4.3.2 Lakarsantri Landfill Site

The Lakarsantri Landfill Site consists of two (2) areas; Areas: A and B as shown in Fig. 4.3-2. The Area A is further divided into two (2) sub-areas by the improved river. The area of the partition A is measured to be 7.6 ha. The capacity as of April, 1992 is measured to be about 431,000 t setting the maximum height of landfill at 10.0 m from EL+16.00 m to EL+26.00 m as shown in Fig. 4.3-3. Considering the landfill operation after April, the remaining capacity will be reduced by 34,000 t to 397,000 t at the end of 1992.

The Area B is not used for disposing waste at present due to its limited area. In order to facilitate its disposal function, it is recommended to expand the area extending around this area as shown in Fig. 4.3-2. The additional capacity of the extended area is calculated to be 441,000 t with the same range of elevation as shown in Fig. 4.3-4. Fig. 4.3-5 shows the capacity - elevation relation of this disposal site including the additional area. According to this figure, the potential capacity of the Lakarsantri Landfill Site is expected to be about 838,000 t with the elevation range from EL.+16.0 m to EL.+26.0 m.

4.3.3 Kenjeran Landfill Site

The Kenjeran Landfill Site is the sea reclamation site along the shore line located northeast of Surabaya city. It is expected to exhaust the capacity at the end of 1992. Furthermore it is reported that the site will be closed in 1993 due to the reasons of the land owner.

4.3.4 Summary of Existing Landfill Sites

The potential capacity of existing landfill sites is summarized below. After all the remaining capacity is the total of Keputih and Lakarsantri, 1,340,000 t.

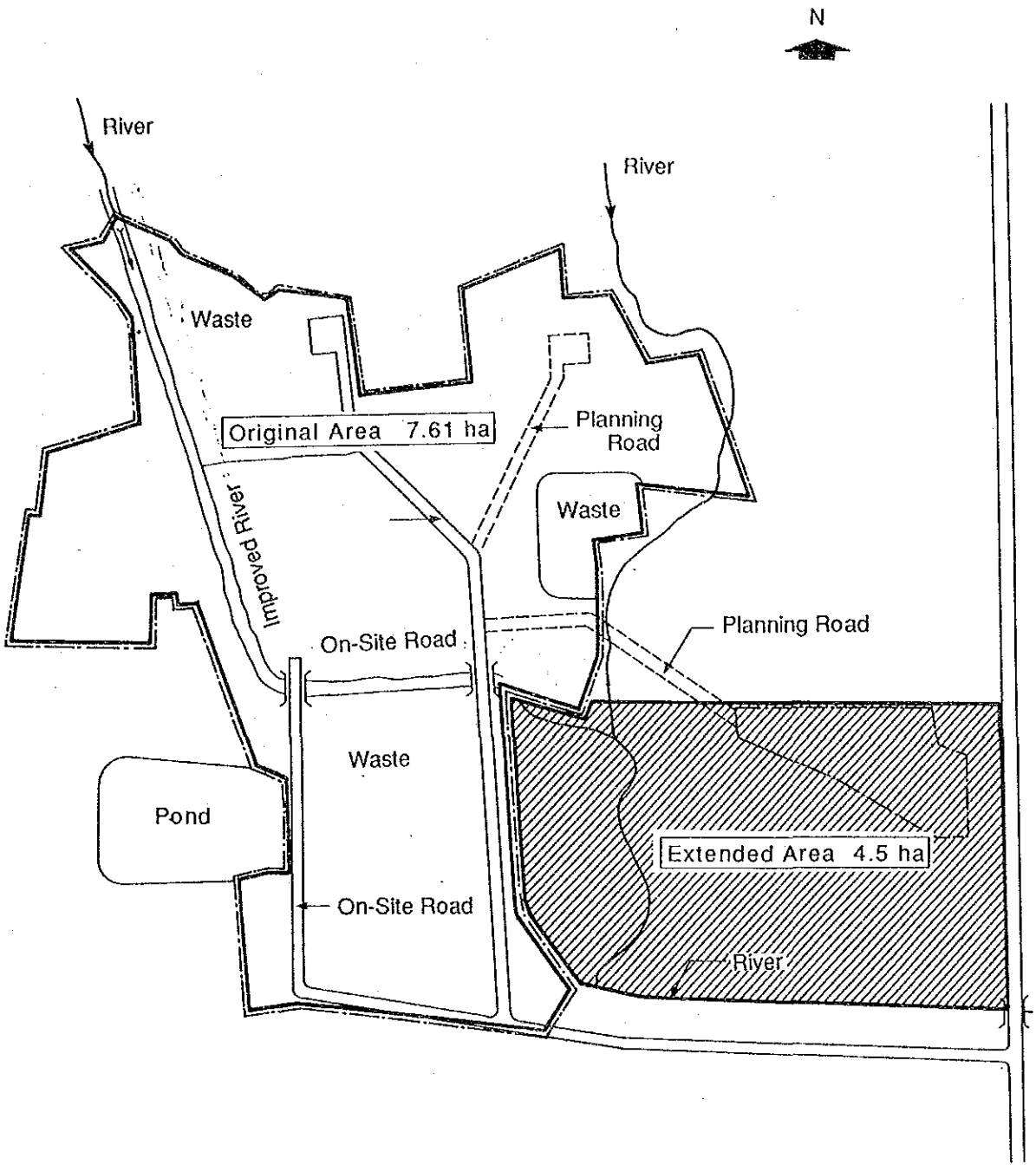
Table 4.3-1 Remaining Capacity of Existing Landfill Sites as of the End of 1992

(Unit : 1,000 t)

Condition	Keputih	Lakarsantri	Kenjeran	Total
Without Expansion	943	397	*	1,340
Proposed Expansion	535	441	-	976
With Expansion	1,478	838	-	2,316

* Kenjeran will be closed in 1992

The expansion and improvement of existing landfill site is not authorized by KMS yet because of difficulty of land acquisition. Therefore, those expanded capacity cannot be taken into consideration.



Legend:

—·—·—·— Present Boundary of the Site

FIG. 4.3-2 ASSUMPTION FOR CAPACITY OF LAKARSANTRI FINAL DISPOSAL SITE

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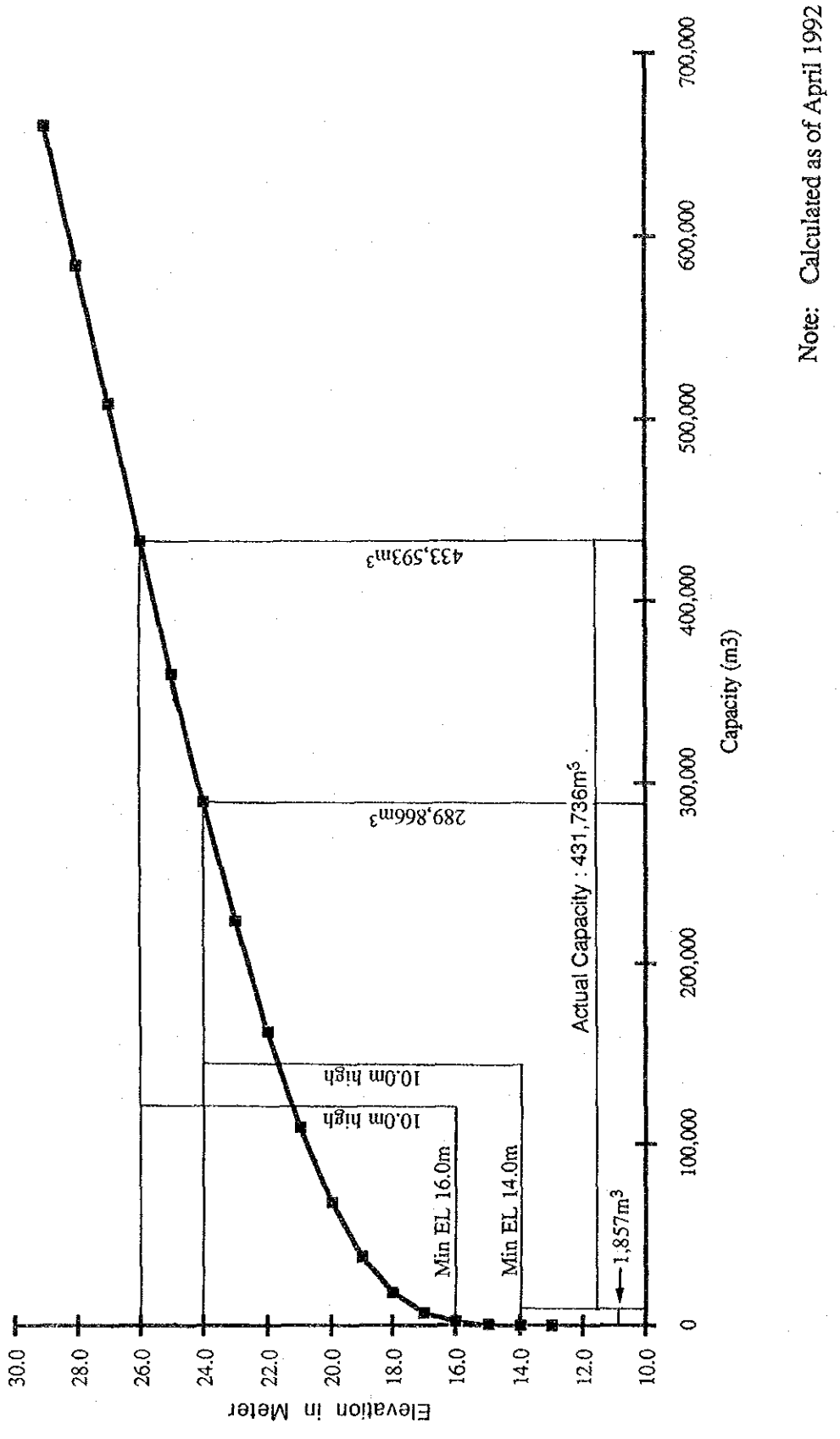

FIG. 4.3-3 ELEVATION CAPACITY RELATION OF THE LAKARSANTRI LANDFILL SITE (ORIGINAL AREA)

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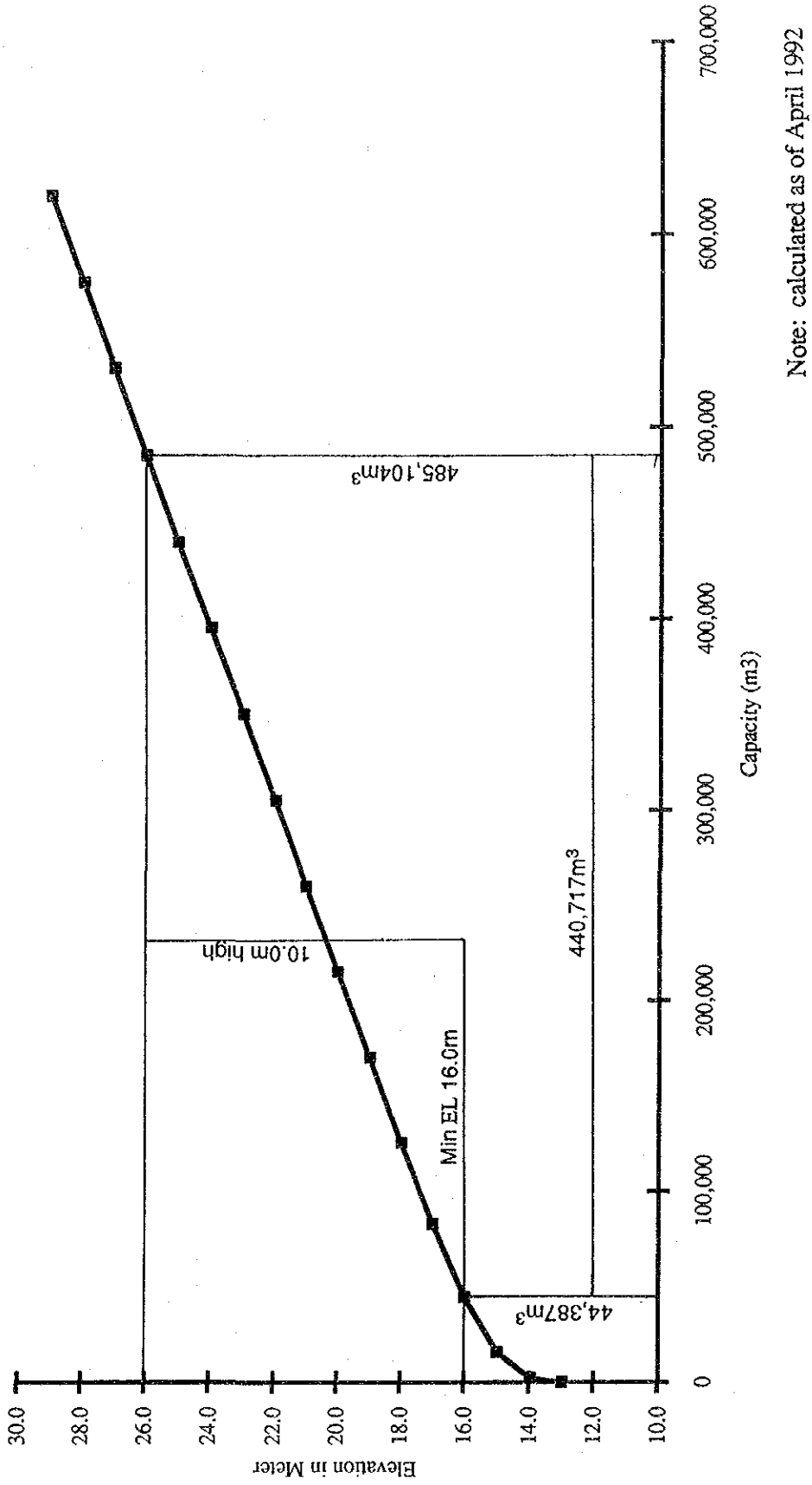

FIG. 4.3-4 ELEVATION CAPACITY RELATION OF THE LAKARSANTRI DISPOSAL SITE(ADDITIONAL AREA)

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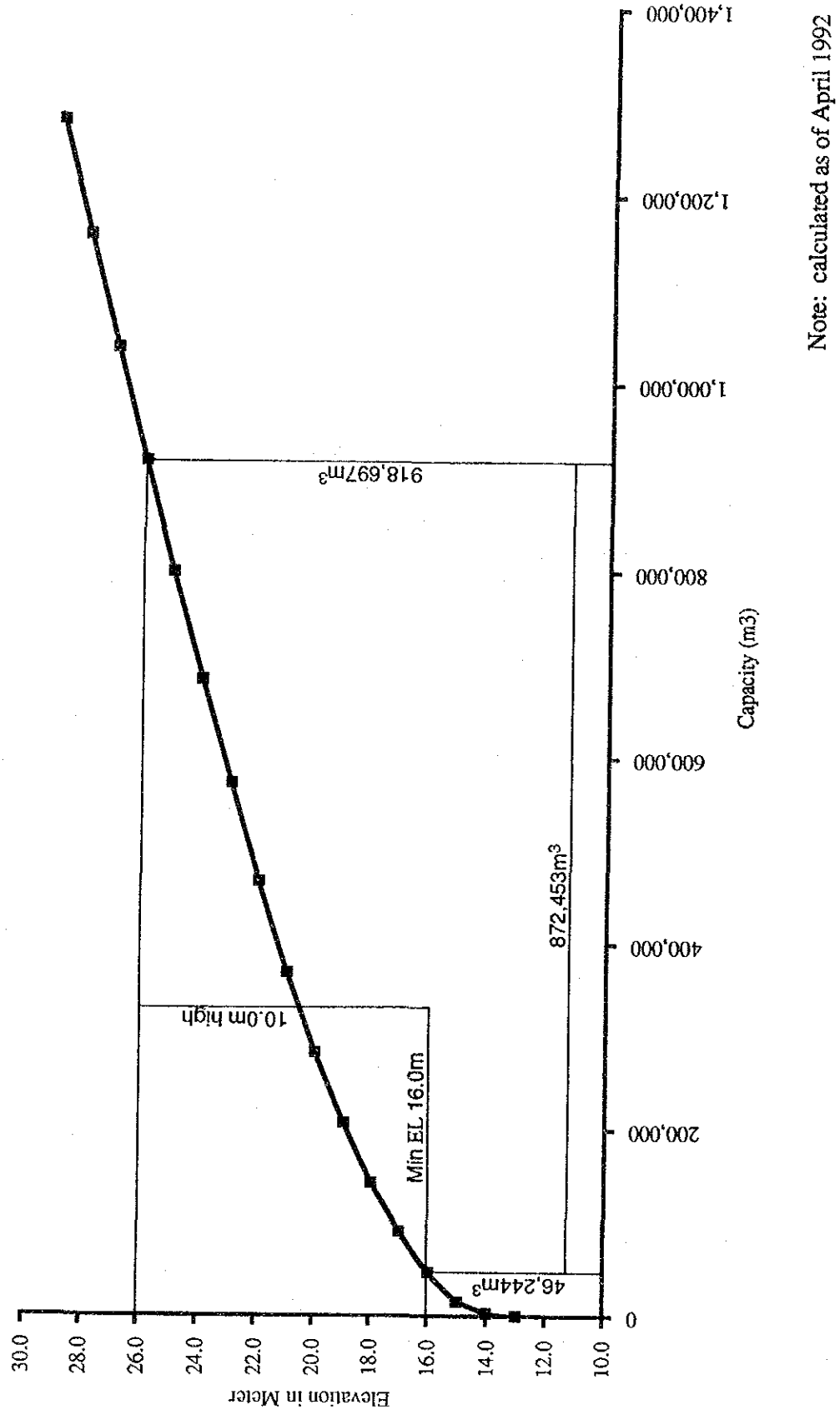

FIG. 4.3-5 ELEVATION CAPACITY RERATION LAKARSANTRI DISPOSAL SITE (TOTAL AREA)

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4.4 Allocation Plan of Landfill Site to Rayon

To reduce the waste haulage across the central part of the city, the following assignment of landfill sites for each Rayon is assumed.

a. Central Rayon : assigned Eastern disposal site, however, while New East is not available, assigned Western disposal site.

b. North Rayon : assigned Western disposal site, however, before Benowo is available, assigned Eastern disposal site.

c. East Rayon : assigned Eastern disposal site.

d. South Rayon : assigned Western disposal site.

e. West Rayon : assigned Western disposal site.

The assumed allocation for planning period based on Case 4 stated in the Main Report is shown in Table 4.4-1 to Table 4.4-5.

Table 4.4-1 Allocation of Landfill Site to Rayon Central

(Unit : 1,000 t)

Year	Keputih	Lakarsantri	Benowo	New East
1993	65			
1994	71			
1995	76			
1996			82	
1997				88
1998				93
1999				98
2000				107
2001				110
2002				113
2003				116
2004				119
2005				122
2006				127
2007				129
2008				130
2009				132
2010				134

Table 4.4-2 Allocation of Landfill Site for Rayon South

(Unit : 1,000 t)

Year	Keputih	Lakarsantri	Benowo	New East
1993		77		
1994		86		
1995		97		
1996		7	100	
1997			118	
1998			130	
1999			142	
2000			161	
2001			173	
2002			185	
2003			197	
2004			211	
2005			224	
2006			244	
2007			260	
2008			277	
2009			295	
2010			314	

Table 4.4-3 Allocation of Landfill Site to Rayon East

(Unit : 1,000 t)

Year	Keputih	Lakarsantri	Benowo	New East
1993	96			
1994	108			
1995	120			
1996	132			
1997	89			56
1998				158
1999				173
2000				194
2001				206
2002				219
2003				233
2004				246
2005				262
2006				283
2007				300
2008				317
2009				336
2010				355

Table 4.4-4 Allocation of Landfill Site to Rayon North

(Unit : 1,000 t)

Year	Keputih	Lakarsantri	Benowo	New East
1993	56			
1994	62			
1995	68			
1996			75	
1997			82	
1998			89	
1999			96	
2000			107	
2001			113	
2002			120	
2003			126	
2004			133	
2005			141	
2006			151	
2007			159	
2008			167	
2009			175	
2010			183	

Table 4-4-5 Allocation of Landfill Site to Rayon West

(Unit : 1,000 t)

Year	Keputih	Lakarsantri	Benowo	New East
1993		25		
1994		30		
1995		35		
1996		40		
1997			45	
1998			52	
1999			58	
2000			68	
2001			75	
2002			82	
2003			90	
2004			99	
2005			108	
2006			120	
2007			130	
2008			143	
2009			154	
2010			167	

4.5 Improvement of Existing LPAs

The history of land once used as a final disposal site is liable to cause an unfavorable influence in surrounding area particularly in water body, for long time even after termination of landfill operation. To improve the sanitary condition is not only natural consequence of solid waste management but also necessary effort to appeal the facility is acceptable to the neighboring community; the effort will mitigate the difficulty of acquiring the new final disposal site in the future.

