Chapter 2

Preconditions of the Project

2 PRECONDITIONS OF THE PROJECT

2.1 Project Site

Based on the Master Plan formulated in Phase I Study, the MIF Project covers the HWM generated in Metro Manila and CALABARZON area.

EMB selected a 10 ha of project site in the future extension area of LIMA Technology Center according to the recommendation of the Master Plan prepared in the Phase 1 study. EMB requested the landowner to cooperate with the study to be conducted by the JICA study team on the 17th of October 2001. In addition, EMB received a letter of confirmation on the same day.

Based upon this confirmation, the JICA study team was officially informed in writing by the secretary of DENR that the project site is the 10 ha area located in LIMA Technology Center.

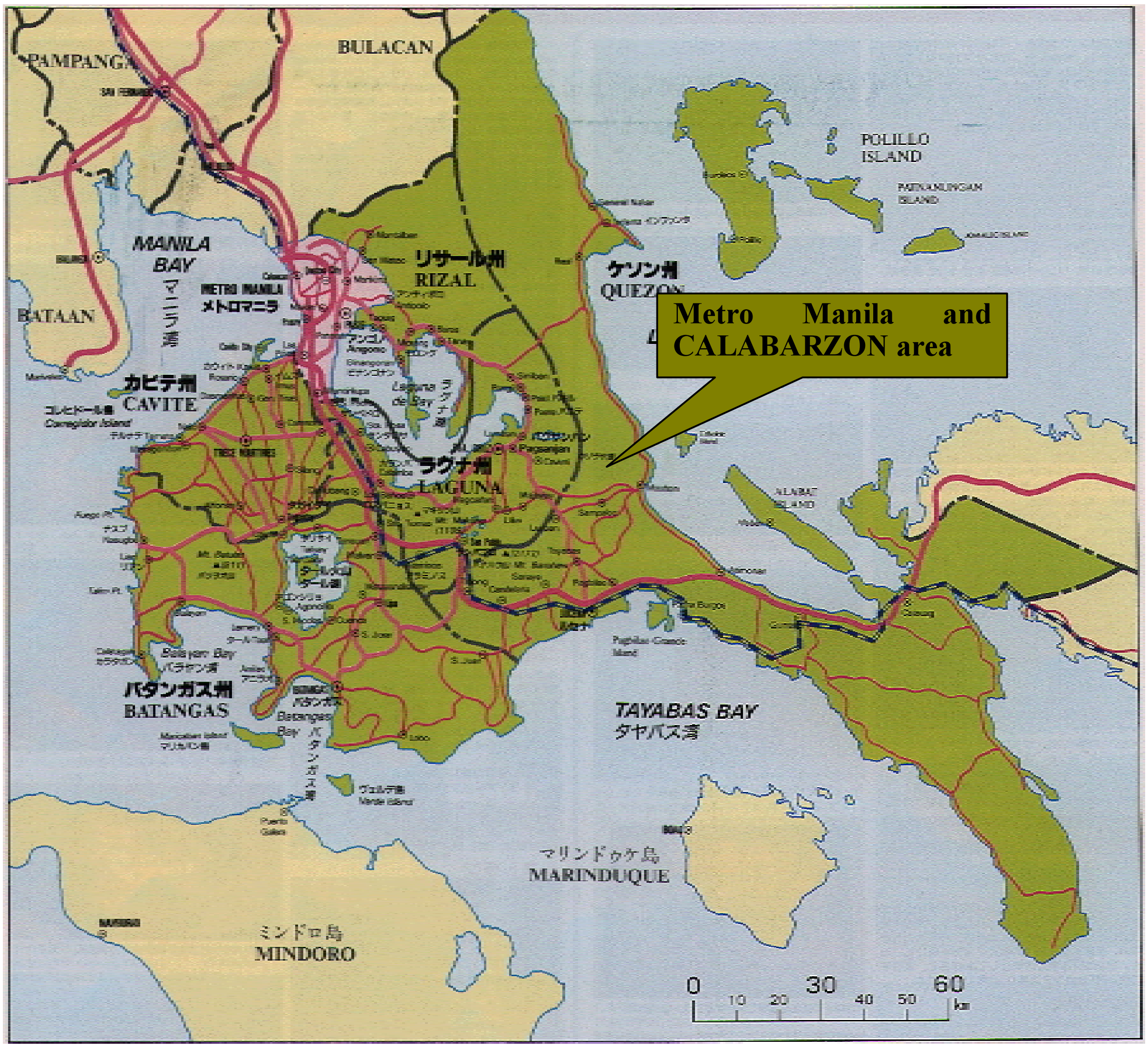

Figure 2.1.1 Location Map of the Project Site

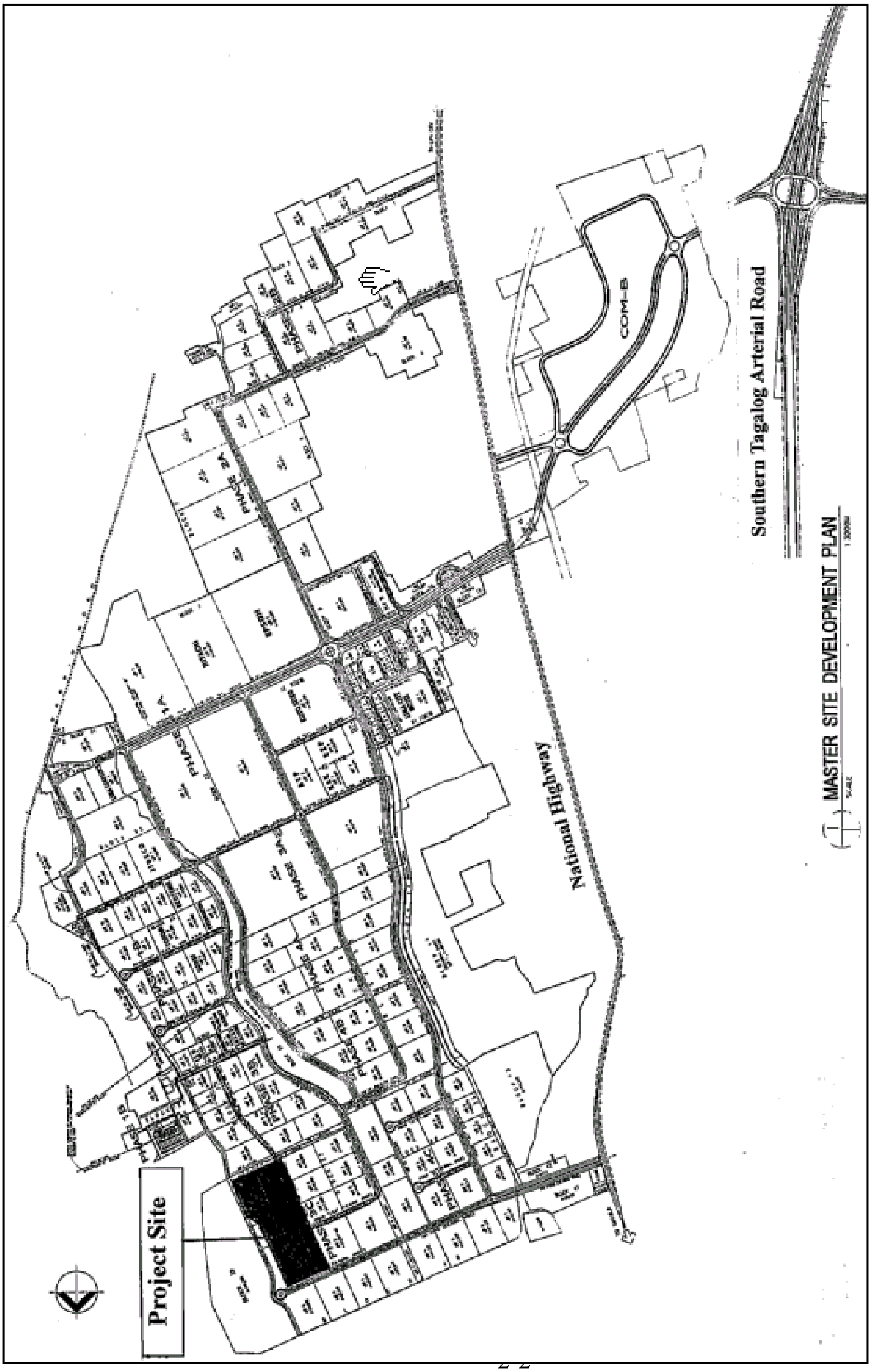

Figure 2.1.2 Location Map of the Proposed MIF Site in LIMA Technology Center

2.1.1 Topographic Survey

The study team undertook a topographic survey of the project site on the 24th of October and it was completed on the 3rd of December 2001. The local contractor commissioned by the study team executed the survey with the cooperation of LIMA Technology Center personnel who helped locate the existing benchmarks to be used.

The survey area has a rolling terrain, with portions covered by bushes and coconut and banana trees and its area is approximately 15 ha. The area was changed from the original plan given in the Phase 1 study, because the plan to divert the existing creek located along the eastern edge of the site was not adopted. The study team applied a scale of 1/500 to the topographic map to attain an accuracy that could be used for a detailed design in the next stage.

Specification for Topographic Survey

a. Site: Proposed site for the model TSD facilities (15 ha)

