7.2 PROCES DESCRIPTION

The entire MSW received at the site will be processed in compost Plant after segregation of non-biodegradable portion from it. It is proposed to develop 80 TPD compost plant to process organic waste, which is to be segregated from mixed waste and green & hotel waste transported separately to the site as one of the component of integrated facility along with 100 TPD of sanitary landfill. In addition, provision for handling additional quantity of MSW in future times has also been proposed. The processing facilities are also planned to provide storage of compost and process rejects requiring land filling during the monsoon.

The design of the compost plant is proposed on the concept for open windrow aerobic composting of organic (biodegradable) component of solid waste. The complete process of MSW Composting can be summarized as follows:

a. Material Intake systems

- Visual inspection of waste
- Weighing of vehicle

b. Pre-processing System

- Manual Sorting of inert and removal of rejected material to landfill on the tipping platforms
- These platforms will also facilitate the rag pickers to remove the recyclables
- Sorted material moved to compost pad to form windrows by JCSs

c. Yard management activities

- Periodic turning of windrows
- Inoculums and water spray to .accelerate the digestion process •
  Process
- Monitoring & Controlling activities

d. Material Stabilization

- After two turnings, shifting of material to stabilization area, from the compost pad using a backhoe unit and dumper.
- After two weeks stabilization, feeding material to coarse segregation section

e. Coarse Segregation Section

- After stabilsation, material is taken to trammels for intermediate screening using a

skid steer loader. This is completely automated section with single point feeding. A RCC structure with 6m high AC roofing and concrete flooring is required for placement of coarse segregation equipment's.

- Oversized rejects (+35 mm) to be sent to landfill
- Oversized rejects (+16 mm) comprising of undigested organic matter and inert material could be used as mask for windrow covering.
- Undersized material (-16 mm) stocked in Curing section go down

f. Curing Section

- Material is stored here for 15 days for further stabilization and moisture control
- A RCC structure 6m high AC roofing and concrete flooring is required for storage of material.
- Some additives as rock phosphate may be added at this stage to improve quality of final product.

g. Refinement Section

- Cured material is fed to a drag feeder conveyor which in turn gradually feeds the same to the Trommel Screen 6/4 mm at a controlled rate
- A RCC structure with 6 m high floor and concrete flooring is required for placement of refine section equipment's.
- Oversized rejection (+ 6 mm) to be ground and mixed in curing section.
- Impurities such as glass, plastic, leaves, inerts etc. are removed
- Under sized fine compost to be enriched with useful microbes, herbal extracts (optional)

h. Grinding Section for recovery of organic compost

- Grinding Section ensure recovery of material which is otherwise rejected from the Plant.
- Grinded male rail will .be added to the curing section material and passed through the refinement section to recover organic compost. .
- A strong RCC structure with 1.5m high floor. Is require' for placement· of. Grinding section equipment's.

i. Packing and Storage System

- Final product (Compost) to be stacked in finished goods goes down.
- Compost to be picked up by marketing agency for distribution in market.

The composting unit also has a lab to achieve efficient composting various process parameters must be periodically monitored and controlled in time. During Composting, some liquid/ concentrated wastewater may percolate through the MSW due to leaching, known as Leach ate. For environmental reasons the leach ate should not be allowed to percolate in the soil or round waters. To avoid this, proper impermeable concreting of the compost pad is undertaken and peripheral drains are provided to collect the leach ate generated during the process. Collected leach ate finally leads to a R.C.C. tank provided in the adjoining landfill site. The air borne litter is controlled by providing a dense green belt around the plant. In green belt creepers are provided to act as green curtain.

To control odor the sanitizer is added at the concrete pad. Sanitizer suppresses the odor generating from the waste. This control also helps in creating a workable environment for the people working at the sorting station. There are various other systems, which are required to be incorporated for trouble free working of the plant. e.g.

1. Diesel filling facility (for material handling equipment)
2. Vehicle washing facility
3. Staff administration blocks
4. Electrical sub station
5. Internal roads
6. Green belt
7. Boundary wall
8. Open drains

2.7.2 SANITARY LANDFILL

Since, the groundwater table is very low (around 5 m below ground level); it is proposed to construct a stockpile type of landfill. Around 2m, high Reef wall shall be constructed at the periphery. 14m high landfill will be created at the slope of 1:6. About 33 acre area has been earmarked for the development of sanitary landfill.