From this point of view, a sanitary improvement plan is prepared for each existing final disposal site. The key items of the improvement plan are identified and the necessary countermeasures consisting of technical and administrative measures are established as stated below.

4.5.1 Lakarsantri LPA

Considering the present site condition and the situation of disposal operation in the Lakarsantri Landfill Site, the objectives of the necessary countermeasures are set as stated below.

1. Treatment of leachate water generated in the landfill
2. Prevention of offensive odor and insects in and around the site
3. Gas ventilation
4. Stabilization of slope formed with garbage layer

To achieve the above-stated objectives, the following technical and administrative countermeasures are recommended to be conducted as early as possible.

1) Technical Countermeasures

The facilities necessary for improving the present disposal site will be provided as stated below.

a. General

The present Lakarsantri Landfill Site consist of Sub-sites A and B, and the Sub-site A is, further, divided into three (3) parts by the existing river and stream flowing through the site as shown in Fig. 4.5-1. It seems to be difficult to divert such flows to the other route considering the topography thereof, and uneconomical to provide culvert structures. It is,

therefore, recommended to maintain the present river condition as it is, and construct the separate landfills in the site depending on such topographic condition.

It is, further, recommended to expand the landfill area to the low areas located between Sub-site B and the existing river course in order to achieve the storing capacity of the said site to the expected one.

The general layout section plan of the recommended landfill are illustrated in Fig. 4.5-1 and Fig. 4.5-2.

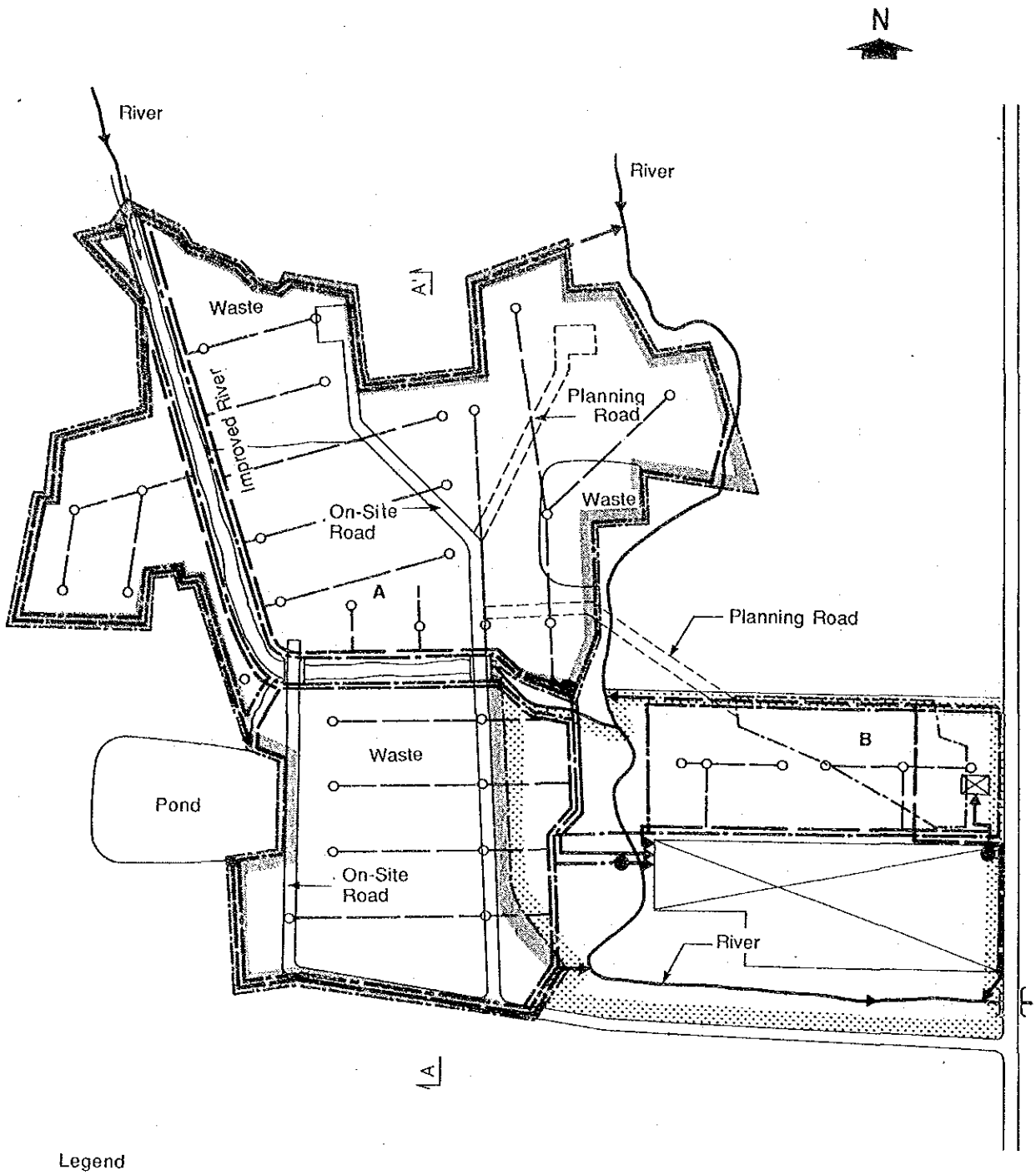

FIG. 4.5-1 GENERAL LAYOUT PLAN OF IMPROVEMENT OF LAKARSANTRI LANDFILL SITE

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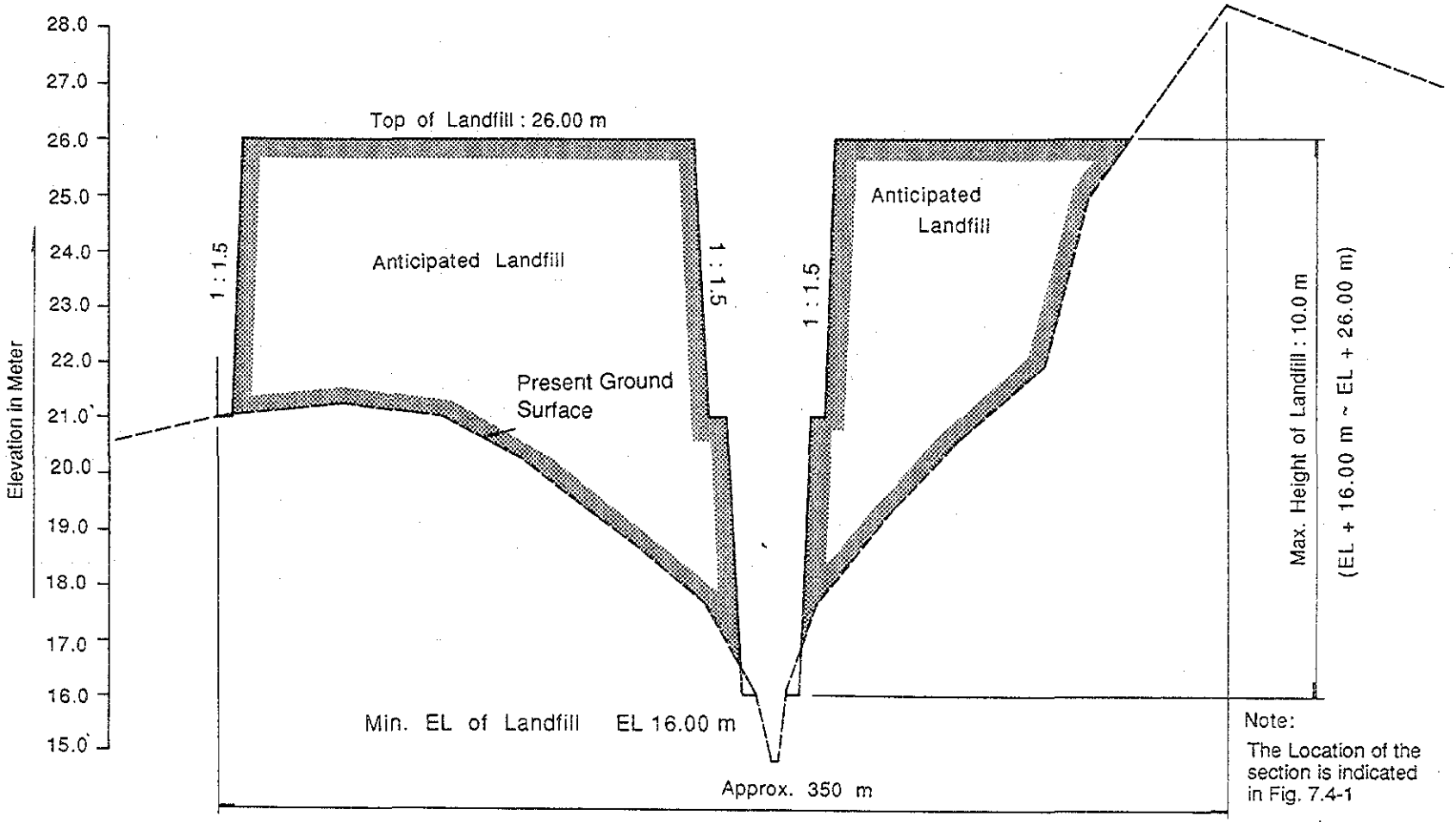

FIG. 4.5-2 CROSS-SECTION OF LAKARSANTRI LANDFILL SITE (SECTION A-A')

THE STUDY ON THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR SURABAYA CITY

b. Leachate Treatment Facilities

In order to treat the leachate generated in the landfill, the following facilities are recommended to be provided in the disposal site.

1. Diversionary ditch to prevent the inflow of the run-off from upstream portion of the site
2. Leachate collection pipes and ditches
3. Oxidation pond
4. Recirculation system

To decrease the leachate volume, the diversionary ditches are required to be provided. Since it is necessary to intercept the run-off flowing into the site from the upstream portion, the diversionary ditches are provided all along the peripheral of the site. Such ditches are of a trapezoidal section with base width of 0.50 m and a side slope of 1:1.50. Total length of the ditches is measured to be about 1.9 km.

The leachate collection system is also necessary for collecting and conveying the leachate generated in the landfill. The system consists of (i) collection pipes, (ii) retention pit, and (iii) leachate conveying pipes and pump.

Two-storey system is applied for the Lakarsantri Landfill Site, because the height of landfill for this site is planned to be rather high reaching to the maximum height of about 10.0 m due to the topography thereof. Where the height of landfill exceeds 5.0 m, second storey of the system is applied, and the first and the second storeys are connected with vertical pipes. The collection pipes are of the clay pipes available locally. The first storey pipes are placed on the bottom of landfill and the second ones on the elevation 5.0 m high above the first storey. Both storeys are connected with vertical column made of gravel contained in the gavion. The pipes of 0.30 m dia. are installed with gravel filter to facilitate collection of leachate in the landfill. This collection system plays a role of a gas ventilation facility also. The typical profile and section of the system are presented in Fig. 4.5-3 and Fig. 4.5-4. The total lengths of collection pipes and ditches are measured to be about 2.9 km and 1.0 km, respectively.

At the downstream end of the collection system, a retention pit is provided to store the collected leachate, and a valve is installed at the outlet of the collection system to regulate the leachate flow. The collected leachate is conveyed to the oxidation pond through PVC pipes. The pond will have a small overflow type spillway to enable the rain water in the site to flow out to the rivers flowing in and around the site. Though such rain water that

collected on the surface of landfill contains some extent of leachate, its density is considered in an acceptable range due to dilution effect.

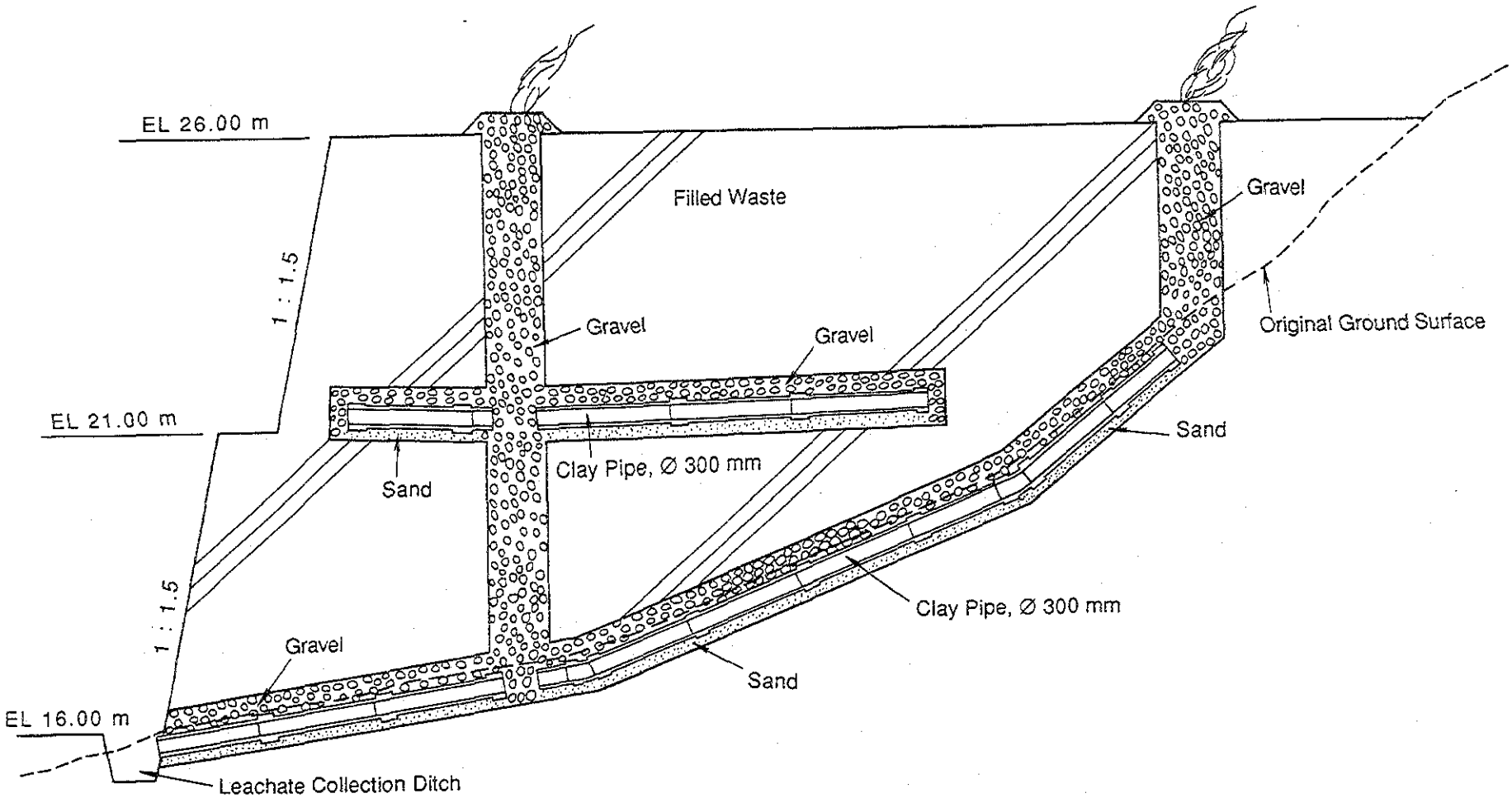

FIG. 4.5-3 TYPICAL PROFILE OF LEACHATE COLLECTION PIPE FOR LAKARSANTRI LANDFILL SITE

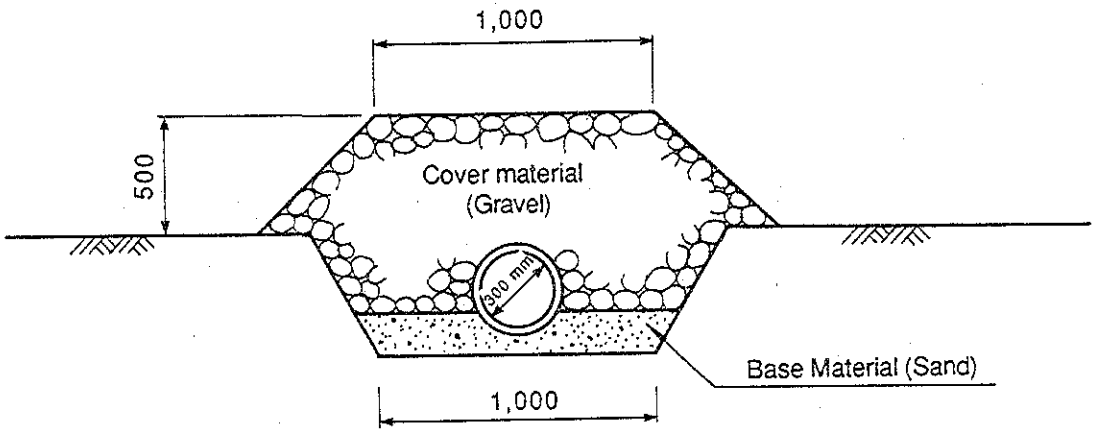

FIG. 4.5-4 TYPICAL CROSS-SECTION OF LEACHATE COLLECTION PIPE OF LAKARSANTRI LANDFILL SITE

THE STUDY ON THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR SURABAYA CITY

The oxidation pond, of which area is measured to be about 1.2 ha, has the depth of 2.0 m. That is provided at the lowest portion of the site. A pump will be installed to recirculate the leachate water from the pond to the top of landfill. The gravel covered area with about 10.0 m by 10.0 m will be provided on the top of landfill to facilitate the absorption of leachate to the landfill.

c. Prevention of Offensive Odor and Insects

To prevent the offensive odor and insects in and around the disposal site, it is recommended to provide soil covers on the portion where the landfill works are completed. The cover should be placed in the process of landfilling from time to time in the following manners.

1. Short term cover with a thickness of 30 cm to be conducted with a few day interval to prevent:

   - littering of wastes,
   - offensive odor, and
   - harmful insects proliferation such as flies, etc.

2. Intermediate cover with a thickness to from 30 cm to 50 cm to be placed when it is necessary that the portion of the site has to be left unfinished for rather long time in order to create foundation of access roads for vehicles and to facilitate the drainage.

3. Final cover more than 50 cm thick to be laid on the top surface of the landfill completed in order to reduce the leachate in the landfill and to finish the completed landfill suitable for the planned ultimate land use thereof.

d. Gas Ventilation

The gas ventilation system shown in Fig. 4.5-5 is provided in the landfill to treat the gas generated in the landfill. For the Lakarsantri Disposal Site, the leachate collection pipes and their vertical pipes will be utilized for this purpose to save the construction costs. The system is planned to treat the gas independently by dispersion in ambient air in principle, but it must be provided with the structure enable to burn the gas when required. The necessary number of ventilator is counted to be 37.