b. Scale: Horizontal = 1／500

c. Interval of contour: 0.5 m

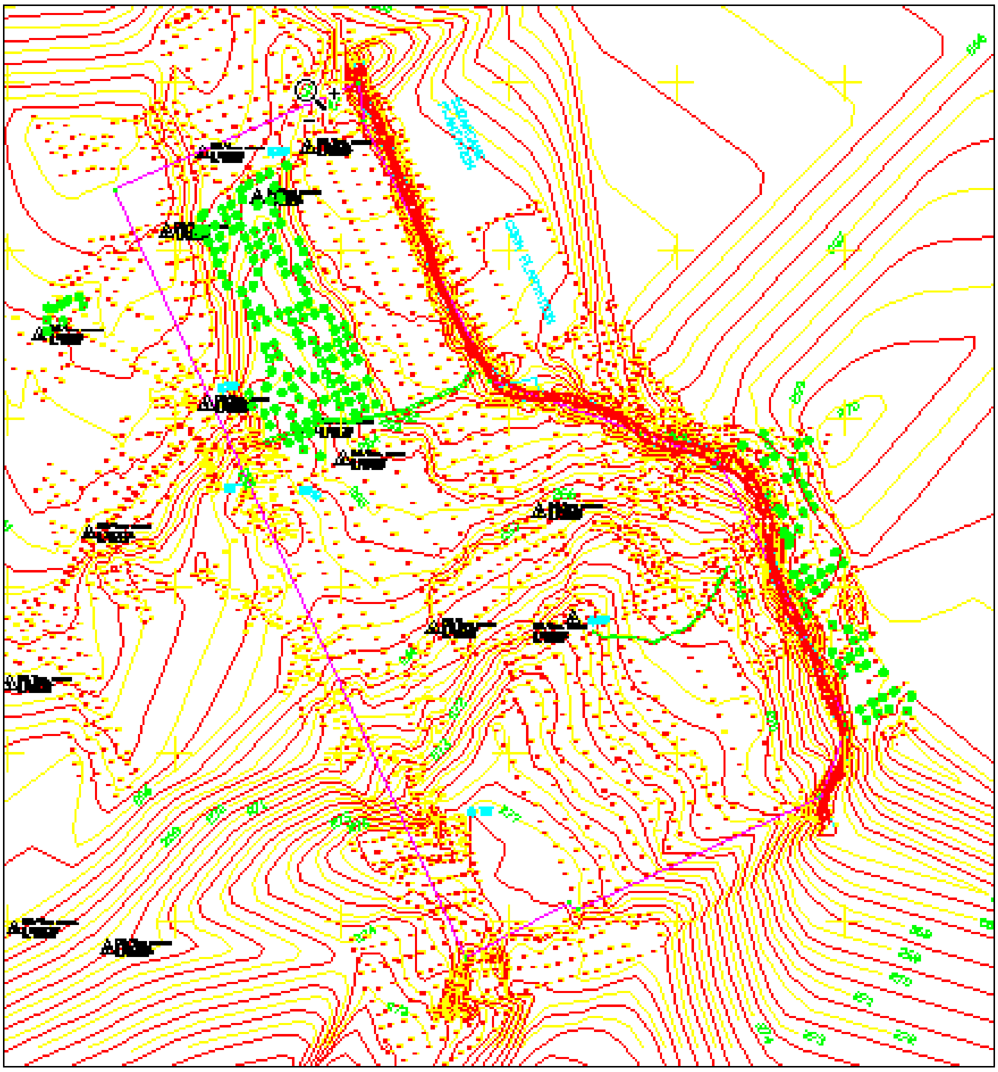

Figure 2.1.3 Topographic Map

2.1.2 Geological Survey

The study team conducted a geological survey of the project site on the same day as the topographic survey according to the following specifications.

The study team conducted five boring works on the project site to ascertain its' geological characteristics. Furthermore, the study team executed three CBR tests along the proposed access road to determine the pavement structure.

Specifications for Geological Survey

a. Site: Proposed site for the model TSD facilities (10 ha)
b. Boring: 5 points
   Depth of boring may be about 20m to confirm the foundation bed.
c. Field test: Standard penetration test, permeability test, ground water level, sampling, CBR test (Access road)
d. Laboratory test:
   Physical test (specific gravity, moisture content, grain size, unit weight, coefficient of permeability)
   Mechanical test (unconfined compression test)

Each boring was dug to 20m because a hard layer with an N value exceeding 50 had not been ascertained.

2.2 Physical Conditions of the Site

The site is located in the future extension area of LIMA Technology Center and its area is approx. 10 ha. Though LIMA Technology Center lies in the Lipa and Malvar municipal areas, the project site is on the Malvar side.

The project site is on a gentle slope. A creek on the eastern side of the site joins the San Juan River and flows into Laguna Lake.

2.2.1 Location and Accessibility

