

6. Pilot Projects

6 Pilot Projects

6.1 Selection of Pilot Projects

6.1.1 Objectives of Pilot Projects

The M/P projects may encounter many difficulties when they are implemented. To determine the problems that may arise and to find a way to overcome these difficulties, pilot projects were conducted during the course of this study in cooperation with the counterparts and many concerned parties. The objectives of the pilot projects are summarised below.

- To **support construction of organizations to resolve SWM issues in the UBC** through the planning, preparation, execution and evaluation of the pilot projects;
- To assess the feasibility of the technical system proposed in the M/P (i.e., establishment of discharge rules, verification of separate collection, etc.).
- To acquire base data so that the design outline of the F/S can be devised (i.e., design of a sanitary landfill reflecting conditions of the study area, examination of mixed combustion method of RDF with coal, etc.).
- Raise public awareness and increase public participation in SWM.
- Demonstrate improvement measures to residents and authorities concerned with SWM.

6.1.2 Selection of Pilot Projects

After the discussion with C/P the following pilot projects were selected and approved by the St/C. The pilot projects were conducted in Phase 2 and Phase 3 study stages as follows:

Phase 2 Study Stage:

- P/P 1. Urgent Improvement of the Ulaan Chuluut Disposal Site
- P/P 2. Thermal Recycling “RDF”
- P/P 3. Recycling Pilot Project: Movable Recyclable Collection System “Chirigami Kokan”
- P/P 4. Examination of the Loading Device for Heavy Waste
- P/P 5. Raising Public Consciousness on Waste Issues

Phase 3 Study Stage:

- P/P 6. Continuation of Urgent Improvement of the Ulaan Chuluut Disposal Site
- P/P 7. Continuation of Thermal Recycling “RDF”
- P/P 8. Collection System Improvement (Establishment of Waste Discharge Rules and Introduction of Separate Collection)
- P/P 9. Organization of Waste Pickers

6.2 Urgent Improvement of the Ulaan Chuluut Disposal Site

6.2.1 Project Outline

a. Justification

There are four official final disposal sites in the study area. All of the sites are operated in so-called open dumping, posing serious negative impacts on the surrounding environments. Air pollution by smoke caused by fire and scattering wastes by wind especially in spring season is particularly serious not only for the surrounding area but also a wide area in the city.

Among the four, Ulaan Chuluut disposal site (UCDS), where wastes are dumped at everywhere without control, is the biggest one receiving more than 90 % of the wastes generated in the study area. The adverse impacts, therefore, very serious and sometimes the fire occurred in the site spread to neighboring houses by strong wind. MOE cautioned MUB to close it unless MUB improves it. The improvement of the site is therefore an urgent matter.

One of the most important targets of the M/P is to conduct a safe disposal of wastes discharged after 3Rs efforts; sanitary landfill operation. It is, however, neither being conducted in the study area nor the country.

Under the above situation MUB has requested the study team to assist to conduct the pilot project on the Urgent Improvement of UCDS in order to mitigate the current environmental problems and to conduct sanitary landfill operation. Under this pilot project the counterpart, Nuuts Co. and the City Maintenance and Public Utilities Department of MUB, will take initiative to implement sanitary landfilling and the study team will provide timely technical assistance with some financial assistance of JICA for the initial investment.

b. Objectives

The objectives of the Pilot Project (PP) for the Urgent Improvement of Ulaan Chuluut Disposal Site (UCDS) are:

- Objective 1. To establish a control and management system of collected waste in order to avoid illegal dumping; i.e. to dispose of all collected waste in the central 6 Duuregs at the authorized disposal site, i.e. UCDS;
- Objective 2. To dispose of the waste at the designated area of the UCDS. This is the first step of the sanitary landfill operation; and
- Objective 3. To rehabilitate completed landfill area of the UCDS and conduct a sanitary landfill operation as much as possible.

c. Improvement Plan and Implementation

In order to achieve the above objectives, the following improvement works were proposed and the work assignment for the implementation was agreed between the C/P and the JICA study team (JICA ST). Consequently the proposed pilot project was conducted by the initiative of the MUB/Nuuts in collaboration with the JICA ST.