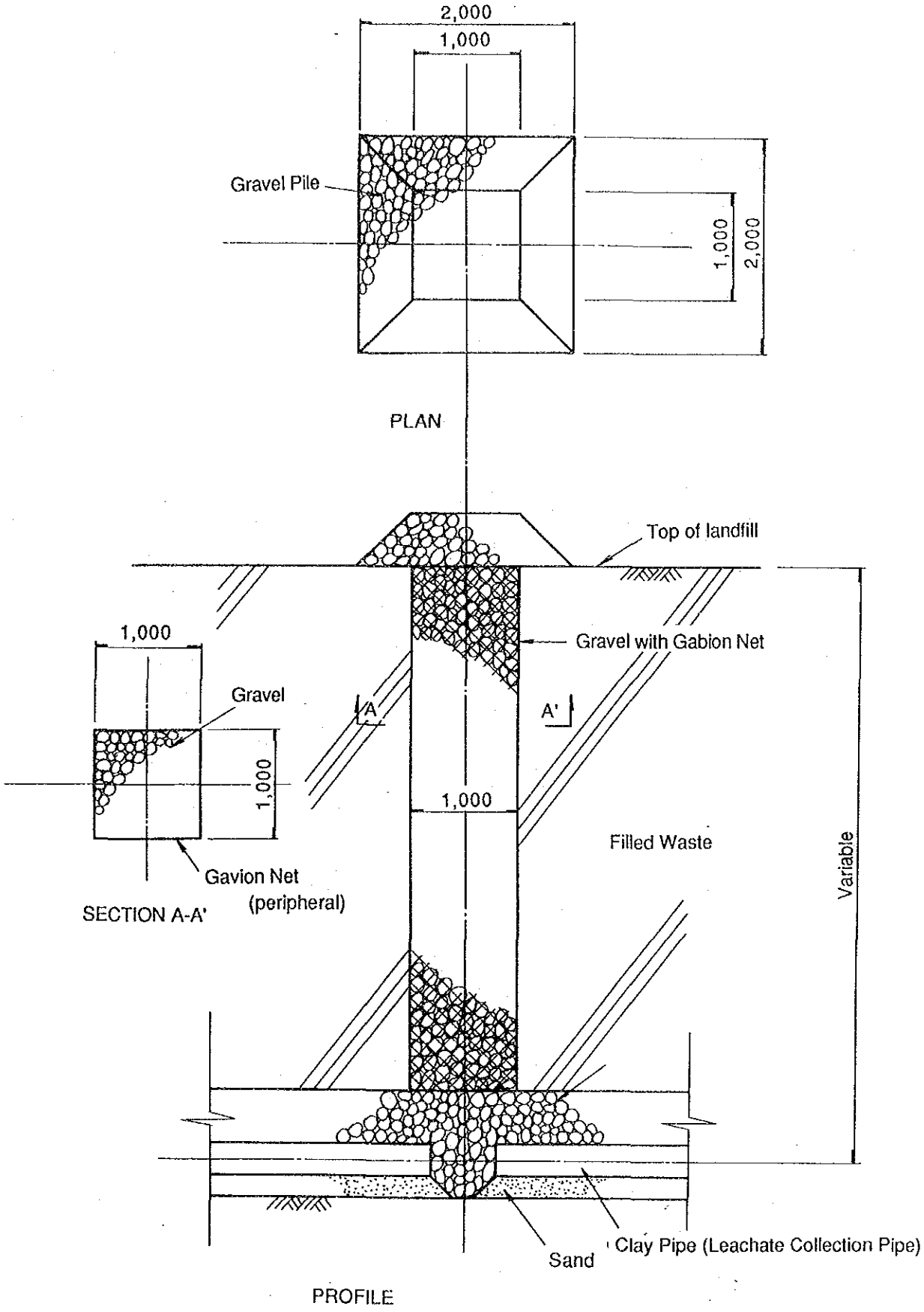

FIG. 4.5-5 TYPICAL GAS VENTILATION SYSTEM

e. Prevention of Garbage Slope from Collapsing

To prevent the garbage slope from collapse, the earthen retaining bunds will be provided along the peripheral of each disposal site. The bund is of the well-selected soil materials to enable to retain itself against the forces acting on it with the dimension of 5.0 m height x 5.0 m berm width x 1:1.50 side slope.

f. Access Roads and Finishing

It is necessary to upgrade the present access roads provided in the site in order to reinforce their bearing capacities to meet with the future more frequent traffic for transporting the wastes into the site. The upgraded access roads are of the section at least 6.0 m wide (5.0 m effective width), paved with 30 cm gravel materials, and with about 1.0 m high embankment as shown in Fig. 4.5-6. The maximum local slope of access roads are set at seven (7) % considering sizes, capacities and speed of the vehicles passing there. In addition, maintenance roads will also be provided along the peripheral of each site to facilitate the maintenance of the completed landfill. The total length of maintenance roads is measured to be 4.6 km.

After the completion of landfilling, all the landfill surface will be finished with sod facing or other plants to protect the surface against erosion and to create a convertible landscaping.

2) Administrative Countermeasures

To increase the present store capacity of the disposal site, it is recommended to acquire the lowland along the tributary of the Kedurus River from Jalan Lontar to disposal site as early as possible, of which area is measured to be about 4.5 ha. The areas both outside and inside of the site will be used for residential areas after the settlement of landfill.

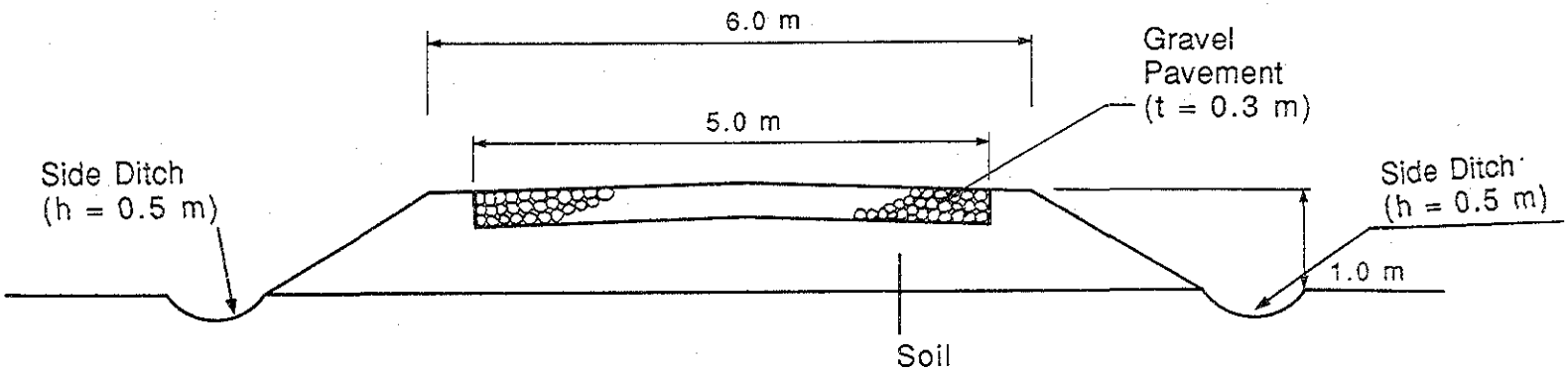

FIG. 4.5-6 TYPICAL CROSS-SECTION OF ACCESS ROAD

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4.5.2 Keputih LPA

Based on the present situation of the Keputih Landfill Site discussed in the foregoing sub-sections, the objectives of necessary countermeasures to be taken for improvement of the said disposal site are established as stated below.

1. Leachate water treatment
2. Prevention of offensive odor and insects

The following technical and administrative measures are required to be taken to achieve the above-stated objectives.

1) Technical Countermeasures

The facilities required for improving the present disposal site will be provided as stated below.

a. General

The present Keputih Landfill Site consists of three (3) partitions; Partitions 1 to 3, and the incineration plant and the human waste treatment plant are also located in Partition 1 as shown in Fig. 4.5-7 and Fig. 4.5-8. To achieve the expected store capacity, it is recommended to expand the site area to the areas located between partitions and rivers.

b. Leachate Treatment Facilities

The following facilities are recommended to be provided to treat the leachate water generated in the landfill.

1. Enclosing ditch to prevent the site from intrusion of run-off in the surrounding areas
2. Leachate collection pipes and ditches
3. Oxidation pond
4. Utilization of the existing human waste treatment plant for treating the leachate water generated in the landfill

To decrease the leachate volume, the enclosing ditches are required to be provided. Since it is necessary to intercept the run-off flowing into the site from the surrounding areas, the enclosing ditches are provided all along the peripheral of the site. Such ditches are of a

trapezoidal section with base width of 0.50 m and a side slope of 1:1.50. Total length of the ditches is measured to be 3.8 km.

The leachate collection system is also necessary for collecting and conveying the leachate generated in the landfill. The system consists of (i) collection pipes, (ii) retention pit, and (iii) leachate conveying pipes and pump.

Single-story system is applied for the Keputih Landfill Site unlike the Lakarsantri Landfill Site, because the site is flat and the height of landfill for this site is planned to be about five (5) m only. The collection pipes are of the clay pipes available locally, and placed on the bottom of landfill. The pipes of 0.30 m dia. are installed with gravel filter to facilitate collection of leachate in the landfill. This collection system plays a role of a gas ventilation facility also. Therefore, the vertical conduit will also be provided for the use as the gas ventilation system. The typical profile and section of the collection pipes are shown in Fig. 4.5-9 and Fig. 4.5-10. The total lengths of collection pipes and ditches are measured to be about 10.1 km and 1.1 km, respectively.

While the leachate generated in the landfill of Partitions 1 and 2 is planned to be collected and discharged directly into the oxidation pond adjacent to the partitions, that in the Partition 3 is once collected in the pit, conveyed to the upstream end of the leachate collection ditch of the Partition 1 with small pump and transportation pipe, and discharged into the oxidation pond through the said collection ditch, because the Partition 3 is isolated.

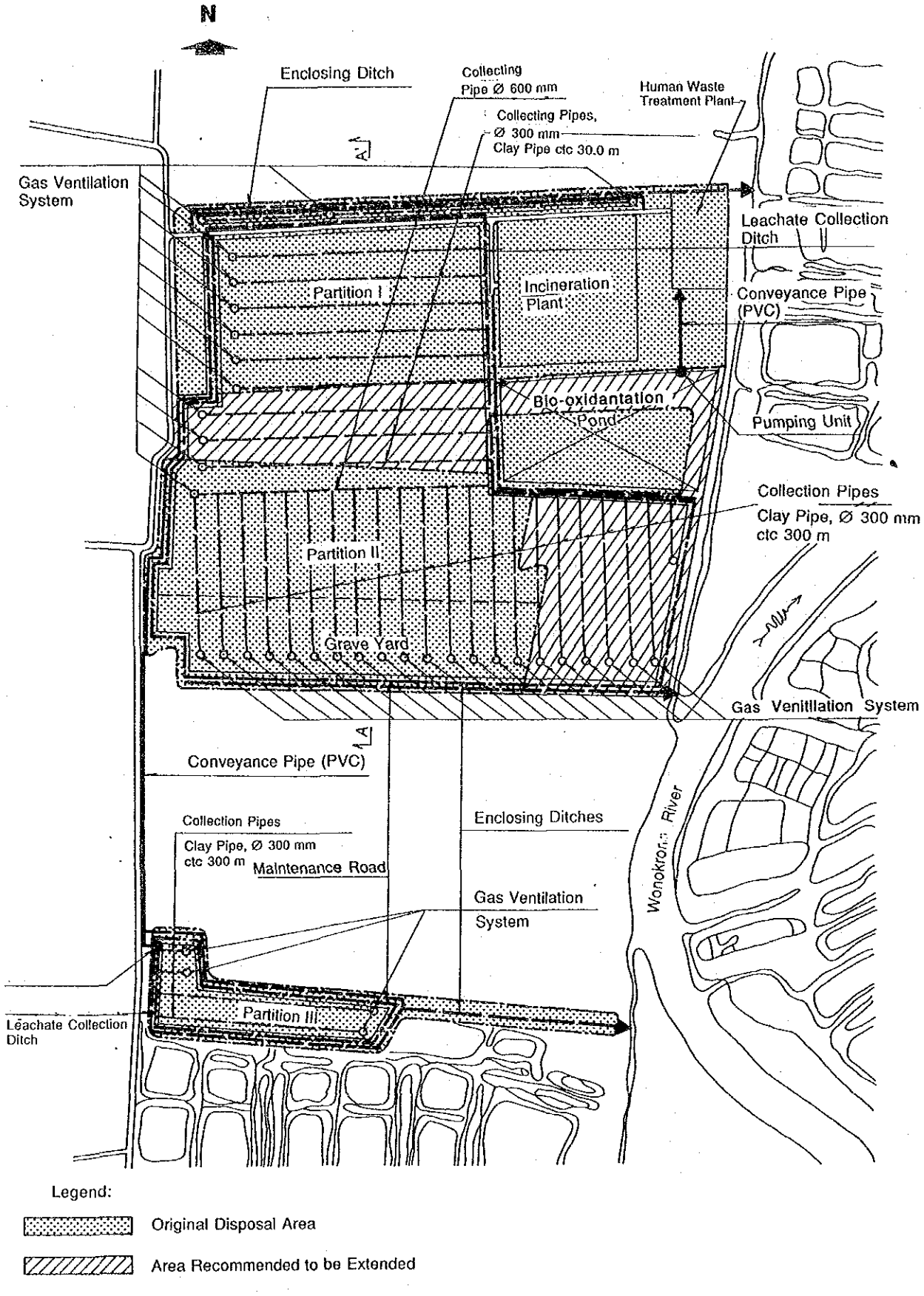
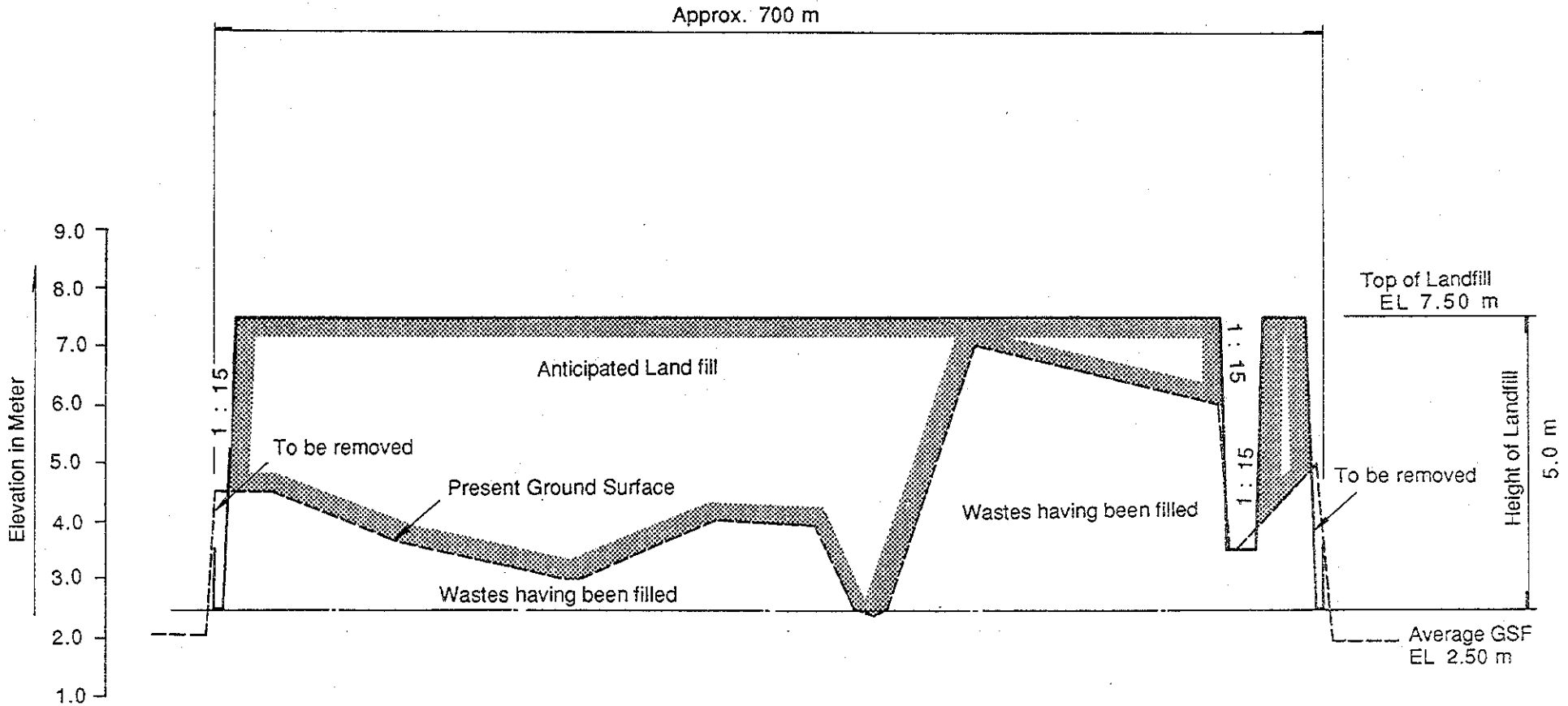


FIG. 4.5-7 GENERAL LAYOUT PLAN OF IMPROVEMENT OF KEPUTIH LANDFILL SITE

THE STUDY ON THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR SURABAYA CITY



Note: The location of the section is indicated in Fig. 7.3-8.