Phase 1 studies show that 70% of HW is being generated in the CALABARZON and Metro Manila areas. The project site is located in northern Batangas adjacent to the Cavite and Laguna provinces where the industrial zones are concentrated. It is also connected directly to the Southern Tagalog Arterial Road linking Santo Tomas with Batangas port by the LIMA interchange to be constructed within three years. Therefore, the project site can have access to all the premises that generate HW in the CALABARZON and Metro Manila areas within two hours.

In addition to the convenience of inland transportation, accessibility from the other islands is also serviceable because the site is only 35km far from the Batangas port.

2.2.2 Infrastructure Availability

(1) Adequate water supply

Water is secured by the groundwater in the neighborhood of the project site. According to the development plan of LIMA Technology Center, 70m^3/ha of groundwater will be supplied by a deep well of more than 250m.

Therefore, the quantity of groundwater has been demonstrated to be sufficient at the developed area.

(2) Electricity supply

LIMA Technology Center now supplies 34.5KV - 50MW of electricity. In addition to the existing supply, the Center plans to introduce a new power line from the 230KV line.

(3) Telephone line

A telephone line is available on the site, and is already being used by the locators in LIMA Technology Center.

(4) Sewerage/water treatment

LIMA Technology Center has its own wastewater treatment facility near the project site. As of the end of 2001, it has been operated at less than half of its capacity. Therefore, all the wastewater can be treated at this facility.

(5) Discharge into creek

LIMA Technology Center discharges treated water from the wastewater treatment facility into the creek that runs along the eastern edge of the project site. The quality of discharged water is controlled by the LLDA, because the treated water flows into Laguna Lake.

2.2.3 Climate and Hydrology

(1) Rainfall

Rainfall data from 1981 to 2000 is shown in the table below.