Based on this concept, an assessment has been carried out for the volume of landfill and the expected life of landfill is estimated to be 25 years.

A 15 meters wide green belt is further proposed to be developed around the integrated facility. .

Development of landfill site should be subjected to rigorous planning. Key elements in developing a scientific landfill for Greater Noida comprise of the following,

Reorganizing and enhancing the present waste collection and transportation practices

- Detailed plans outlining the site development activities and
- Detailed designs of all the engineering works
- The overall control on the development and operation of each landfill site will be the requirement to adopt a cellular approach to land filling. The landfill development activities will comprise
- Site Clearance
- Sub-:division of site into major operational phases
- Progressive excavation for landfill earthworks
- Ordered development of operational 'phases in working land filling cells
- Advance preparation of the lining system on the landfill base
- Sequential infilling of land filling cells and operational phases.
- Copping of land filled cells

I. Leachate Collection System:

The primary function of leach ate collection system is to collect and to convey the leach ate out of the landfill unit and to 'control the depth of the leach ate above the liner As per USEPA Manual the leachate collection system should be designed to maintain a leachate depth or head of 30 cm or less above the liner. The design leachate head is very important as flow of leachate through imperfections in the liner system increases with an increase in leachate head above the liner. Maintaining a low leachate level above the liner helps to improve the performance of the composite liner system. The main components of leachate collection system are leachate collection tank, feeder mains and header main.

II. Liner System Design.

The liner system for landfill site at Greater Noida shall be designed based on MoEF recommendations. As per MoEF "Construction of a non-permeable lining system at the base and wall of waste disposal site area. For landfill receiving residues of waste processing facilities or mixed waste or waste having contamination of hazardous material' (such.· as aerosol, bleaches, polishes, batteries, waste oils, paint products and pesticides) minimum liner specification shall be a composite barrier having 1.5mm High Density Polyethylene (HDPE) geo membrane or equivalent overlying 90cm of soil (clay/amended soil). Therefore for the landfill site composite liner of following specifications has been Recommended complying Municipal Solid Waste (Management and Handling) Rules 2000.

- A 90cm thick compacted clay or amended soil (amended with betonies) of permeability not greater than 1 x 10"7 em/see
- A HDPE geo membrane liner of thickness 1.5mm
- A drainage layer of 300 mm thick granular material of permeability not greater than 10" em/see

III. Landfill Gas Management System: (Optional)

Landfill gas is a bi-product of biodegradation process that takes place in landfills. Since landfill site at Greater Noida shall be supported by compost plant, gas generation is anticipated to be very less. The principal components of landfill gas are Methane (CH_4) and Carbon dioxide (Co_2). For landfill site at Greater Noida a gas venting system with flaring arrangement is proposed. A gas-venting layer of 20 em thick granular soil should be provided on the top of solid waste and the gas collected in this layer shall be collected and vented through gas vent pipes (38 no.) of 150 mm diameter perforated HDPE pipes. With the help of blower, gas through the pipes shall be collected and taken to flaring unit. The

collection system is a network of 150 mm HDPE perforated pipes connected to flaring unit. The flaring unit consists of collection' chamber, blower, ignition mechanism, Control valves and sensors.

IV. Final Cover system:

The final cover consists of the following components,

- Vegetative layer of 450 mm thick with good vegetation supporting soil
- Drainage layer of 150 mm thick granular material
- Barrier layer of 600 mm thick clay/amended soil
- Gas venting layer of 200mm thick granular material

Chapter 11

PROJECT BENEFITS SUMMARY

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An integrated solid waste management system would lead to an effective management of the solid waste of the city along with a commercially viable and sustainable implementation plan for the solid waste. Few''' of the benefits, which could be:

- Reduction, reuse and recycle of the waste
- Source Segregation & collection of
- Transportation of waste in covered vehicles to the site
- Processing of waste through composting
- Conversion of waste into a useful and marketable product (Manure)
- Only inerts/processing rejects to be landfilled which is about 25% of total waste quantity transported to the site. This would save upon the future requirements of area for land filling.
- Public and private participatory mechanism to ensure a long-term sustainability of the project.
- Commercially viable project and long term sustainability
- Systematic approach
- Clean, hygienic and better infrastructure of the city

Improved and mechanized services for the community

- Increase in employment opportunities transportation and in processing and disposal facility.
- Organized and a scientific land fill site with 25 years of life
- Regulatory compliant system