FIG. 4.5-8 CROSS-SECTION OF KEPUTIH LANDFILL SITE (SECTION A-A')

THE STUDY ON THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR SURABAYA CITY

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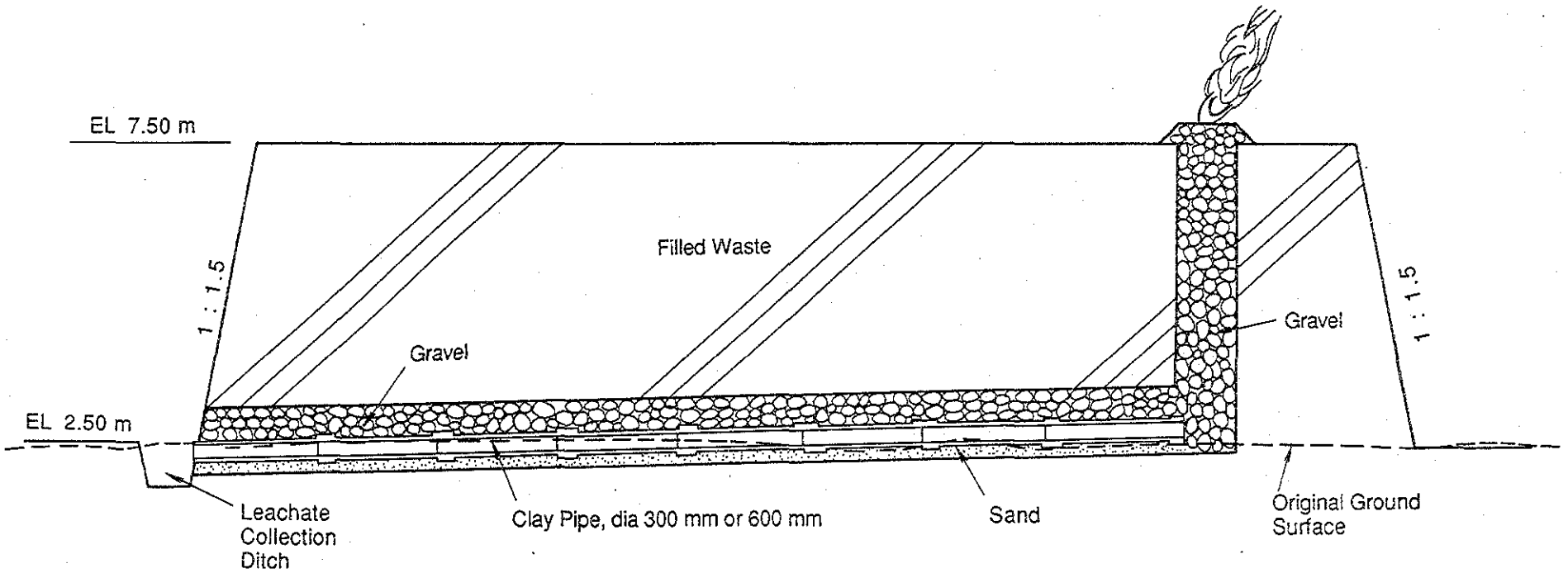
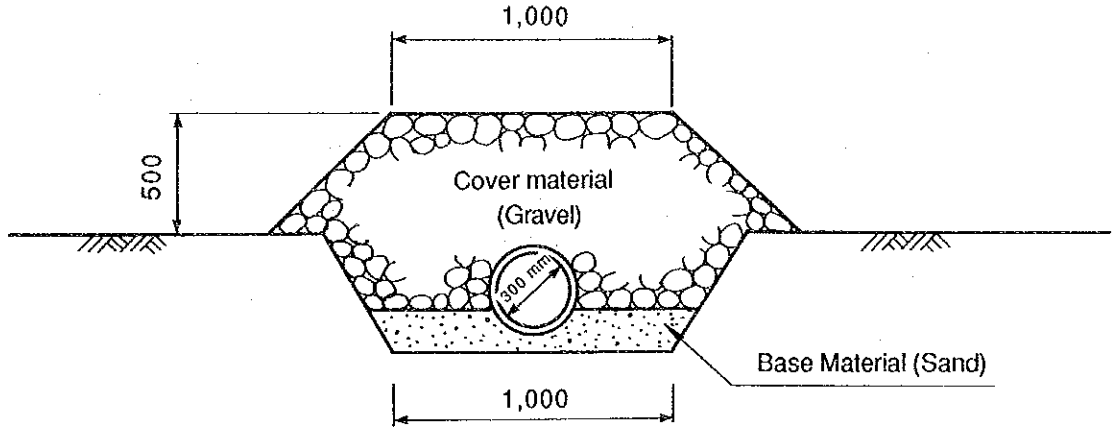


FIG. 4.5-9 TYPICAL PROFILE OF LEACHATE COLLECTION PIPE FOR KEPUTIH LANDFILL SITE

THE STUDY ON THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR SURABAYA CITY



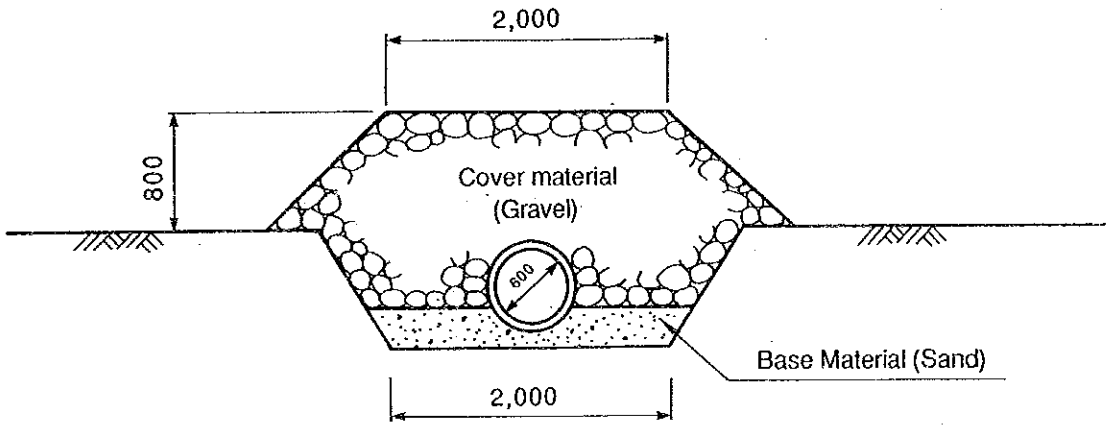


FIG. 4.5-10 TYPICAL CROSS-SECTION OF LEACHATE COLLECTION PIPE OF KEPUTIH LANDFILL SITE

The bio-filter and oxidation pond which has the similar function with the area of 3.4 ha is provided at the narrow tract expanded between the Partitions 1 and 2. A small pump will be installed to convey the leachate water to the human waste treatment plant located in Partition 1 to treat the leachate.

c. Prevention of Offensive Odor and Insects

To prevent the offensive odor and insects in and around the disposal site, it is recommended to provide soil covers on the portion where the landfill works are completed. The cover should be placed in the process of landfilling from time to time in the same manners as the Lakarsantri Landfill Site.

d. Gas Ventilation

The gas ventilation system is provided in the landfill to treat the gas generated in the landfill. For the Keputih Landfill Site, the leachate collection pipes and their vertical conduits will be utilized for this purpose to save the construction costs. The system is planned to treat the generated gas independently with atmospheric dispersion in principle, but it must be provided with the structure enable to burn the gas when required. The typical ventilation system to be applied to this disposal site is shown in Fig. 4.5-5, and the total necessary number of gas ventilator is counted to be 35.

e. Prevention of Garbage Slope from Collapsing

To prevent the garbage slope from clasping, the earthen retaining bunds will be provided along the peripheral of each disposal site. The bund is of the well-selected soil materials to enable to retain itself against the forces acting on it with the dimension of 5.0 m height x 5.0 m berm width x 1:1.50 side slope.

f. Access Roads and Finishing

It is necessary to upgrade the present access roads provided in the site in order to reinforce their bearing capacities to meet with the future more frequent traffic for transporting the wastes into the site. The upgraded access roads are of the section at least 6.0 m wide (5.0 m effective width), paved with 30 cm gravel materials, and with about 1.0 m high embankment. The maximum local slope of access roads are set at seven (7) % considering sizes, capacities and speed of the vehicles passing there. In addition, maintenance roads will also be provided to facilitate the maintenance of the completed landfill. The total length of maintenance roads is measured to be about 4.6 km.

After the completion of landfilling, all the landfill surface will be finished with sod facing or other plants to protect the surface against erosion and to create a comfortable landscaping.

2) Administrative Countermeasures

The following measures are required to be conducted to improve the capacity of the said disposal site as early as possible.

1. Land acquisition of isolated area between three pieces of LPA site and enclosed area by LPA and Pojokan Semampir River, a tributary of Wonokromo River; about 11.5 ha.
2. Acceptance of leachate water at the human waste treatment plant

The areas both outside and inside of the disposal areas will be used for green area and, residential and green areas, respectively, in the future.

4.5.3 Kenjeran LPA

Kenjeran final disposal site has been contributing Surabaya City in acceptance of solid waste discharged by residents since 1984. Its output would have reached up to 5 million m^3 of disposed amount by the time its lifetime completed in 1992.

Though its contribution to Surabaya City was great, there remains a problem to be solved. There is a possible water pollution caused by leachate water out of the pile of solid waste already buried down. It seems that there is no problem in dry season, however, it is necessary to keep sound condition of neighboring water body even in rainy season.

The operating landfill site is enclosed by an onsite road which consists of rock-made breakwater and soil embankment with a width of about 10 m. The structure has a certain function to prevent seepage of leachate water out of site, however, it is uncertain if the pressure of seepage may exceed the impermeability of embankment in rainy season. That is the reason why an introduction of water treatment facility is proposed.

The most important objective is to prevent the intrusion of the pollutant into the adjacent sea area. The plan of improvement of the Kenjaran Landfill Site is presented in Fig. 4.5-11.

It is recommended to provide an enclosing drain along the road space.

The leachate water treatment plant is also recommended to be provided in the site to treat the leachate generated in the site. The treated leachate will be discharged into the sea area.

To prevent the offensive odor and insects it is recommended to provide the soil covers on the disposed wastes as early as possible.

As for the operation of the water treatment plant, it should be taken care of by the land owner who utilizes the site as a part of recreation facility because the operation is considered to be a component of the maintenance to keep the facility clean. Therefore it is better the operation of the water treatment plant would be entrusted to the owner by KMS Cleansing Department who is to be the constructor of the plant.

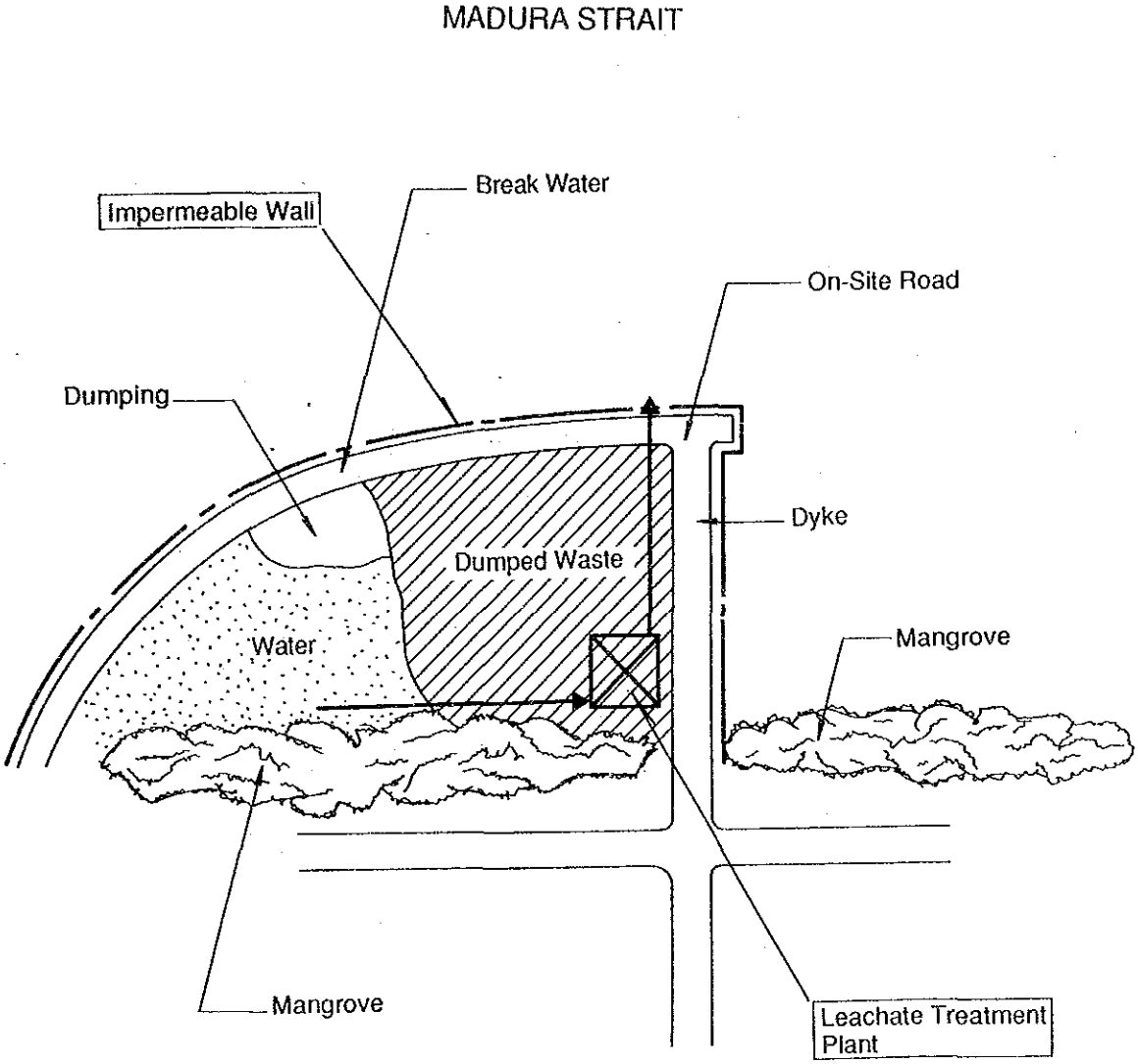


FIG. 4.5-11 GENERAL LAYOUT PLAN OF IMPROVEMENT OF KENJERAN LANDFILL SITE

4.5.4 Cost Estimates of Improvement of Existing LPAs

1) General

The direct construction costs required for improving the existing LPAs such as Keputih, Lakarsantri and Kenjeran Disposal Sites are estimated as stated below based on the preliminary design.

2) *Preliminary Cost Estimates*

The works for improvement of the Keputih and the Lakarsantri Disposal Sites consist mainly of construction of approach, temporary access and maintenance roads, construction of leachate treatment facilities including bio-oxidation ponds, and construction of gas ventilation system. The impermeable walls should be constructed in the Kenjeran Disposal Site to avoid the leakage of leacheate water to the sea.

The estimated costs are summariazed below, and their detailes are presented in Table 4.5-1.

1. Keputih Disposal Site: Rp.3,464,196,000

2. Lakarsantri Disposal Site: Rp.2,833,101,000

3. Kenjeran Disposal Site: Rp.852,000

4. Total Required Direct Costs: Rp.7,149,297
   (Total of Items 1 to 3)

Considering that the anticipated capacities of the Keputih and the Lakarsantri Disposal Sites are calculated to be 1,559,000 m^3 and 872,000 m^3, respectively, the costs per m^3 are derived as stated below.

1. Keputih Disposal Site: Rp.2,222/m^3

2. Lakarsantri Disposal Site: Rp.3,249/m^3

Table 4.5-1 Preliminary Cost Estimates for Improvement of Existing Disposal Site (1/2)

(Unit: 1,000Rp.)

Item	Description	Quantity	Unit Price	Amount
I. Improvement of Keputih Disposal Site				**3,464,196**
1.	Construction of Temporary Access Roads	1.2 km	198,000	237,600
2.	Construction of Maintenance Roads	4.6 km	198,000	910,800
3.	Construction of Retaining Bund	3.9 km	400,000	1,560,000
4.	Construction of Leachate Treatment Facilities			738,296
4.1	Placing Clay Pipes for Leachate Collection System Including Gravel Filter and Sand Bed	10.1 km	19,300	194,930
4.2	Constructionof Leachate Collection Ditches	1.1 km	3,340	3,674
4.3	Construction of Pits with Pumping Unit for Conveying Leachate	1.0 no.	23,000	23,000
4.4	Placingt PVC Pipe for Transporting Leachate	1.0 km	96,000	96,000
4.5	Construction of Enclosing Ditches along Peripheral of Site	3.8 km	3,340	12,692
4.6	Construction of Bio-oxidation Pond	3.4 ha	120,000	408,000
5.	Construction of Gas Ventilation System	35.0 nos	500	17,500
II. Improvement of Lakarsantri Disposal Site				**2,833,101**
1.	Construction of Approach Roads	0.3 km	220,650	66,195
2.	Construction of Temporary Access Roads	1.0 km	198,000	198,000
3.	Construction of Maintenance Roads	4.6 km	198,000	910,800
4.	Construction of Retaining Bund	3.3 km	400,000	1,320,000
5.	Construction of Leachate Treatment Facilities			274,856
5.1	Placing Clay Pipes for Leachate Collection System Including Gravel Filter and Sand Bed	2.9 km	19,300	55,970
5.2	Constructionof Leachate Collection Ditches	1.0 km	3,340	3,340
5.3	Construction of Pits with Pumping Unit for Conveying Leachate	2.0 nos	23,000	46,000
5.4	Placingt PVC Pipe for Transporting Leachate	0.2 km	96,000	19,200

Table 4.5-1 Preliminary Cost Estimates for Improvement of Existing Disposal Site (2/2)

(Unit: 1,000Rp.)

Item	Description	Quantity	Unit Price	Amount
5.5	Construction of Enclosing Ditches along Peripheral of Site	1.9 km	3,340	6,346
5.6	Construction of Bio-oxidation Pond	1.2 ha	120,000	144,000
6.	Construction of Gas Ventilation System cum Vertical Collection Pipes	37.0 nos	1,000	37,000
7.	Construction of Leachate Recirculation System	1.0 no.	26,250	26,250
III. Improvement of Kenjeran Disposal Site				**852,000**
1.	Construction of Approach Roads	1.2 km	274,000	329,000
2.	Construction of Pits with Pumping Unit	4 set	23,000	92,000
4.	Construction of Leachate Treatment Plant and Discharge Facility	1.0 set	431,000	431,000
IV. Total Amount (I+II+III)				**7,149,297**

4.6 Improvement of Existing Incinerator

4.6.1 Suggested Air Pre-heater

A suggested air pre-heater is defined its specifications by assuming the following condition:

•	Flue gas temperature	400°C	1)
•	Flue gas flow rate	10,600 Nm^3/h	1)
•	Combustion air flow rate (V)	4,500 Nm^3/h	2)
•	Inlet air temperature (Ti)	25°C	
•	Outlet air temperature (To)	200°C	

Note:

1) Source; Investigation of Air, Water and Land Pollution from the Waste Incineration Plant in Surabaya, Dinas Keberasihan Pemerinta Kotamadya Dati II, Surabaya 1991.

2) Combustion air flow rate is calculated below.

$L = l \times Lo = l \{8.89 \times c + 26.7 \times (h-o/8) + 3.33 \times s\}$

L : Combustion air flow rate (Nm^3/kg)
l : Excess air ratio (l = 2)
Lo : Theoretical combustion flow rate
c : Carbon ratio of unit weight of waste
h : Hydrogen ratio of unit weight of waste
o : Oxygen ratio of unit weight of waste
s : Sulfur ratio of unit weight of waste

According to the chemical analysis of Household waste, each values are giver as follows:

c : 0.1498
h : 0.019
o : 0.0885
s : 0.00019

$L = 2 \times \{8.89 \times 0.1498 + 26.7 \times (0.019 - 0.0885/8) + 3.33 \times 0.00019\}$
$= 3.09\ Nm^3/kg$

Therefore, the combustion air flow rate is

$$3.09\ Nm^3/h \times \frac{200\ ton/day}{6\ furnace \times 24\ hour} = 4{,}500\ Nm^3/h$$

With this equipment, the heat recovery is expected at about 236,000 kcal/h for a hurnace:

$Q_{Air} = V \times C \times \Delta T$

note : V : Combustion air (4,500 Nm^3/h)

C : Specific heat (0.3 kcal/Nm^3/deg)

ΔT : To - Ti = 200 - 25 = 175°C

= 4,500 x 0.3 x 175

= 236,250 kcal/h

On the other hand, the fuel consumption of the existing incineration plant is reported to be 10 to 24 liter per one ton of waste (refer to Table 3.8-1). Assuming the fuel consumption at 24 liter/ton by adopting the maximum value, the heat value of fuel is given below.

Q_{Fuel} = 24 l/ton x 1.39 ton/h x 7,000 kcal/l

note : 1.39 ton/h = 200 ton/d ÷ 24 hr ÷ 6 furnaces

7,000 kcal/l : calorific value of fuel

= 233,520 kcal/h

The heat value of the fuel (Q fuel) and the heat recovery (Q air) are almost same each other: this means that the assist fuel will be of no use if the air pre-heater is installed.

4.6.2 Cost Estimate

The unit cost of air preheater is estimated at Rp 120,000,000/unit, which is the approximate cost of the small-sized pilot plant for incineration installed by KMS.

Total cost of air preheater : Rp936,000,000
(Rp 120,000,000/unit x 1.3 (Interest) x 6 units)

Total fuel cost : Rp249,892,797/year
(15.95 l/ton x 147 ton/day x 365 days x Rp292/l)

note: 15.95 l/ton : average consumption of existing plant

After all, the cost will be recovered in about 5 years.

CHAPTER 5.

VEHICLE MAINTENANCE AND REPAIR

CHAPTER 5. PLAN FOR VEHICLE MAINTENANCE AND REPAIR

5.1 Removal of Abandoned Vehicles/Containers and Remodeling of the Asemrowo Workshop

5.1.1 General

An apparent physical problem with the Asemrowo Workshop is that much of the area is occupied with abandoned trucks and containers. There are as many as 37 abandoned trucks waiting for a permission for official abandonment which are to be given by the municipal parliament. It seems that the Cleansing Department asked for such a permission three times since 1986, but did not receive the permission yet.