Table 2.2.1 Rainfall data

NO.	Year	Rainfall	NO.	Year	Rainfall
1	1981	1,869.6	11	1991	1,946.3
2	1982	1,650.9	12	1992	1,586.4
3	1983	1,279.5	13	1993	2,122.6
4	1984	1,798.7	14	1994	1,656.2
5	1985	2,034.4	15	1995	1,965.8
6	1986	2,458.0	16	1996	1,608.4
7	1987	1,369.5	17	1997	1,269.1
8	1988	1,971.0	18	1998	1,678.9
9	1989	2,084.7	19	1999	2,364.1
10	1990	2,283.5	20	2000	2,456.7

Source: Batangas City

(2) Climate

The site has a tropical climate with hot, humid weather throughout the year. The mean annual temperature is 27°C. The weather is normally dry between the months of November and May. The rainy season begins in May and the mean annual rainfall is approximately 1,900mm. The region experiences strong cyclonic storms, or “typhoons”, during which very severe winds and heavy, intense rainfalls may be experienced.

2.2.4 Geology and Hydrology

(1) Ground slope and stability

The highest point of the site is at the southwestern end and the lowest is at the northeastern end, with elevations of 278m and 259m above sea level, respectively. The gradient between these points is approximately 3.8%.

It seems there is no danger of the land collapsing or a landslide on the site and surrounding area.

(2) Surface geology

The project site is covered with a silty sand layer, one to two meters thick. According to the results of permeability tests conducted by the JICA study team, its permeability is less than 7.33E-0.6. This means that the site’s topsoil can be considered for a material for the clay liner to protect from a leakage of leachate.

(3) Sub-surface geology (below 5m)

Sand layers and silty sand lay alternately 5m below ground surface. According to the results of the standard penetration test, the basic formation characterized by a N-values over 50 is not found up to 20 meters underground. However, N-values obtained are mostly over 30, which seem strong enough for a foundation for the proposed buildings.

(4) Aquifer potential

Through the geological survey, the level of ground water is confirmed to be 15 to 18 meters below the surface. However, the quantity of water obtained from this layer does not seem to be in abundance as the contractor could not pump water out of the borehole because the water level was drawn down within a short period of time. On the other hand, ground water seems to be abundant in the deep layer because LIMA Technology Center gets groundwater from a well of which the depth is more than 250m.

(5) Groundwater quality and quantity

The quality of the groundwater obtained from the site is good enough for potable water use. The water quality is shown in Chapter 9.

In terms of quantity, LIMA Technical Center had planned to supply 70 m^3 of water per hectare based on estimated safe reliable yield.

However, LIMA Land will have to monopolize the development of the groundwater in the area in order to supply the water regularly.

2.3 Assumed Demand for Treatment

Based on the registration data of Metro Manila, CALABARZON and Region 5 as of the end of 2000, the generation amount and the actual treatment situation are expressed by types of wastes and treatment methods. The actual treatment situation categorized as Recycle, On-site and Off-site treatment is shown in Table 2.3.1, and furthermore the generation amount categorized by each treatment method is described in Table 2.3.2.

Table 2.3.1 Actual Treatment Situation of HW in the South Luzon

HW Code		Total	Recycle	On-site treatment	Off-site treatment
A	Plating wastes	9,620	0	9,363	258
B	Acid wastes	25,436	1,027	23,899	510
C	Alkali wastes	46,325	1,079	5,427	39,818
D4	Inorganic chemical wastes	48,099	32,843	1,843	13,412
D5	Reactive chemical wastes	194	0	75	118
E	Paints/Resins/Lattices/Dyes /Adhesives/Organic Sludge	4,063	279	1,871	1,913
F	Organic solvents	1,896	634	161	1,100
G	Putrescible /organic wastes	14,280	8,117	155	6,007
H	Textile	69	0	9	59
I	Oil	12,034	7,103	594	4,337
J	Containers	2,090	342	151	1,597
K	Immobilized Wastes	512	61	61	390
L	Organic chemicals	884	74	178	631
M5	Pathogenic or infectious wastes	12,550	0	1,168	11,382
M6	Asbestos wastes	9,954	0	0	9,954
M7	Pharmaceutical wastes and drugs	0	0	0	0
M8	Pesticides	0	0	0	0
Total		188,005	51,560	44,958	91,487

Source: The Master Plan Study on Industrial Hazardous Waste Management in the Philippines (Phase I).