The existence of many abandoned vehicles and container has been causing not only obstacles to the traffic in the Workshop area, but also dangers as a passing vehicle may hit other vehicles while passing narrow areas on the premise.

After the removal of the abandoned trucks and containers, the workshop area should be remodeled in such a manner as to divide it into two major parts: one part for parking area, the other for maintenance and repair area. The purpose of the remodeling is to use the Workshop area more effectively and safely.

5.1.2 Remodeling of the Asemrowo Workshop

Fig. 5.1-1 shows the proposed remodeling plan for the Asemrowo Workshop.

1) Parking Area and Vehicle Passage

The left side (indicated as 1-1 & 1-2 in Fig. 5.1-1) should be used as parking space. A paved passage (indicated as 2 in the figure) should be constructed on the left side of the parking space so that vehicles can pass through it. The passage to be paved will be roughly 4 m wide 30 m long.

2) Repair and Maintenance Area

The right side of the workshop area will be used as repair and maintenance space. In the two repair sections (indicated as 3 and 4 in Fig. 5.1-1), most repairs including those

of engine, chassis, brake will be carried out. There will be 10 bays (6 bays in the first section, 4 in the second section).

The third repair section (indicated as 5 in Fig. 5.1-1) will be used for repairs of containers. There will be 3 bays in this section. A tool warehouse will be provided on the right side of this repair section.

Fourth section (indicated as 6 in Fig. 5.1-1) will be used for maintenance services and tire changes. There will be 6 bays in this section.

Vehicle washing facilities (both a wash pond and a hot water high pressure washer) will be provided in the area 7. The provision of the vehicle washing facilities is strongly recommended to reduce corrosions of vehicles.

A traffic breaker will be provided to avoid the coming of unwanted vehicles into the premise.

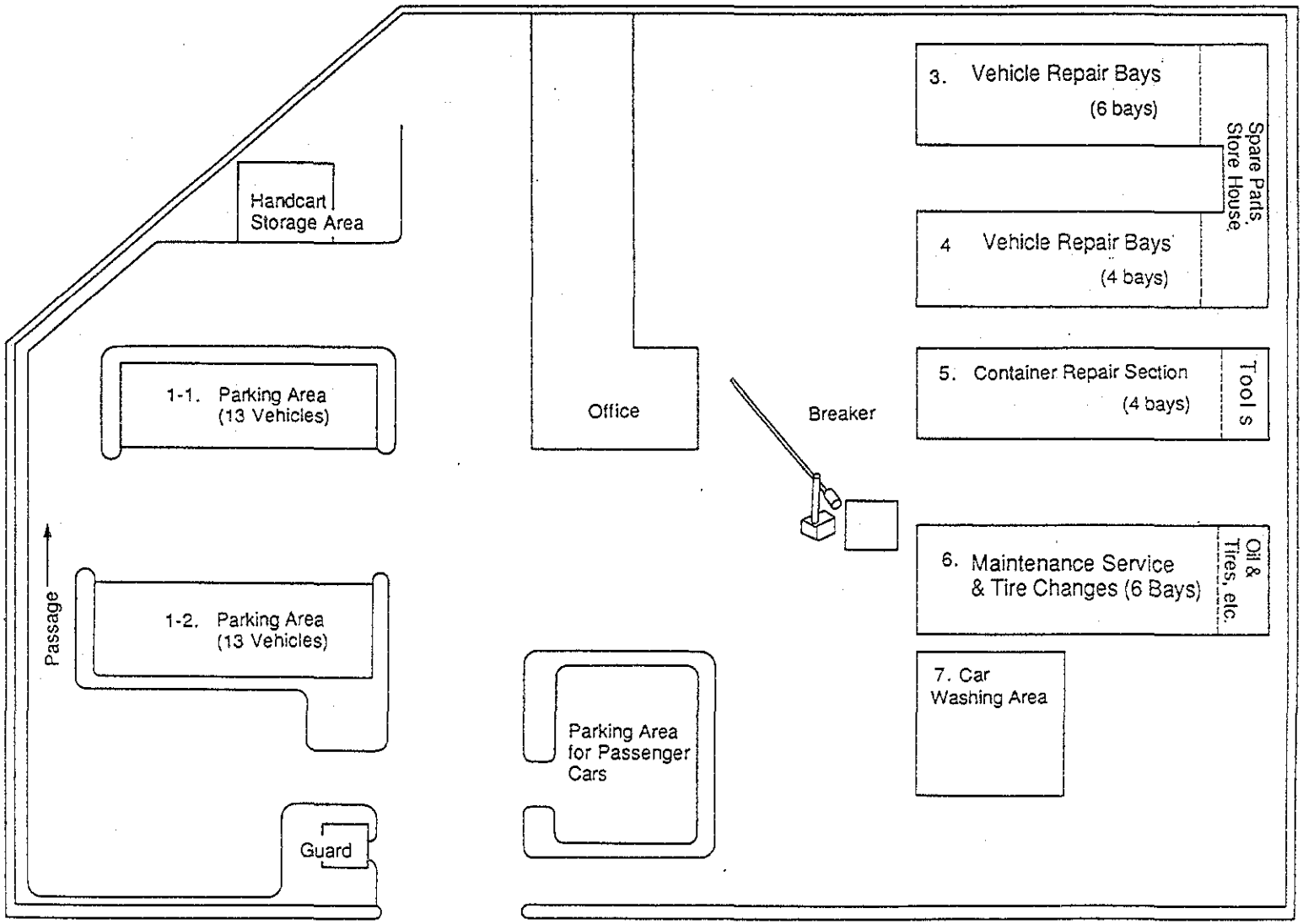


FIG. 5.1-1 REMODELLING PLAN FOR THE ASEMROWO WORKSHOP

THE STUDY ON THE SOLID WASTE MANAGEMENT IMPROVEMENT FOR SURABAYA CITY

5.2 Purchase of Tools and Equipment for Maintenance and Repairs

Asemrowo Workshop is not equipped with adequate tools and equipment for maintenance and repairs. For example, the Workshop does not have equipment such as gauges for measuring the accuracy and appropriateness of repairs and adjustments made.

The items listed in the Table 5.2-1 are recommended as basic equipment and tools necessary for carrying out proper and effective maintenance and repairs. A total procurement cost is estimated at about Rp 85 million in 1992 price.

Although most of the listed equipment are relatively simple and easy to use, the adequate training on the usage of those equipment should be provided.

Table 5.2-1 Recommended Equipment and Tools for Maintenance and Repairs.

(Unit : Rp)

NO	ITEM	QUAN-TITY (A)	UNIT PRICE (B)	AMOUNT (C)= (A)x(B)
A.	**For engine overhaul : Nos. 1-9**			
1	Diesel Compression Gauge	1	903,600	903,600
2	Adapter (larger) for Item 1 (For Toyota Dyna)	1	270,000	270,000
3	Adapter (smaller) for Item 1 (For Toyota Dyna)	1	270,000	270,000
4	Adapter for Item 1 (For Mitsubishi 4D-31)	1	270,000	270,000
5	Cylinder Gauge 50 - 150 mm	1	374,400	374,400
6	Nozzle Tester 500kg/cm^2	1	501,600	501,600
7	Valve Lifting Compression 40 - 190 mm	1	504,000	504,000
8	Piston Ring Tool 70 - 120 mm	1	270,000	270,000
9	Piston Compression Tool 75 - 175 mm	1	45,900	45,900
B.	**For chassis repair : Nos. 10-21**			
10	Hydraulic Gauge Jack 15 ton	2	3,315,600	6,631,200
11	Rigid Pack 3 ton	8	144,000	1,152,000
12	Service Creeper	2	129,600	259,200
13	Garage Lamp	5	99,000	495,000
14	Mobile Work Bench	1	2,160,000	2,160,000
15	Engineers Vise 110 mm	1	471,600	471,600
16	Engineers Vise 215 mm	1	3,114,000	3,114,000
17	Lock Nut Wrench	1	975,600	975,600
18	Tire Pressure Gauge 10kg/cm^2	2	97,560	195,120
19	Tire Pressure Gauge 11kg/cm^2	2	329,400	658,800
20	Tire Lever 450 mm	4	15,300	61,200
21	Tire Lever 760 mm	4	113,400	453,600
C.	**For repair of electric systems: Nos. 22-24**			
22	Circuit Tester	2	129,600	259,200
23	Battery Hydrometer	2	26,000	52,200
24	Boost for Starting Engine	1	848,160	848,160

D.	General tool : Nos. 25-59			
25	Adjustable Wrench 615 mm	1	245,160	245,160
26	Adjustable Wrench 450 mm	1	117,900	117,900
27	Ratcheting Chain Wrench 480 mm	1	213,120	213,120
28	Snap Ring Pliers	2	147,420	294,840
29	Snap Ring Pliers	2	146,880	293,760
30	Adjustable spanner wrench (120-323 mm)	1	403,560	403,560
31	Adjustable spanner wrench (38-100 mm)	1	210,600	210,600
32	Attack Driver	2	432,000	864,000
33	Mechanic Tool Set (for large vehicles)	3	3,370,500	10,111,500
34	Mechanic Tool Set (for construction equipment)	2	4,072,500	8,145,000
35	Hexagon Wrench Set (indicated in meter)	2	18,720	37,440
36	Hexagon Wrench Set (indicated in inch)	1	33,480	33,480
37	Stud Remover	1	66,420	66,420
38	Adjustable Pipe Wrench 750mm	2	340,020	680,040
39	Torque Wrench 20kgf.cm	1	184,140	184,140
40	Torque Wrench 50kgf.cm	1	207,540	207,540
41	Gear Puller 54mm	1	96,480	96,480
42	Gear Puller 2223mm	1	234,720	234,720
43	Gear Puller 4763mm	1	945,540	945,540
44	Bearing Pulley 64mm	1	65,880	65,880
45	Bearing Pulley 95mm	1	136,980	136,980
46	Bearing Pulley 19mm	1	1,071,540	1,071,540
47	Push puller (H) (capacity 10 ton)	1	269,640	269,640
48	Push puller (H) (capacity 17.5 ton)	1	469,620	469,620
49	Slide Hammer Pullers	1	241,020	241,020
50	Chisel 19mm	2	5,940	11,880
51	Rolling Head Pry Bar 302mm	2	52,380	104,760
52	Rolling Head Pry Bar 456mm	2	65,880	131,760
53	Jimmy Bar 610mm	2	62,820	125,640
54	Jimmy Bar 1372mm	2	324,000	648,000
55	Screw Extractor 7-8mm	1	8,280	8,280
56	Screw Extractor 8-12mm	1	5,580	5,580
57	Screw Extractor 13mm	1	7,020	7,020
58	Impact Wrench 1"	2	4,680,000	9,360,000
59	Socket Impact Wrench	4	37,080	148,320

E.	**For Measurement (Gauge) Nos. 60-70**			
60	Vernier Caliper 0-300mm	2	279,900	559,800
61	Out-Side Micrometer 0-25	1	107,280	107,280
62	Out-Side Micrometer 25-50	1	159,120	159,120
63	Out-Side Micrometer 50-75	1	206,100	206,100
64	Out-Side Micrometer 75-100	1	230,580	230,580
65	Out-Side Micrometer 100-125	1	261,000	261,000
66	Dial Indicator	2	69,480	138,960
67	Magnetic Base	2	105,480	210,960
68	Standard Thickness	2	54,900	109,800
69	V-Block	2	85,680	171,360
70	Tachometer	1	365,580	365,580
F.	**Air Equipment Nos. 71-73**			
71	Air Blow Gun	3	39,240	117,720
72	Engine Cleaning Gun	2	90,180	180,360
73	Part Cleaner	1	2,934,720	2,934,720
G.	**For Vehicle Washing No. 74**			
74	Hot Water High Pressure Washer	1	20,457,000	20,457,000
H.	**For Oil and Grease Nos. 75-77**			
75	Grease Pump	3	1,139,580	3,418,740
76	Oil Bucket Pump	2	963,720	1,927,440
77	Grease Pump	10	65,880	658,800
I.	**For Welding and Cutting Nos. 78-94**			
78	Arc Welder 300A	2	2,925,000	5,850,000
79	Welding Shield	3	16,920	50,760
80	Secondary Cord	4	207,540	830,160
81	Safety Holder	2	41,400	82,800
82	Earth Clip	2	30,600	61,200
83	Oxygen Pressure Regulator	2	164,340	328,680
84	Acetylene Pressure Regulator	2	164,340	328,680
85	Cutting Torch	1	199,800	199,800
86	Cutting Torch (shorter)	1	320,580	320,580

87	Welding Torch (longer)	1	309,420	309,420
88	Oxygen Rubber Hose	2	126,000	252,000
89	Oxygen Acetylene Rubber Hose	2	117,000	234,000
90	Cylinder Carrier	1	1,080,000	1,080,000
91	Screw Clamp 75 m/m	2	32,580	65,160
92	Screw Clamp 200 m/m	2	1,280,520	2,561,400
93	High Speed Abrasive Cutting Wheel	1	3,141,000	3,141,000
94	Cutting Wheel	5	12,600	63,000
	Total			102,294,180

CHAPTER 6.

INSTITUTIONAL AND REVENUE IMPROVEMENT PLAN

CHAPTER 6 INSTITUTIONAL AND FEE REVENUE IMPROVEMENT PLAN

The Chapter discusses the following four (4) issues:

1. Establishment of Independent Cleansing Authority (Perusahaan Daerah Kebersihan) in Surabaya
2. Shift of Waste Haulage Responsibility from KMS to Generators
3. Increases in the Use of Contractors (Contracting Out)
4. Fee Revenue Improvement

6.1 Establishment of Independent Cleansing Authority (Perusahaan Daerah Kebersihan) in Surabaya

6.1.1 Characteristics of SWM Services

An agency for solid waste management - SWM (collection, haulage, disposal, and street sweeping) service has characteristics commonly shared with agencies of other utilities services such as water, electricity and telephones in the following sense:

1) Agencies provide services that people want.

2) In principle, costs of the services should be paid by users (beneficiaries) of the services.

It is the above common characteristics that leads to the discussion for the establishment of an independent cleansing authority (Perusahaan Daerah Kebersihan).

However, the SWM service has the following characteristics as well which are different from other services.

1. **SWM services require public cooperation to the great extent, while the other services do not require it except for paying fees.**

2. **It is difficult for a SWM agency to collect fees from all the beneficiaries, and fully recover the cost of the service, while it is very possible for agencies of other services to do so.**

The difficulty in the full recovery of SWM service costs is attributable to the following reasons:

1) There always exist free riders who receive waste collection and disposal services without paying fees. Why free riders exist ? Because:

   a. Identification of individual service recipients is imperfect. (It is not easy for the a SWM agency to identify all the individual recipients.)

   b. The inherent characteristics of SWM services make it difficult to selectively stop SWM services for those who do not pay the fee.

   c. There is no effective way of sanctioning those who do not pay the fees. (People can get rid of waste by throwing it to the streets, rivers or public places even if a SWM agency can stop the waste collection service for them.)

2) From public sanitation view point, a SWM agency should provide SWM services even for free riders because it would lead to the situation where they throw their waste to public spaces such as roads and rivers, and cause public sanitation problems to the people.

3) An attempt for the full cost recovery may impose unfairly heavy financial burdens on the honest fee payers as they have to pay extra fees that should have been paid by free riders.

6.1.2 Conditions for the Establishment of PDK

We have identified two import characteristics of SWM services that do not exist in other utilities services:

1) SWM services require the public cooperation.
2) It is difficult for a SWM agency to collect fees from all the service recipients and, recover full costs.

It is due to the above characteristics that most SWM agencies take the form of municipal cleansing department (Dinas Kebersihan). Those two characteristics seem to be obstacles against the establishment of an independent cleansing authority (Perusahaan Daerah

Kebersihan). There is a fear that a Perusahaan Daerah Kebersihan (PDK) may not obtain sufficient public cooperation. And, a more fundamental question is that the establishment of PDK may not be feasible simply because it cannot recover full costs of SWM services.

It is obvious that a Perusahaan Daerah Kebersihan (PDK) would have too much problems if it is established in a same manner as a Municipal Water Authority (PDAM). If a PDK should be established, the following conditions have to be met:

Condition 1. A mother municipal government should provide PDK with supports in the areas of finance, law enforcement, and public education and instruction.

Condition 2. A new form of company (different from PDAM) should be developed for PDK with special financial and accounting arrangements.

6.1.3 Advantages and Disadvantages of PDK

1) Advantages

Major advantages deriving from establishing PDK are:

1. Increases in the service efficiency and cost-effectiveness
2. Improvements on the cost recovery - more realization of Beneficiary Pay Principle (BPP) through the clearer and stronger linkage between revenues and expenditures

These advantages are purposes of establishing PDK as well.

a. Increases in the Service Efficiency and Cost-Effectiveness

An important question is which of the two forms of organization, PDK or Dinas Kebersihan is better in terms of overall service efficiency and cost-effectiveness, in other words, in terms of "do more and better (services) with less (money)".

We have two good SWM agencies as examples, i.e., Municipal Cleansing Company of Bandung (PDKB) and Cleansing Department (Dinas Kebersihan) of Surabaya municipal

government. Both cities received Adipura Award for its excellent urban environmental management, particularly solid waste management. The following table shows the overall unit costs of solid waste management.

Table 6.1-1 Annual SWM Costs, Waste Amounts and Unit Costs in Bandung and Surabaya in 1992

	PDK Bandung (1)	Dinas Kebersihan Surabaya (2)	Ratio (2)/(1)= (3)
a. Total Annual Cost	Rp 5,000,000,000	Rp 12,500,000,000	250 %
b. Daily Average Waste Amount Managed	1,300 ton/day	900 ton/day	69 %
c. Total Annual Waste Amount Managed (Item 2 x 365 days/year)	474,500 ton/year	328,500 ton/day	69 %
d. Average Unit Cots per ton (a ÷ c)	Rp 10,540/ton	Rp 38,050/ton	361 %

Source: For PDKB: Hearing from PDKB officials.
For Surabaya: Based on 1991/92 Budget of Dinas Kebersihan with adjustments of component of depreciation of equipment and facilities.

Unit cost Rp 38,050/ton of Surabaya is 3.6 times higher than Rp 10,540/ton of Bandung. Yet, Bandung is as clean as Surabaya. It can be concluded that PDKB is very cost effective relative to the Dinas Kebersihan of Surabaya.

Note: A reason for high cost of Surabaya is that Surabaya has an incinerator, of which annual cost is Rp 4,500,000,000. Surabaya' unit SWM cost excluding the incinerator is Rp 24,350/ton, which is still 2.3 times higher than the unit cost of Bandung. Surabaya uses waste contractors for haulage of 30 % of total waste managed by KMS. The unit contract price is much lower than the cost of KMS' haulage cost.. The unit SWM cost of KMS' own operation alone (excluding the incineration and the waste haulage by contractors) is around Rp 30,000/ton.

b. Improvements on the Cost Recovery - More Realization of Beneficiary Pay Principle (BPP) through the Clearer and Stronger Linkage between Revenues and Expenditures

It is expected that the establishment of PDK contributes to higher degree of realization of Beneficiary Pay Principle (BPP). The degree of realization of BPP can be measured

in terms of cost recovery ratio. PDKB' cost recovery ratio is as high as 70 % as compared to 27 % of Surabaya.

Table 6.1-2 Degree of Realization of BPP in terms of Cost Recovery Ratio

	PDK Bandung (1)	Dinas Kebersihan Surabaya (2)	PDK Medan (3)
a. Annual Cost	Rp 5,000,000,000	Rp 12,500,000,000	Rp 4,800,000,000
b. Annual Net Fees Collected after deduction of handling charges	Rp 3,500,000,000	Rp 3,370,000,000	Rp 3,350,000,000
c. Degree of Realization of BPP in terms of Cost Recovery Ratio (b + a)	70 %	27 %	70 %

Notes:

1) Net fees collected after deduction of handling charges (Item b) are calculated based upon data obtained from PDKB (projected 1992 income statement) and Dinas Kebersihan of Surabaya (1991/92) and PDKM (projected 1992 income statement) respectively.

2) The PDKM' annual cost does not include the costs of depreciation of equipment.

PDKB' high cost recovery is attributable to the existence of the clear and strong linkage between revenues and expenditures, which lead to the following situation:

1. PDKB has been making remarkable efforts for increasing the fee revenues by introducing new fee collection methods such as 1) volume-based fee collection for business waste, and 2) use of electric company's (PLN) charge collection points.

2. PDKB is keen in controlling expenditures.

As a matter of fact, PDKB is very keen in collecting monthly fee revenues because such monthly revenue is used as the source of monthly payments of operational costs including salary. Thus, there is a clear and strong linkage between revenues and expenditures, which is very important for sound and efficient management of any company. Such linkage does drive PDKB to make efforts for revenue improvements and cost saving.

PDKM's fee revenue (retribution) increased 4.5 times from Rp 800 million, maximum amount collected before the establishment of PDKM to Rp 3,600 million in 1992 on gross term. This is a remarkable increase.

2) Disadvantages

a. Less Availability of Public Cooperation

Some officials say that PDK obtains less cooperation from citizens and organizations such as Kelurahan than Dinas Kebersihan does because they view PDK as a profit making company.

A PDKB official stated that there are some market people who are not cooperative, they discharge waste in undesirable manner, and there are also some citizens who discharge waste in bad manner. This official, however, said that he is not sure whether or not such uncooperative manner is attributable to the establishment or PDKB or the people' character. In Surabaya, waste discharge manner of some market people is not good either.

Even if it is true that some people are not cooperative for PDKB, this is where the mother municipal government should support PDK. As discussed in the subsequent sections, even after the establishment of PDK, its mother municipal government should provide PDK with supports in the field of finance, law enforcement and public education. Only with such supports, PDK will be able to achieve its purpose for which it was established.

It would be very wrong to think that PDK should be same as Municipal Water Company (PDAM) in every sense. As discussed later, it is necessary to develop a new form of organization for PDK considering characteristics of solid waste management.

b. PDK's Loss of the Central Government Funds for Basic Salary of Employees of PDK

Under the existing Indonesian government system, the salary of the employees of local governments are provided by the central government. The transformation of the cleansing department into PDK implies that the salary of employees of PDK has to be paid by PDK itself in principle.

It can be said that the existing Indonesian system where funds for salary of permanent employees of local governments are provided by the central government acts as disincentive for local governments to establish municipal companies such as PDK.

It should be generally noted that whether something is an disadvantage or advantage depends the position of the people who see it. The disadvantage to the local governments (lose of funds for employees' salary) is an advantage (fund saving) to the central government and the Indonesian tax payers. For the Indonesian society as a whole, there are no net disadvantages or advantages. It is essentially a matter of question who should bear the costs of SWM service of local cities.

From the Beneficiary Pay Principle, it is more fair and sound that the costs of the municipal cleansing services be paid by the local citizens who directly receive the services rather than the case where the costs of municipal services be paid by general Indonesian tax payers.

3) Summary of Advantages and Disadvantages

As was already discussed above, it is possible to overcome the disadvantages that may arise from the establishment of PDK by taking some measures as shown below:

Table 6.1-3 Disadvantages and Measures

Disadvantages	Comments and Measures to be Taken
1. Less Availability of Public Cooperation	This has not been proved yet. However, even if it is so, this disadvantage may be overcome through the mother municipal government' supports. Judging from the characteristics of SWM services, it is necessary for the municipal government to actively support PDK in the fields of law enforcement and public education and instruction.
2. Loss of Central Government Funds for Basic Salary of Employees of PDK	The local governments' loss of this fund is offset by the saving advantage at national level. There is no net disadvantages to the Indonesian society as a whole. From BPP view point, it is more fair and sound that local SWM service costs be paid by its citizens who directly receive the service.

The advantages are 1) increases in the service efficiency and cost-effectiveness and 2) improvement on the cost recovery - higher degree of realization of the Beneficiary Pay Principle. These advantages are the purpose of establishing PDK as well. The experience of PDKB proved that the establishment of PDKB can bring about these advantages.

As a conclusion, it is summarized as follows: the advantages are absolute, permanent and much greater than the disadvantages, which are transitional and can be overcome through the mother municipal government' support.

The problem of PDK is that the concerned government officials have a wrong expectation that 1) PDKB should and can be self-dependent in every aspect, and 2) the constant supports of the municipal government of Bandung is not necessary.

6.1.4 Municipal Government Supports for PDK

Section 6.1.2 discussed that the mother municipal government' support of PDK is necessary conditions for establishing PDK. This Section will discuss what supports the mother municipal government should provide. There are three areas in which the mother municipal government should support PDK.

1. Law enforcement, and Public education and instruction
2. Guidance and support of waste pickers
3. Financial supports in the form of provision of capital equipment and facilities

1) Law Enforcement, and Public Education and Instruction

The enforcement of the cleansing regulations as well as the public education and instruction are important activities of municipal solid waste management. Judging from the experience of the Municipal Cleansing Company of Bandung (PDKB), the responsibility for the law enforcement can be more effectively performed by the municipal government than by PDK. Activities for public education and instruction should be jointly performed by both the municipal government and PDK.

It is very important for the municipal government to appeal to the citizens that they should cooperate with PDK, and appeal, if necessary, that PDK is a part of the municipal government.

2) Guidance and Supports of Waste Pickers

Waste pickers contribute to the reduction of waste amounts that a municipal government has to manage. They need some guidance so that they feel that they are an important part of the society contributing to the municipal solid waste management. They also need training in other job skills so that they could change their job when they want to do so.

It would be too much to expect PDK alone to perform the responsibility for providing guidance and training of waste pickers. Such guidance and training should be provided jointly by the municipal government and PDK.

3) Financial Supports

a. Current Cost Recovery Ratio

As shown in the table below, the current cost recovery ratios of PDKB and Dinas Kebersihan of Surabaya are 70 % and 27 % respectively.

Table 6.1-4 Ratio of Fee Payers and Cost Recovery

	PDK Bandung	Cleansing Department of Surabaya
1. Ratio of Fee (Retribution) Payers to Potential Fee Payers	61 % *1	75 % *2
2. Ratio of Cost Recovery (Ratio of the fee revenue to the costs of the service)	70 % *3	27 % *3

Notes:
*1: 234,791 (Estimated total number of fee payers) + 385,000 (Estimated total registered number of households and business establishments) = 61 %
*2: 399,000 (Estimated total number of fee payers) + 530,000 (Estimated total registered number of households and business establishments) = 75 %
*3 These percentage figures are taken from the previous table.

PDKB's high cost recovery (70 %) is the result of PDKB' remarkable efforts in the fee collection.

Dinas Kebersihan performs better than PDKB in terms of the ratio of fee payers to the potential payer, which is as high as 75 %. However, the cost recovery ratio (27 %) of

Dinas Kebersihan of Surabaya is low as compared to that of PDKB. The Dinas Kebersihan's low cost recovery ratio relative to the high ratio of fee payers implies that 1) the fee rates of Surabaya is much lower than the actual unit cost, 2) the SWM cost of Surabaya is too much relative to the fee revenue.

b. Proposed Target Cost Recovery Ratio

PDKB' cost recovery ratio is 70 % of the total SWM service cost in spite of its remarkable efforts of fee collection. As was already discussed, the full cost recovery is impossible in case of solid waste management service as there exist always free riders who receive SWM services without paying fees. Attempts for full cost recovery through the fee collection is not only impossible but also undesirable because such attempt would result in the imposition of unfairly high financial burden on the honest fee payers.

An important question is how much actual fee payers should pay to PDK. The answer is simple; Based upon the Beneficiary Pay Principle (BPP), they should pay fees equivalent to the costs of the service they receive, which should be considered as the target amount of fee revenue for PDK. The proposed target cost recovery ratio (Rt) can be expressed as follows:

$Rt = a + b$

where

Rt = Proposed target cost recovery ratio

a = Target Fee Revenue = Cost of SWM Services Received by Actual Fee Payers

b = Total Cost of SWM Services Spent by PDK

Assuming that the cost of SWM services is proportional to the waste amount to be managed, the target cost recovery ratio for PDK can be re-expressed as follows:

$Rt = c + e$

where

c = Amount of waste discharged by actual fee payers, and managed by PDK

e = Total amount of waste managed by PDK

The following table would help the readers to understand the concept of calculation of the proposed target cost recovery ratio.

	Amount of Waste Discharged by Actual Fee Payers (1)	Amount of Waste Discharged by People who do not Pay Fees (2)	Total (1)+ (2) =(3)	Proposed Target Cost Recovery Ratio (4)
Managed by SWM Agency	c	d	e	c/e
Not Managed by SWM Agency	f	g	h	---

PDKB' cost recovery target (Rt) as calculated in the above manner would range from 65 % to 70 %, which happens to be close to the current actual cost recovery ratio of PDKB. On the other hand, the target cost recovery ratio of Dinas Kebersihan of Surabaya as calculated in the above manner may be over 90 %, while its actual cost recovery rate is 27 %.

It is important to note that the target cost recovery ratio is changeable. It can increase with increases of number of fee payers, and increases of waste amount discharged by fee payers relative to that of non-fee payers.

c. Source of Financing the Shortage

Attempts to increase cost recovery ratio higher than the target cost recovery ratio means that honest fee payers have to pay more fees than actual costs that they have to share. For example if the target cost recovery ratio is 70 %, and PDK attempts 100 % cost recovery from the fee collection alone, honest fee payers have to pay 42 % higher fees than what they have to pay based upon BPP. [Note: 42 % is calculated as follows: {(100% + 70%) - 1} x 100 = 42]

In the case of municipal cleansing departments, any shortage, i.e., the gap between the costs and the fee revenue is financed by general municipal budget, of which main original source is the tax paid by the Indonesian people.

Likewise, it is proposed that a mother municipal government should provide PDK with some subsidies enough to cover the gap.

d. Alternative Methods for Deciding Amounts of Subsidies

Ideally, the amount of subsidies to be provided by the municipal government should be equivalent to the gap between the cost of SWM service and the target fee revenue. However, this does not means that the municipal government should automatically finance the above gap. Such automatic way of financing the gap will deprive PDK of incentives to increase its fee revenue, and save costs, and then the whole purpose of establishing PDK will be lost.

It is extremely important to use an appropriate base for determining amounts of the subsidies. It is considered there are the following alternative methods for determining amounts of the subsidies.

Alternative 1 Subsidy Amounts are Determined based upon Costs of Provision of Capital Equipment and Facilities

Amounts of subsidies to be provided for PDK by its mother municipal government will be equivalent or related to the costs of provision of major capital equipment and facilities such as waste trucks and disposal sites (LPA and Depo).

Alternative 2 Subsidy Amounts are Determined Based on a Fixed Percentage of PDK' Expenditures

A mother municipal government will provide PDK with subsidies equivalent to a fixed percentage of PDK' expenditures, 30 % for example.

Alternative 3 Subsidy Amounts are Determined Based on a Fixed Percentage of PDK' Fee Revenue

A mother municipal government will provide PDK subsidies equivalent to a fixed percentage of PDK' actual fee revenue.

Alternative 4 Subsidy Amounts are equivalent to the Gap between the Accounting Costs and the Target Fee Revenue

A mother company will provide PDK with a subsidy equivalent to the gap between PDK's accounting costs (not actual expenditures) and the target fee revenue (not actual revenue). The target fee revenue is equal to the estimated costs of SWM services provided for fee payers.

Alternative 5 Any Amounts Necessary to Fill the Gap between Actual SWM Expenditure and Actual Fee Revenue

A mother municipal government will provide PDK subsidies needed to fill the gap between PDK' expenditures (not accounting costs) and actual fee revenue.

e. Evaluation of the Alternatives

An appropriate method of subsidy is the one that do not affect PDK's incentive for improving its service efficiency, i.e., increasing its revenue and saving its costs in the long term. Some alternatives may be good in short term, while they may be bad in long term. The long term impacts are more important than the short term impacts.

The results of the evaluation of respective alternatives are shown in the table below. The grading are as follows:

A: No negative impacts
B: Some negative impacts
C: Significant negative impacts

Table 6.1-5 Evaluation of the Alternative Methods for Deciding Amounts of the Subsidies

Alternatives	Long Term Impacts (More important than short term impact.)	Short Term Impacts
Alternative 1 Amounts of subsidies are determined based upon the costs of provision of capital equipment and facilities	[A] No negative impacts. Expected percentage of subsidy under this Alternative will be about 30 - 35 % of the total SWM costs.	[A] No negative impacts.
Alternative 2 Amounts are determined based upon a fixed percentage of PDK' expenditures	[B-] Amounts of subsidy could substantially change depending on amounts of PDK's capital investments. This situation would reduce the financial autonomy of PDK in the medium and long term.	[B-] More the expenditure, more the subsidy PDK can receive. This situation is not sound, and may affect PDK's incentive for improving the service efficiency in short term.
Alternative 3 Amounts are determined based upon fixed a percentage of PDK' fee revenue	[C] There is not much logical justification for this Alternative. This Alternative does not match with the characteristics of SWM services either.	[A] More the revenue, more the subsidy PDK can receive. This situation will encourage PDK to increase its fee revenue in the short term.
Alternative 4 Amounts are equivalent to the gap between the accounting costs and the target fee revenue.	[C] This method will significantly reduce PDK's incentive for increasing fee revenues or for saving expenditures once PDK's fee revenue reached a target level.	[A] The amounts determined under this Alternative is very appropriate based upon an application of Beneficiary Pay Principle.
Alternative 5 Any amounts are provided necessary to fill gap between actual SWM expenditure and actual fee revenue	[C-] This alternative gives PDK no incentive for improving its efficiency in the long run. This Alternative will completely spoil the financial autonomy of PDK, therefore, it will not serve for the purpose of establishing PDK.	[B+] The subsidy provided under this Alternative will completely satisfy PDK's need for cash.

f. Best Alternative and Its Sub-Alternatives

Alternative 1 - the method for determining amounts of subsidies based upon costs of procurement of major capital equipment and facilities is evaluated as the best because it will not affect PDK's incentive for improving its service efficiency, and the financial autonomy of PDK can be best maintained.

There is another reason why Alternative 1 is recommendable. In Indonesia, the costs of procurement of major equipment and facilities range from 30 % to 35 % of total SWM costs. Consequently, the amounts of subsidies to be determined under Alternative 1 will be 30 % - 35 % of the cost of the SWM services. Such percentages seem to be appropriate because they are close to the percentage of the gap between the SWM cost and the target fee revenue of PDKB.

It is possible to formulate the following sub-alternatives from Alternative 1.

1.1 PDK's all investment expenditures for major equipment and facilities will be paid by its mother municipal government.

1.2 Annual amounts of subsidies will be equivalent to accounting costs (depreciation and interests) of major equipment and facilities.

1.3 Annual amounts of subsidies will be equivalent to depreciation costs of major equipment and facilities.

1.4 A mother municipal government will lease capital equipment and facilities to PDK at very low rates - 10 % of equipment prices at maximum.

Amounts of subsidies to be provided for PDK will be different depending on the choice of the sub-alternatives. Expected percentages of the subsidies to be provided by applying the respective sub-alternatives are as follows:

Sub-Alternatives	Percentages of Expected Subsidies To Be Provided Relative to Total SWM Cost
1.1	30 % - 35 %
1.2	30 % - 35 %
1.3	20 % - 25 %
1.4	10 % - 15 %

An appropriate sub-alternative is the one that will generate subsidies close to the gap between the actual SWM expenditures and the target fee revenue. The target fee revenues differ depending on cities and time. Therefore, an appropriate sub-alternative will differ as well depending on cities and time.

g. Special Financial Supports Needed During Early Period of PDK

It is wrong to think that the benefits of establishing a PDK will immediately come right after the establishment. It will take time for PDK to strengthen the managerial and financial capability and autonomy. Special financial supports of PDK will be needed at the time of establishing it and during the early period, which would be 7 - 10 years.

It is proposed that a mother municipal government should provide PDK with all necessary equipment, facilities and buildings, in addition to salary of employees transferred from the cleansing department. Degree of financial supports will then gradually be decreased. The following table shows proposed financial supports to be provided during the early period of PDK.

Table 6.1-6 Financial Supports Needed During the Early Period of PDK

Stages	Financial Supports Needed
1. At the Time of Establishment	[Alternative 1.1 of Section 6) should be applied.] - Equipment such as waste collection vehicles, - Facilities such as disposal sites (LPA & Depo) - Buildings
2. For the First 5 Years [It is desirous that the amount of fees collected by PDK will reach the target fee revenue by the end of 5th year.]	- Subsidies under Alternative 1.1 (additional equipment and facilities if necessary) in addition to: - Salary of employees transferred from the municipal government - Costs of maintenance and repair of equipment if necessary
3. For 6th - 10th Years	- Subsidies under Alternatives 1.1 or 1.2 should be provided in addition to: - Salary of employees transferred to PDK (Number of employees originally transferred from cleansing department will decrease as time passes.)
3. After 11th Year	- Subsidies under an appropriate Alternative 1 (either 1.1 or 1.2 or 1.3 or 1.4) should be applied. - Salary of transferred employees who wish to hold status of the government employees.

6.1.5 General Purpose and Alternatives for Privatization of Utilities Service Providing Agencies

To establish PDK is a form of privatization of SWM services. It is worthwhile to examine the general purpose, alternatives and factors of privatization of utilities service providing agencies (water, electricity, gas and telephone, etc.) in order to understand the similarity and difference of those service providing agencies with SWM agency.

1) Purpose of Privatization

The purpose of the privatization of the service providing agencies (water, electricity, gas and telephone, and SWM) is to improve the efficiency of the agencies so that they can "do more and better (services) with less (money)".

2) Alternatives

There exist the following 4 ways to increase the privatization of the service providing agencies:

Alternative 1 Use of Contractors

Alternative 2. Establishment of an Independent Authority for Cleansing Service (Perusahaan Daerah Kebersihan)

Alternative 3. Combination of both Alternatives 1 and 2.

Alternative 4. Complete Privatization with no government involvement except for issuing guidelines and regulations with respect to the standards of the services to be achieved by the service providing companies. Citizens have direct contracts with service providing companies.

The following matrix table help the readers to develop a clearer picture about the above alternatives:

	Municipal Department	Establishment of an Independent Authority	Complete Privatization with No Governmental Involvement except for Setting out Regulations or Guidelines
Use No Contractors		Alternative 2	Not Applicable
Use Contractors	Alternative 1	Alternative 3	Alternative 4

3) Factors of Privatization

There are the following two important factors through which the privatization serve its purpose, i.e., improvements of the management efficiency.

Factor 1. Generation of competition among competitors (contractors)

Factor 2. Achievement of managerial and financial autonomy

The generation of competition among contractors (Factor 1) will be best achieved by applying Alternative 4 (Complete privatization). The use of contractors would also strengthen Factor 1. The managerial and financial autonomy (Factor 2) will be achieved by applying Alternative 2 as shown in the table below:

Table 6.1-7 Evaluation of Alternatives in Terms of the 2 Factors

Alternatives	Generation of Competition among Competitors (Factor 1)	Achievement of Managerial & Financial Autonomy (Factor 2)
Alternative 1. Use of contractors	√	
Alternative 2. Establishment of an Independent authority		√
Alternative 3. Combination of Alternatives 1&2	√	√
Alternative 4. Complete Privatization with No governmental involvement except for issuing guidelines or regulations	√√	√

Note: "√" means effective, "√√" means very effective.