Approximately 188 thousand tons of HWs are annually generated in the Study area, of which about 51% are recycled or treated on-site. The Study estimated that the above situation would continue for the next couples of years.

The remaining 49% (approximately 91.5 thousand tons per year) will comprise the potential demand for off-site treatment. Although the actual treatment situation is not clearly identified, many of these HWs are estimated to be stored on site.

Table 2.3.2 Generation Amount by Types of Wastes and Treatment Methods

HW Code	Grand Total	01-Recycle	02-Incineration	03-Lagoon	04-Biological Treatment	05-Chemical Treatment	06-Oil Separator	07-Storage	08-Disposal	09-Off-site Treater	10-Export	11-Effluent	12-Unclassified Treatment
A Plating wastes	9,620	0	0	9,219	3	141	0	21	5	60	170	0	1
B Acid wastes	25,436	1,027	1	2	44	23,853	0	0	3	17	0	1	490
C Alkali wastes	46,325	1,079	7	2,235	55	3,131	0	36,609	2,225	125	35	0	825
D4 Inorganic chemical waste	48,099	32,843	680	5	17	1,141	0	205	8,085	934	190	0	3,998
D5 Reactive chemical wastes	194	0	72	1	1	2	0	0	117	0	0	0	1
E Paints/Resins/Lattices/Dye /Adhesives/Organic Sludge	4,063	279	148	708	8	1,006	0	18	58	23	0	3	1,811
F Organic solvents	1,896	634	146	0	4	12	0	14	645	9	3	0	430
G Putrescible /organic wastes	14,280	8,117	0	89	66	0	0	0	1,325	0	0	0	4,682
H Textile	69	0	0	0	9	0	0	0	55	0	0	0	4
I Oil	12,034	7,103	11	83	266	61	173	448	157	324	4	0	3,404
J Containers	2,090	342	151	0	0	0	0	7	17	311	0	0	1,262
K Immobilized wastes	512	61	1	60	0	0	0	12	109	250	0	0	19
L Organic chemicals	884	74	137	1	3	28	10	23	4	0	0	0	604
M5	12,550	0	667	500	1	0	0	5	11,170	81	0	0	126
M6	9,954	0	0	0	0	0	0	0	0	0	0	0	9,954
M7	0	0	0	0	0	0	0	0	0	0	0	0	0
M8	0	0	0	0	0	0	0	0	0	0	0	0	0
	188,005	51,560	2,020	12,904	476	29,374	183	37,362	23,975	2,134	402	5	27,609

Source: The Master Plan Study on Industrial Hazardous Waste Management in the Philippines (Phase I).

The Study assumed that the total amount of off-site treatment given in Table 2.3.1 above would be the potential demand of HW treatment by the model facility. Though this assumption is based on the data of registered HW generators only, actual demand may increase with the enhanced enforcement of HWM by EMB. However, the Study took this conservative, but more certain amount as the basic demand of HW treatment.

In terms of treatment process applied, the Study categorized the above treatment demand into three categories as shown in Table 2.3.3 below.

Table 2.3.3 Categorization of Treatment Demand by Types of Processes

Code	HW Category	Off-Site Treatment
1. Thermal Treatment		
E	Paints/Resins/Lattices/Dyes/Adhesives/Organic Sludge	1,913
F	Organic Solvents	1,100
G	Putrescible/Organic Wastes	6,007
H	Textile	59
I	Waste Oil	4,337
J	Containers	1,597
L	Organic Compounds	631
M	Miscellaneous Wastes	11,382
	Thermal Treatment Total	**27,026**
2. Physicochemical Treatment		
A	Plating Wastes	258
B	Acid Wastes	510
C	Alkali Wastes	19,909
D	Chemical Wastes	118
	Physicochemical Treatment Total	**20,795**
3. Solidification/Landfill		
C	Alkali Wastes	19,909
D	Chemical Wastes	13,412
K	Immobilized Wastes	390
M	Miscellaneous Wastes	9,954
	Solidification/Landfill Total	**43,665**
	Total	**91,487**

Source: The Master Plan Study on Industrial Hazardous Waste Management in the Philippines (Phase I).