6.1.6 Privatization of SWM Services

The previous section generally evaluated the alternatives for the privatization of service agencies from two factors, i.e., 1) generation of competition, and 2) achievement of managerial and financial autonomy, through which the privatization serve its purpose. It is necessary to consider one more additional factor, i.e., availability of public cooperation when we evaluate alternatives for the privatization of SWM services.

Table 6.1-8 Evaluation of Alternatives for Privatization of SWM Services

Alternatives	Generation of Competition among Competitors (Factor 1) (Weight: 25 %)	Achievement of Managerial & Financial Autonomy (Factor 2) (Weight: 25 %)	Availability of Public Cooperation (Factor 3) (Weight: 50 %)	Overall Evaluation (Weight: 100 %)
Alternative 0: Municipal Department without using contractors	C	C	A	B
Alternative 1: Municipal Department with Use of contractors	A	C	A	B+
Alternative 2: Establishment of PDK	C	A	B^+	B+
Alternative 3: Combination of Alternatives 1&2	A	A	B^+	B++
Alternative 4. Complete Privatization with No governmental involvement except for issuing guidelines or regulations	A^+	A	C^-	C+

Grading:

A : Good

B : Reasonable

C : Poor

The overall evaluation (right column of the table) is made by attaching specific weights to respective factors; 25 % to Factor 1, 25 % to Factor 2, and 50 % to Factor 3 as the public cooperation is a vital factor for solid waste management.

As can be seen from the table, the best form of organization is Alternative 3, i.e., PDK with use of private contractors in terms of both the service efficiency and availability of public cooperation.

6.1.7 Summary and Conclusion

1) Advantages and disadvantages of Establishing PDK

Major advantages are:

a. Increases in the service efficiency and cost effectiveness
b. Increases in cost recovery - more realization of Beneficiary Pay Principle (BPP) through a clearer and stronger linkage between revenues and expenditures

Possible disadvantages are:

a. Less availability of public cooperation

   This has not been proved yet. However, even if it is so, this disadvantage can be overcome through the mother municipal government' supports in the fields of the law enforcement, and public education and instruction.

b. Loss of the central government funds for basic salary of employees of PDK

   This disadvantage to a local government is a money saving advantage to the central government. There is no net disadvantage to the Indonesian society as a whole. From BPP view point, it is more fair and sound that local SWM service costs be paid by its citizens who directly receive the service.

The advantages are absolute, permanent and much greater than the disadvantages, which are transitional and can be overcome through the mother municipal government' supports.

2) Feasibility of Establishing PDK

To establish PDK in the metropolitan cities including Surabaya is feasible and recommendable with the following conditions:

Condition 1. A mother municipal government should provide its PDK with supports in the following areas:

   1) Law enforcement, and public education and instruction

2) Guidance and supports of waste pickers

3) Financial supports

Condition 2. A new concept for evaluation of the benefits of establishment of PDK should be developed.

1) The maximization financial profits should not be considered as a prime target of PDK.

2) Benefits of establishment of PDK should be evaluated in terms of degree of improvements achieved after the establishment in the following areas:

a. Increases in cost effectiveness of the SWM services
b. Increases in cost recovery ratio
c. Improvements of cleanliness of the city
d. Expansion of service coverage

3) Necessity for Financial Supports

The reasons that PDK needs financial supports from its mother municipal government are as follows:

a. There always exist free riders who receive SWM service without paying fees because the elimination of free riders is difficult because there is no effective way to punish the free riders. (The stoppage of SWM services for free riders are not only difficult from operational view point, but also undesirable from sanitary view point because the stoppage of the service may cause them to throw away their waste into public spaces.)

b. In the unavoidable presence of free riders, any attempts for full cost recovery from the honest fee payers alone would impose unfairly high financial burden on the honest fee payers, which is not desirable from the Beneficiary Pay Principle.

4) Appropriate Amounts of Subsidies

Appropriate amounts to be provided by the mother municipal government for PDK are the ones which are close to the gap between the actual costs of SWM services and the target fee revenue.

5) Target Amounts of PDK' Fee Revenue

A target amount of fee revenue is equal to the cost of SWM services provided for the fee payers.

6) Necessity for Selecting Appropriate Base on Which Amounts of Subsidies are Determined

Item 4) does not means that the municipal government should automatically finance the above gap. Such automatic way of financing the gap will deprive PDK of incentives to increase its fee revenues, and save costs.

7) Appropriate Base on Which Amounts of Subsidies are Determined

It is the most appropriate to use the procurement costs of major equipment (trucks, etc.) and construction costs of facilities (LPA & Depo) as the base for determining amounts of the subsidy because (1) this method would not spoil PDK's incentives for increasing its service efficiency and for strengthening cost recovery efforts, and (2) amounts of subsidies to be determined under this method would be close to the ideal subsidy amounts; the gap between the SWM service cost and the target fee revenue.

8) Sub-Alternatives for Deciding Amounts of Subsidies

The method as above-explained can be developed into the following sub-alternatives:

1.1 PDK's all investment expenditures for major equipment and facilities will be paid by its mother municipal government.

1.2 Annual amounts of subsidies will be equivalent to accounting costs (depreciation and interests) of major equipment and facilities.

1.3 Annual amounts of subsidies will be equivalent to depreciation costs of major equipment and facilities.

1.4 A mother municipal government will lease capital equipment and facilities to PDK at very low rates - 10 % of equipment prices at maximum.

An appropriate sub-alternative is the one that will generate subsidies close to the gap between the actual SWM expenditures and the target fee revenue. The target fee revenues differ depending on cities and time. Therefore, an appropriate sub-alternative will differ as well depending on cities and time.

9) Special Financial Supports during Early Period of PDK

During early period of PDK (for the first 10 years), special subsidies for covering salary of transferred employees, and maintenance and repair costs of equipment may be necessary.

10) Use of Contractors

To establish PDK is one form of privatization. Another form is to use contractors. Cost saving is made possible through the use of contractors. The use of contractors is helpful for the promotion of the development of technologies for solid waste management. For example, if the haulage of waste with mini containers is contracted out to contractors, contractors, in the medium term, will attempt to develop or choose most cost effective trucks, i.e., either front end loader (FEL) or rear end loader (REL), whichever is more efficient.

The benefits of privatization can be maximized by establishing PDK that will partly use SWM contractors.

6.2 Shift of Waste Haulage Responsibility from KMS to Generators of Large Waste Amount

6.2.1 Current Situation

At present, KMS manage 226 ton/day of business waste (including commercial and industrial establishments as well as markets). The total fee revenue (retribution) collected from business establishments is estimated to be about Rp 1,300 million, while KMS spent an estimated Rp 2,978 million for management of business waste. [Management of waste include the case where KMS provides only disposal service.] The cost recovery is only 44 %.

Note on the Estimation of Actual SWM Cost Spent for Business Waste:

a = b x c/d = Rp 2,978 million

where,

a: Annual SWM cost spent by KMS for management of business waste alone

b: Annual total SWM cost spent by KMS = Rp 12,500,000,000/year

c: Annual amount of business waste managed by KMS = 81,395 ton/year (223 ton/day)

d: Annual total amount of waste managed by KMS = 341,640 ton/year (936 ton/day)

The difference (Rp 1,678 million) between the revenue and the cost of managing business waste is covered by KMS' general budget.

The Surabaya Municipal Regulation No.2/1986 stipulates that those who generate waste as much as 2.5 m^3 or more each day should haul the waste to final disposal sites by themselves unless they request KMS to do so.

6.2.2 Shift of Waste Haulage Responsibility from KMS to Generators of Large Waste Amount

It is proposed that KMS should make it obligatory for large amount waste generators (generating 2.5 m^3/day or more) to haul their waste by themselves. For this purpose, KMS should revise the cleansing law accordingly. The reasons for the proposed shift of responsibility include the following:

1. KMS can save costs.

2. The proposed shift of the responsibility is desirous from the Beneficiary Pay Principle (BPP).

3. The proposed shift of the responsibility is desirous also from environmental view point because this shift will give waste generators incentives for reducing waste generation.

4. Business establishments that discharge large amount of waste have financial ability to have their waste hauled either by themselves or by using contractors.

5. It is projected that the amount of business waste increases faster than household waste in Surabaya - like many other cities in the world.

6.2.3 Enforcement and Target

As a first step, KMS should apply this new regulation to markets. Markets are the biggest waste generators in Surabaya. They generate as much as 258 ton/day of waste on average in 1992. It however takes time for markets to make arrangements to have their waste hauled by themselves or by contractors. During the time of the arrangement which should be less than a few years, KMS may haul market waste at prices close to the full costs.

It is proposed that KMS will apply the new regulation to more number of waste generators, and strengthen the enforcement year by year. The following table show the target application in terms of amount of waste to be hauled by generators themselves. It is proposed that the ratio of self-hauled-waste to total waste generation amount will reach to 25 % by the year 2000.

Table 6.2-1 Target Waste Amount to be Hauled by Waste Generators Themselves

Year	Total Waste Generation in Surabaya (1)	Waste to be Hauled by Generators (2)	Percentage (1) + (2) = (3)
1992	1,626 ton/day	137 ton/day	8%
1995	1,882 ton/day	332 ton/day	18%
2000	2,402 ton/day	601 ton/day	25%
2005	3,066 ton/day	767 ton/day	25%
2010	3,913 ton/day	978 ton/day	25%

6.3 Increases in the Use of Contractors (Contracting Out)

6.3.1 Advantages and Necessity for Increases of Contracting Out

1) Advantages of Increases of Contracting Out

("Contracting Out" means to use contractors to let them do a part of the services that have to be originally provided by the public agency.)

Increases in the contracting out bring about the following benefits:

1. KMS can save substantial costs.
2. Technological development can possibly be promoted by the intensive use of contractors.
3. Coverage of waste collection and haulage can be expanded if an appropriate contract method is applied.

a. Possible Cost Saving

It is estimated that the unit cost of waste haulage by contractors will be about two thrids of the unit cost of KMS's own operation. An estimated cumulative cost to be saved by 2010 through the use of waste haulage contractors will be approximately Rp 22.8 billion - equivalent to KMS' current SWM budget of two years. (This is the difference accumaulated till 2010 between SWM costs with and without using contractors.) Refer to Section 3.4 for assumptions and cost details used for estimation of the future saving.

b. Technological Development through Increasing Use of Contractors

At present, KMS uses rear-end-loader (REL) compactor trucks for collection of waste from small containers (1 m3). The current REL compactor trucks, however, need to be improved; especially hydraulic system (container lifting equipment) should be modified so that time for lifting and emptying containers should be reduced.

A front-end-loader (FEL) truck is another possible option to be used for collection of waste from small containers. A FEL truck is cheaper than a REL truck. However, the technology of FEL is still in the experimental stage.

In this situation, it is expected that if contractors were used for collection of waste from small containers, they will cooperate with manufacturers in developing the most-cost effective system within a few years.

c. Expansion of the Waste Collection Coverage

It is proposed that 1) the future contracts with waste haulage contractors should include provision of containers as well as trucks, and 2) the contractual remuneration should be calculated based upon actual waste haulage amount (tonnage of waste actually hauled, measured at LPA with a truck scale).

Such contract will give contractors strong incentives for collecting and hauling more waste. The contractors will request for permissions from KMS to put additional containers wherever necessary.

It is then possible to increase the waste collection and haulage coverage even in suburban areas of Surabaya.

2) Necessity for Saving Costs of Waste Haulage

The saving of the costs of waste haulage and street sweeping is very necessary because of the following reasons:

1. KMS will need large amount of money for implementation of the sanitary landfill in the future.

   Note: The cost of waste disposal will become larger once a city achieved a reasonable level of waste collection and haulage services - like Surabaya. This is natural and unavoidable trend observed in many cities of the world.

2. Needs for SWM services in terms of waste amount to be managed will increase at a rate faster than that of KMS' general municipal budget because of 1) increasing need to provide SWM services for currently-unserved population, and 2) increases in per capita waste generation rate.

6.3.2 Plan for the Contracting Out of the Waste Haulage Service

1) Target Degree of Contracting Out

It is proposed that KMS will increase its degree of the contracting out to 73 % in the year 2010 from the current rate of 30 %. Such target will be achieved if KMS continue to haule a contant amount of waste in the future equivalent to the current waste amount (621 ton/day on averatge) hauled by KMS' trucks, and haulage contractors haule the remaining amount of waste, which will increase in the future.

Table 6.3-1 Target Waste Haulage Amount and Degree of Contracting Out

Unit: Ton/Day

Year	Total Waste to be Hauled (1)	Waste to be Hauled by KMS' Trucks (2)	Waste to be Hauled by Contractors (1) - (2) = (3)	Degree of Contracting Out (3) ÷ (1) = (4)
1992	889	621	268	30 %
1995	1,007	621	386	38 %
2000	1,312	621	691	53 %
2005	1,752	621	1,131	65 %
2010	2,310	621	1,689	73 %

2) Type of Haulage Systems to be Contracted Out

Type of haulage systems to be contracted out should be determined on the basis on degree of benefits expected through the contracting out.

KMS uses two major haulage systems:

1) Haulage with small containers
2) Haulage with large containers

It is considered that the contracting out of the 1st system (haulage with small containers) would bring about more benefits than the contracting out of the second system (haulage with large containers) would. The contracting out of the haulage with small containers will bring about all the three benefits [1) cost saving, 2) technological development and 3) expansion of service coverage].

KMS wil be able to save Rp 6,266/ton, 38 % of the unit cost of KMS' haulage with small containers if such service is contracted out, while the corresponding saving in case of contracting out the haulage service with large containers is Rp 3,125/ton, 31 % of the KMS' unit cost. See the table below:

Table 6.3-2 Comparison of Expected Cost Savings through the Contracting Out of Two Haulage Systems

	Estimated Unit Cost of KMS' Own Operation (1)	Estimated Unit Contract Price including KMS' Supervision Cost (2)	Expected Saving for KMS (1) - (2) = (3)
1. Haulage with small containers	Rp 16,353/ton (100%)	Rp 10,087/ton (62%)	Rp 6,266/ton (38%)
2. Haulage with large containers	Rp 10,172/ton (100%)	Rp 7,047/ton (69%)	Rp 3,125/ton (3 %)

Note: See Section 2.5 for details of calculations of the above-shown costs.

With respect to the future responsibility to be shared by KMS and its contractors, it is advised that:

1. KMS will be responsible for:
   1) Waste haulage service (621 ton/day on average) with large containers,
   2) Waste haulage of special waste (collected through community voluntary work and bulky waste on request base)

2. Contractors will be responsible for:
   1) All the remaining haulage service with large containers,
   2) All the haulage service with small containers

3) Inclusion of Provision and Maintenance of Containers in the Contract

It is advised that the future contract with waste haulage contractors will include the provision and maintenance of containers due to the following reasons:

1. A complete responsibility for a haulage system (consisting of containers and trucks) will make contractors to choose or develop a better haulage system.

A good haulage system is a good combination of containers and trucks. Suitable type and capacity of trucks depend on specifications of containers. A complete responsibility of contractors for a haulage system will make them to choose or develop cost-effective and technologically suitable combination.

2. The contract price may decrease.

   As a result of the above advantage (higher possibility for choosing or developing cost-effective and technically more suitble system), the cost of contractors' haulage service may decrease, which would lead to a decrease in the contract price. Alternatively, the contractors may use the saving for research and development of even more effcient system..

3. A complete responsibility for a haulage system will reduce the risk of contractors' failure.

   If the provision and maintenance of containers remain to be the responsibility of KMS, the contractors may use this fact as an excuse for their failures of not hauling required amount of waste.

4. Coverage of wast collection and haulage service would increase.

   The inclusion of the responsibility for the provision of containers together with waste amount-based contract price would give contractors incentives to increase its waste collection and haulage amounts. This will help to increase the waste collection coverage particularly in unserved areas.

6.3.3 Conditions for Increasing the Contracting Out

KMS should satisfy the following conditions in order to increase the contracting out of the waste haulage service:

Conditions to be Met in order to Increase the Contracting Out of Haulage Service

1. Increases of the contract price
2. Longer contract period - at least one year
3. To lease or sell KMS' used trucks if contractors accept it.

4. The unit contract price should be decided on tonnage base (Rp/ton), not volume base (Rp/m^3). For this purpose, KMS needs to purchase truck scales to be placed in LPA.

1) Increases of the Contract Price

Whether or not the contracting out of the waste haulage service will be successful depend largely on whether or not KMS will apply an appropriate contract price. The current contract price, Rp 1,100/m^3 is too low even for the existing haulage system of the contractors.

The contract price should be high enough to attract potential contractors. The minimum future contract prices for waste haulage services are estimated as follows:

Table 6.3-3 Estimated Minimum Contract Prices for the Future Waste Haulage Services

Type of Service	Estimated Minimum Contract Price	Estimated KMS' Cost
1. Waste haulage with small containers [Cost Index: KMS' cost = 100]	Rp 9,889/ton (Rp 1,978/m^3) [60]	Rp 16,353/ton (Rp 3,271/m^3) [100]
2. Waste haulage with large containers [Cost Index: KMS' cost = 100]	Rp 6,909/ton (Rp 1,382/m^3) [68]	Rp 10,172/ton (Rp 2,034/m^3) [100]

Notes:
1. The above shown contract prices and KMS' costs per cubic meter are not reliable, and presented only for reference.

2. The above shown contract prices and KMS' costs per cubic meter are calculated by applying the waste density of 0.2 ton/m^3, which is equivalent to the waste density implicitly applied in the KMS' contract with the haulage contractors. [According to the measurement by KMS, the total contract waste amount hauled by KMS' five contractors was 1,327 m^3/day in June 1992, while the contractors' waste amount estimated by JICA Study Team was 268 ton/day. This implies that the implicit waste density applied in KMS' contract is 0.2 ton/m^3 (268 ton/day ÷ 1,327m^3/day = 0.2 ton/m^3)]

Section 6.3.4 shows assumptions and cost details used for estimation of the above shown unit prices.

2) Longer Contract Period - One year at least

According to the interview serveys with the five waste haulage contractors conducted by the JICA Study Team, the contractors complain that the current contract period, 3 months is too short. They desire at least one year contract.

The disadvantages derving from the short contract period include the following:

1. Shorter the contract period, the more difficult for the contractors to acquire loans from banks.

2. The shorter the contract peirod, the quicker cost recover the contractors will attempt, which lead to higher contract prices.

From contractors' view point, it is desirous that the contract period is same as the duration (period of use) of waste haulage vehicles.

It is recommended that KMS should make the contract period longer - at least one year, 2 years is even better. It is advisable that KMS and contractors prepare an informal agreement stating that the contract is renewarable for 5 years, in principle, with an appropriate price escalation to be agreed upon by both parties.

3) Lease or Sales of KMS' Used Trucks to Contractors

According to the interview survey conducted by the JICA Study Team, four (4) contractors out of five (5) said that if KMS leased used containers trucks under an agreement, they would accept such a lease agreement. They also said that they can accept the responsibility of maintenance and repairs except for major ones such as overhaul of engines. The coverage of the maintenance responsibility depends on the lease price. The lease of KMS' used trucks is considered feasible because the contractors have ability to use trucks for long time with reasonable maintenance. Another possibility is the sales of KMS's used trucks to contractors. This arrangement would even better than the lease because problems of maintenance responsibility can be avoided with the sales.

It is advised that KMS will seriously consider the above-proposed arrangements (sales or lease) because these arrangements would lead to the reduction of the contract price.

4) Tonnage Based Contract Price (Rp/ton)

It is recommended that KMS will apply a weight based contract price instead of volume based contract price because:

1. Waste volume is changeable depending on the densities of waste, which change according to the conditions of waste.

   Note: The density of waste may be less than 0.2 ton/m3 at generation sources (in the household containers), and increase to 0.3 ton/m3 in the handcarts, it further increases when transported by trucks.

2. It is not possible for KMS to measure the volume of waste to be hauled by contractors from many small containers.

It is advised that KMS should provide a weight measurement equipment (truck scale) at each LPA.

Truck scales are useful not only for the contractual purpose but also for analysis and planning of solid waste management, which in trun will be helpful for solving problems and increasing the SWM service efficiency. Truck scales are also helpful to save manpower that is currently used for monitoring waste volume at each depo and LPS.

6.3.4 Major Assumptions and Cost Details Used for Estimation of the Unit Contract Prices and KMS' Costs

1) 10 m3 Compactor Truck with Mini Containers

a. Major Assumption

	KMS	CONTRACTORS
1. Truck Purchase Price	Rp 109,300,000	Rp 109,300,000
2. Duration of Truck	7 years	10 years
3. Duration containers	5 years	5 years
4. Number of containers served per trip	12 units	12 units
5. Number of trips to LPA per day	3 trips/day	4 trips/day
6. Loan period	20 years	5 years
7. Loan interset	10.5 %/year	25 %/year
8. Number of Crew (per Person)		
8.1. Driver	1	1
8.2 Assistant	2	1
9. Rate of Salary of Crew		
9.1 Driver	Rp 2,760,000/year*1	Rp 3,300,000/year
9.2 Assistant	Rp 1,500,000/year	Rp 1,800,000/year
10. Density of waste		
10.1 Base of contract volume	0.2 ton/m3	0.2 ton/m3
10.2 At container	0.33 ton/m3	0.33 ton/m3
10.3 After compaction	0.396 ton/m3	0.396 ton/m3

*1: Note on Salary rate of drvier of KMS:

- Basic Salary:	Rp 150,000
- Incentive:	Rp 60,000
- Premee:	Rp 20,000
Total:	Rp 230,000

b. Assumptions on Waste Amount Hauled

	KMS	CONTRACTORS
1. Average waste collected per container (1 m3)	0.33 ton/container	0.33 t/container
2. Average waste hauled per trip (12 containers)	3.96 ton/trip	3.96/trip
3. Average umber of trips per operating day	3 trips/day	4 trips/day
4. Waste amount hauled per truck per operating day	11.88 t/truck/d	15.84 t/truck/d
5. Average number of operating days per year	310 days/y	310 days/y
6. Average amount hauled per truck per year	3,683 t/truck/y	4,910 t/truck/y

c. Cost per Truck per Year (10 m3 Compactor Truck with Mini Containers)

		KMS	CONTRACTORS
1.	Depreciation	Rp 15,614,000	Rp 10,930,000
2.	Loan interest	Rp 11,476,000	Rp 6,832,000
3.	Operation & Maintenance		
	3.1 Fuel	Rp 5,000,000	Rp 6,667,000
	3.2 Salary of Drivers and Assistants	Rp 5,760,000	Rp 5,100,000
	3.3 Tax and insurance	Rp 2,590,000	Rp 2,590,000
4.	Maintenance (% of Truck purchase cost: 12.5 % for KMS, 14 % for Contractors)	Rp 1,366,000	Rp 1,530,000
5.	Cost of containers (36 for KMS, 48 for Contractors)		
	5.1 Depreciation of containers per truck	Rp 4,320,000	Rp 5,760,000
	5.2 Maintenance of containers per truck	Rp 540,000	Rp 720,000
6.	Total cost (1+2+3+4+5)	Rp 46,666,000	Rp 40,129,000
7.	Indirect Management Cost (10 % of Item 6)	Rp 4,667,000	Rp 4,013,000
8.	Grand total (6+7)	Rp 51,333,000	Rp 44,142,000

Note on Calculation of Annual Interest:
KMS: Cumulative interest for 20 years (10.5 % x Rp 109,300,000 x 20 years ÷ 2 = Rp 114,765,000)
Annual average interest = Rp 114,765,000 ÷ 7 years = Rp 16,395,000
Annual average interest after discount = Rp 11,476,000
Contractors: Cumulative interest for 5 years (25 % x Rp 109,300,000 x 5 years ÷ 2 = Rp 68,312,000)
Annual average interest = Rp 68,312,000 ÷ 10 years = Rp 6,832,000

d. Unit Haulage Cost Per Ton

		KMS	CONTRACTORS
1.	Total Annual Cost per Truck	Rp 51,333,000/year	Rp 44,142,000/year
2.	Total Annual Waste Hauled per Truck		
	2.1 Theoritical Amount	3,683 t/year	4,910 t/year
	2.2 Actual Amount	3,139 t/year	
3.	Unit Haulage Cost per Ton		
	3.1 Theoritical Unit Cost (1 ÷ 2.1)	Rp 13,938/ton	Rp 8,990/ton
	3.2 Actual Unit cost od KMS (1 ÷ 2.2)	Rp 16,353/ton	-
	3.3 Contract Price with 10 % Profit	-	Rp 9,889/ton
	3.4 Cost of supervision and administration of contractors (2 % of Item 3.3)		Rp 198/ton
4.	Final Unit Costs for Comparison	Rp 16,353/ton	Rp 10,087/ton
5	Cost Index (Contractor = 100)	162	100
6.	Cost Saving for KMS	Rp 6,266/ton	-

2) Container Truck with 10 m^3 Containers

a. Major Assumptions

	KMS	CONTRACTORS
1. Truck Purchase Price	Rp 81,300,000	Rp 81,300,000
2. Duration of Truck	7 years	10 years
3. Duration containers	5 years	5 years
4. Number of trips to LPA per day	5 trips/day	7 trips/day
5. Loan period	20 years	5 years
6. Loan interset	10.5 %/year	25 %/year
7. Number of Crew		
7.1. Driver	1	1
7.2 Assistant	1	0
8. Rate of Salary of Crew		
8.1 Driver	Rp 2,760,000/year	Rp 3,300,000/year
8.2 Assistant	Rp 1,500,000/year	-
9. Density of waste		
9.1 Base of contract volume	0.2 ton/m3	0.2 ton/m3
9.2 At container	0.33 ton/m3	0.33 ton/m3

b. Assumptions on Waste Amount Hauled

	KMS	CONTRACTORS
1. Average waste collected per Container (10 m3)	3.2 ton/container	3.2 t/container
2. Average number of trips per operating day	6 trips/day	8 trips/day
3. Average waste amount hauled per truck per operating day	19.2 t/truck/d	25.6 t/truck/d
4. Average number of operating days per year	330 days/y	330 days/y
5. Average amount hauled per truck per year	6,336 t/truck/y	8,448 t/truck/y

c. Cost per Truck per Year (Container Truck with 10 m3 Containers)

		KMS	CONTRACTORS
1.	Depreciation	Rp 11,614,000	Rp 8,130,000
2.	Loan interest	Rp 8,536,000	Rp 5,100,000
3.	Operation & Maintenance		
	3.1 Fuel	Rp 6,081,000	Rp 8,400,000
	3.2 Salary of drivers and assistants	Rp 4,260,000	Rp 3,300,000
	3.3 Tax and insurance	Rp 2,030,000	Rp 2,030,000
4.	Maintenance	Rp 10,163,000	Rp 11,382,000
	(% of Truck purchase cost: 12.5 % for KMS, 14 % for Contractors)		
5.	Cost of containers (6 for KMS, 8 for Contractors)		
	5.1 Depreciation of containers per truck	Rp 6,600,000	Rp 8,800,000
	5.2 Maintenance of containers per truck	Rp 825,000	Rp 1,100,000
6.	Total cost (1+2+3+4+5)	Rp 50,109,000	Rp 48,242,000
7.	Indirect Management Cost (10 % of Item 6)	Rp 5,011,000	Rp ,4,824000
8.	Grand total (6+7)	Rp 55,120,000	Rp 53,066,000

Note on Calculation of Annual Interest:

KMS: Cumulative interest for 20 years (10.5 % x Rp 81,300,000 x 20 years ÷ 2 = Rp 85,365,000)
Annual average interest = Rp 85,365,000 ÷ 7 years = Rp 12,195,000
Annual average interest after discount = Rp 8,536,000

Contractors: Cumulative interest for 5 years (25 % x Rp 81,300,000 x 5 years ÷ 2 = Rp 51,000,000)
Annual average interest = Rp 51,000,000 ÷ 10 years = Rp 5,100,000

d. Unit Haulage Cost Per Ton

		KMS	CONTRACTORS
1.	Total Annual Cost per Truck	Rp 55,120,000/year	Rp 53,066,000/year
2.	Total Annual Waste Hauled per Truck		
	2.1 Theoritical Amount	6,336 t/year	8,448 t/year
	2.2 Actual Amount	5,419 t/year	-
3.	Unit Haulage Cost per Ton		
	3.1 Theoritical Unit Cost (1 ÷ 2.1)	Rp 8,699/ton	Rp 6,281/ton
	3.2 Actual Unit Cost (1 ÷ 2.2)	Rp 10,172/ton	-
	3.3 Possible Contract Price with 10 % Profit	-	Rp 6,909/ton
	3.4 Cost of supervision and administration of contractors (2 % of Item 3.3)		Rp 138/ton
4.	Final Unit Cost for Comparison	Rp 10,172/ton	Rp 7,047/ton
5.	Cost Index (Contract Price = 100)	144	100
6.	Cost Saving for KMS	Rp 3,125/ton	

3) Future Cost Saving for KMS

a. Unit Cost Saving per Ton

1. Compactor Truck: Rp 6,266/ton (38 % of KMS' cost Rp 16,353/ton)
2. Container Truck: Rp 3,125/ton (31 % of KMS' cost Rp 10,172/ton)
3. Weighted Average: Rp 3,947/ton (33 % of KMS' cost Rp 11,791/ton

b. Total Waste to be Hauled by Contractors during 1993 - 2010

1. By Compactor Trucks: 1,511,100 ton (230 ton/day on average)
2. By Container trucks: 4,258,455 ton (648 ton/day on average)

c. Saving for KMS to be Achieved during 1993 -2010

1. Compactor Trucks: Rp 6,266/ton x 1,511,100 ton = Rp 9,468,552,600
2. Container trucks: Rp 3,125/ton x 4,258,455 ton = Rp 13,307,671,875
3. Total Saving: Rp 22,776,224,475
4. Average saving per year (Item 3 ÷ 18 years): Rp 1,265,345,804

6.4. Fee Revenue Improvement

6.4.1 Current Fee Revenue

1) Cost Recovery Ratio

KMS' SWM cost and revenue (sanitary retribution) in 1991 is estimated as follows:

1.	Total SWM Cost:	Rp 12,500,000,000	(100 %)
2.	Net Revenue to KMS:	Rp 3,340,000,000	(27 %)
3.	Gap between the Cost and Revenue:	Rp 9,160,000,000	(73 %)

Notes:
1) The above-shown total SWM cost include estimated depreciation cost of trucks and incinerators.

2) The net revenue is calculated as follows:
Rp 3,975,000,000 (Gross revenue) - Rp 635,000,000 (handling charges paid to those involved in the fee collection) = Rp 3,340,000,000

3) The net fee revenues by payers are as follows:

a.	Household Type B paying through non-PDAM:	Rp 1,092,000,000 (33 %)
b.	Household Type B paying through PDAM:	Rp 368,000,000 (11 %)
c.	Household Type A paying through PDAM:	Rp 706,000,000 (21 %)
d.	Business establishments:	Rp 1,174,000,000 (35 %)
Total:		Rp 3,340,000,000(100%)

(Non-PDAM payers are those who pay the retribution through RT/RW.)

The cost recovery is 27 %, which much lower than the corresponding percentage (70 %) of the Cleansing Authority of Bandung (PDKB).

2) Fee Payers

It is estimated that 399,000 payers paid the sanitary retribution in 1991, which is 94 % of an estimated number of recipients of SWM service provided by KMS.

1.	Number of Registered Households & Business Establishments	530,000	(100 %)	
2.	Estimated Number of Recipients of SWM Service Provided by KMS:	424,000	(80 %)	(100 %)
3.	Number of Fee Payers	399,000	(75 %)	(94 %)
4.	Number of Non-Fee Payers (Free Riders)	25,000	(5 %)	(6 %)

Note: Of the registered number of households and business establishments, the number of business establishments are about 20,000.

The above two facts that 1) cost recovery ratio is as low as 27 %, and 2) ratio of fee payers to an estimated number of SWM service recipients is as high as 94 % mean that the rates of the fee (retribution) is low.

6.4.2 Free Revenue Improvement Measures

It is the citizens who bear the costs of public services including SWM services either directly by paying the retribution and fees or indirectly by paying taxes. In this sense nothing is free. The citizens of Surabaya pay two kinds of direct charges for the SWM services: the waste collection service fees to RT or RW where they belong to, and the sanitary retribution to KMS.

It is considered that the former fees cover all the cost (estimated at Rp 8.5 billion/year) of the waste collection service executed by RT and RW. The retribution paid by the citizens amounted to Rp 4 billion in fiscal year 1991/92, which corresponds to about one third of KMS' total SWM expenditure in the same year.

The Study Team considers that to finance SWM services with direct charge (the sanitary retribution and fees) is more sound than financing it with indirect taxes in view of the following advantages of the former:

(1) To finance SWM services with direct charges (herein-referred to as the direct charge cost bearing system) would achieve the Beneficiary Pay Principle (BPP).

(2) The direct charge cost bearing system would be helpful for the reduction of waste generation.

(3) Under the direct charge cost bearing system, the citizens will be more aware of and demanding the appropriateness of the municipal SWM services, which may induce the municipal authority to improve the services.

It is proposed that KMS should improve and strengthen the collection of the retribution through the improvement measures summarized as follows:

1. Gradual application of volume-based-retribution to business waste.

Target completion of the application: 1997

2. Introducton of a new fee collection method (utilization of PLN fee collection points)

Target introduction year: 1994

3. Gradual increases of the retribution rates

(This is explained in the Main Report Part 3 Chapter 6.)

6.4.3 Application of Volume-Based Fee Rates to Business Establishments

The advantages of application of volume-based fee rates are as follow:

1. This method is more fair than a fixed rate method.
2. Fee revenues can substantially increase.
3. This method gives waste generators incentives to reduce waste generation.

The Cleansing Authority of Bandung (PDKB) introduced the volume based fee rates in 1987. As a result, the fee revenue from business establishments dramatically increased from Rp 409 million in 1986 to Rp 988 million in 1987 (241 % of the 1986 revenue). PDKB's current fee rate is Rp 4,650/m^3.

6.4.4 Introduction of a New Fee Collection Method

1) Current Net Fee Revenue

KMS collected about Rp 4 billion of the fee called "sanitary retribution" for the solid waste management service in the fiscal year 1991/92. However, as shown in Table 6.4–1, the net revenue available to KMS is estimated at Rp 3.37 billion, 84.8% of the retribution collected. The remaining 15.2 % is paid as handling charges to various parties involved in the collection of the retribution such as PDAM (municipal water supply company), and RT and RW, etc. (Note: The percentage of the handling charges are as follows: 9 % to PDAM, 14 % to RT, and 5.75 % to RW. Some other parties such as chiefs of Kelurahan and Kecamatan also receive some.

Table 6.4-1. Retribution Collected and Handling Charges Paid to Involved Parties in 1991/92

Unit: Million Rupiah

	Pay Through PDAM (A)	Pay Through Non-PDAM (B)	Total (C)=(A)+(B)
1. Retribution Collected	2,498	1,477	3,975
2. Handling charges paid to involved parties	250 (10% of 2,498)	355 (26% of 1,477)	605 (15.2% of 3,975)
3. Net revenue to KMS (1-2)	2,248 (90%)	1,123 (74%)	3,370 (84.8%)

Note: Most households without PDAM connections pay Rp. 500/month.

As shown in table, all the households and business establishments (153,000) who have connections with PDAM pay the retribution, while only 65 % of those who do not have connections pay the retribution. As a whole, 75 % of the potential payers actually pay the retribution. The proposed new collection method as explained in the following section will be helpful for the increases of the number of payers.

Table 6.4-2 Potential and Actual Number of Payers of the Retribution

	Pay Through PDAM (A)	Pay Through Non-PDAM (B)	Total (C)=(A)+(B)
1. Number of the Current Potential Payers in Surabaya	153,000	377,000	530,000
2. Actual Number of Payers of the Retribution	153,000 (100%)	246,000 (65%)	399,000 (75% of total) Households)

Note: It is estimated that 530,000 current potential payers consists of 510,000 households, and 20,000 business establishments.

2) Proposed Method for Collection of Retribution and Its Benefits

a. Method

In June 1991, the Cleansing Authority of Bandung (PDKB) introduced a new fee collection system where PDKB utilizes the electric company (PLN) payment points (offices) as PDKB's fee collection points. PDKB's fee collectors stay at PLN's payment offices. They have been allowed to have fee collection counters next to PLN's payment counters in the same offices. PLN customers who visited and paid PLN bill are requested to walk to the next payment counter of PDKB, and pay the retribution to the PDKB's fee collection counter. PLN accepted this fee collection method of PDKB's because this method does not interfere PLN's bill system.

According to PDKB, it received some complaints from the fee payers for the first two months following the initiation of this method. Subsequently, however PDKB has not received any complaints. PDKB's monthly fee collection efficiency (rate) is now 93 - 97%, remarkable increases from the previous rate of 12%. (In Bandung, 98% of the households have PLN connections).

This fee collection method has been applied not only in Bandung but also 5 other cities, i.e., Tasikmalaya, Bogor, Sukabumi, Ambon, Samarinda.

b. Expected Benefits

It is expected that the application of the proposed fee collection method will bring about higher net revenue to KMS as a result of the following changes:

a. Increases of the number of payers of the retribution.

It is expected that the number of payers will increase from the current 399,000 to 485,500 upon the application of the proposed method. In addition, the number of payers will more quickly increase in the future than the current increase of payers of the sanitary retribution because number of PLN connections has been increasing faster than that of PDAM connections.

b. Reduction of the deductions (commission and administrative costs to be paid to the parties involved in the collection of the retribution).

The current total deductions are 15.2 % of the total retribution collected. It is expected that the total deductions will reduce to 6.7 % upon the application of the proposed method.

As the result of the above two changes, it is expected that the net revenue to KMS will increase by 74 % from the current Rp 3,370 million/year to Rp 5,849 million/year. See Tables 6.4-3 and 6.4-4 for details.

Table 6.4-3 Number of Potential Payers of Retribution with the Application of the Proposed Fee Collection Method

	Those with PLN Connections (A)	Those without PLN Connections (B)	TOTAL (C)=(A)+(B)
1. Number of PLN Connections and Non-PLN Households	400,000 (380,000 Households + 20,000 business establishments)	130,000	530,000
2. Number of Potential Payers	400,000	85,000 (65% of 130,000)	485,500

Note: It is assumed that all those who have PLN connections will pay the retribution with the application of the new method, while only 65 % of those who do not have PLN connections pay the retribution through RT/RW.

Table 6.4-4. Potential Revenue with the Proposed Fee Collection Method

Unit: Million Rupiah

	PAYMENT THROUGH PLN PAYMENT OFFICES (A)	PAYMENT THROUGH NON-PLN (B)	TOTAL (C)=(A)+(B)
1. Potential Revenue	5,760	510	6,270
2. Handling charges and cost of fee collection	288 (5% of item 1)	133 (26% of item 1)	421 (6.7% of item 1)
3. Net Revenue to KMS (1-2)	5,472 (95%)	377 (74%)	5,849 (93.3%)

NOTE :

1. Calculation of potential revenue (Rp. 5,760 million) through PLN offices:

   a. Households

   Rp 1,000/month/household x 12 months/year x 380,000 households = Rp 4,560,000,000/year

   b. Business Establishments

   Average commercial and industrial retribution rate Rp 5,000/year x 12 months/year x 20,000 business establishment = Rp 1,200,000,000/year

   Households + Business Establishments

   Rp 4,560,000,000 + Rp 1,200,000,000 = Rp 5,760,000/year

2. Calculation of potential revenue (Rp 510 million) through Non-PLN:

   Rp 500/month/payer x 12 months/year x 85,000 payers = Rp 510,000,000