Regarding the potential demand for thermal treatment of approximately 27 thousand tons per year given in the table above, its actual demand is estimated to be larger since about 2 thousand tons of HW currently incinerated on site will give rise to residues requiring off-site treatment. Moreover, the amount of medical HW may be underestimated in the above estimation due to limited available generation data from hospitals and other medical facilities. Taking all of these into account, the Study established the potential demand of thermal treatment to be 30 thousand tons per year.

As to physicochemical treatment (PCT), a considerable number of generators may establish their own PCT facility to treat their HW on site. Local treaters are also currently employing this type of process. Therefore, the Study estimated that 75%

of the above off-site treatment amount would be absorbed by generators' on-site treatment while a half of the remaining 25% will be handled by the existing local treaters. Accordingly, the potential demand of PCT at the model facility is established to be 2.5 thousand tons per year, about one-eighth of the above off-site treatment amount.

The 43 thousand tons of off-site treatment amount subject to solidification and landfill are considered to represent the amount that is stored on-or off-site for at least 4 to 5 years. Based on this, the Study assumed that the actual potential demand of solidification and landfill would be about 10 thousand tons per year (rounding out the result of dividing 43 thousand tons by 4 years). Although the landfill in the model facility is designed to accept residues generated from each treatment facility in MIF, the Study assumed to accept 60% of the above potential demand 6,000 tons) at the landfill in consideration of the limited availability of proper landfill and storage for HW in the Study area. In this case, 2,500 thousand tons (approximately 40%) of the above 6 thousand tons may be required for solidification to meet the acceptance criteria at the landfill while the remaining 3,500 tons (approximately 60%) can be directly disposed at the landfill.

Thus, the estimated potential demand of HW treatment in the model facility is estimated as shown in Table 2.3.4 below.

Table 2.3.4 Estimated Potential Demand of HW Treatment

Treatment System	Potential Treatment Demand (tons/year)
PCT Facility	2,500
Thermal Treatment Facility	30,000
Solidification	2,500
Controlled Landfill	3,500
Total	38,500

Remark: The potential demand of landfill only includes the amount of direct disposal. The amount coming from other treatment processes in MIF is not included.

Moreover, the Study allocated the above potential demand of HW treatment to each category of HW in the proportion of HW category specific off-site treatment amount given in Table 2.3.3. Table 2.3.5 below shows the results of such allocation.

Table 2.3.5 HW Category-Specific Potential Treatment Demand (in tons per year)

Code	HW Category	Off-Site Treatment	Potential Treatment Demand
1. Thermal Treatment			
E	Paints/Resins/Lattices/Dyes/Adhesives/Organic Sludge	1,913	2,124
F	Organic Solvents	1,100	1,221
G	Putrescible/Organic Wastes	6,007	6,668
H	Textile	59	65
I	Waste Oil	4,337	4,814

Code	HW Category	Off-Site Treatment	Potential Treatment Demand
J	Containers	1,597	1,773
L	Organic Compounds	631	700
M	Miscellaneous Wastes	11,382	12,635
	Thermal Treatment Total	**27,026**	**30,000**
2. Physicochemical Treatment			
A	Plating Wastes	258	31
B	Acid Wastes	510	61
C	Alkali Wastes	19,909	2,393
D	Chemical Wastes	118	14
	Physicochemical Treatment Total	**20,795**	**2,500**
3. Solidification/Landfill			
C	Alkali Wastes	19,909	2,736
D	Chemical Wastes	13,412	1,843
K	Immobilized Wastes	390	54
M	Miscellaneous Wastes	9,954	1,368
	Solidification/Landfill Total	**43,665**	**6,000**
	Total	**91,487**	**38,500**