Table 6-1: Improvement Plan, Work Assignment and Achievement

Objective	Improvement Plan	Work Assignment	Achievement
Objective 1	1.1. Registration of collection service organizations and establishment of control system of them	MUB/Nuuts	Operation of weighbridge (WB) started on 26 Dec 2005 and registration of collection trucks including TUKs and other organizations started digitally using PC in WB control building.
	1.2. Strengthening control and management capability of Nuuts Co., Ltd. including increase of budget for it	MUB	Control and management capability of Nuuts Co., Ltd. is being strengthened through the pilot project, C/P training in Japan, etc. Budget of Nuuts has increased to 4 times from Jan 2006 which is 150,000,000 MNT in the year for 2006.
	1.3. Construction of a new control building	JICA ST	The new building is fully completed together with WB and operational from 26 Dec 2005.
	1.4. Unification of access to the southern road	MUB/Nuuts	As enclosing bank and fences were completed, no access other than the southern road is possible.
	1.5. Installation of a weigh bridge	JICA ST	Installation of a weigh bridge is completed on 26 Dec 2005
	1.6. Development of a database for control & management of waste collection and disposal	JICA ST	Nuuts staffs have received on the job training in control building by JICA ST continuously for around one year. Three persons who are in charge of WB operation are now familiar to operate. Development of a database for control & management of waste collection and disposal is in progress and monthly report was submitted to MUB using WB data base.
	1.7. Development of monitoring and control system for illegal dumping	MUB/Nuuts	MUB is examining monitoring and control system for illegal dumping. The study on construction waste was done by the JICA ST and the results of the study have been analyzed.
	1.8. Reexamination of tipping fee	C/P and JICA ST	The tipping fee was examined together with fee collection system and tariff setting. New tariff was set and enforced from 1 st September 2006.
	1.9. Strengthening enforcement	C/P and JICA ST	System of controlling illegal dump was examined and proposed in the Final Report.
Objective 2	2.1. Establishment of boundary of the UCDS by installation of a gate, a fence and an enclosing bank	JICA ST	A Gate, a fence and an enclosing bank were constructed to surround the UCDS. Consequently the boundary of the site was established.
	2.2. Prevention of UCDS from expansion of ger area by installing fence or buffer zone	MUB	A buffer zone to protect UCDS from expansion of ger area was approved by the Standing Committee for Environment of the Citizens' Representatives Khural of MUB and necessary measures such as the setting of sign board and boundary structures were conducted. It is being regulated by the Citizens' Representatives Khural of MUB. Green belt was constructed with tree planting to indicate the buffer zone and it was proved that tree can be glowed with proper maintenance.
	2.3. Construction of an enclosing dam and bank to establish waste disposal operation area (working face)	JICA ST	An enclosing dam and bank to establish waste disposal operation area (working face) has been completed. 1st working face was filled with waste 2nd enclosing bank was constructed on Dec 2005. 3 rd enclosing bank was constructed on September 2006.
	2.4. Improvement of on-site road	JICA ST & Nuuts	A main on-site road has been completed. But due to the break down of bulldozer, collection truck could not reach to the working face and some part of the road was blocked by the waste. On site road was realigned to further west in order to avoid blockage by the wastes.
	2.5. Cleaning waste dumped along the access road and surrounding areas	MUB and JICA ST	MUB contractor and JICA contractor cleaned up waste dumped along the access road and surrounding areas. Cleaned up waste is used for the filling material of enclosing dam. Cleaning waste along access road is being done periodically.
Objective 3	3.1. Installation of gas removal facilities	JICA ST	In total 18 units of gas removal facilities were installed at the UCDS. Some removal facilities need to be extended.
	3.2. Construction of storm water drain	JICA ST	The storm water drain was constructed together with the enclosing bank.
	3.3. Installation of leachate treatment facility	JICA ST	Leachate treatment facility that consists of leachate collection facilities and treatment ponds was constructed. There was no leachate outflow observed.

3.4. Construction of a warm garage	JICA ST	In order to facilitate smooth operation of landfill equipment in the winter season a warm garage was constructed. Water truck and bulldozer are stored inside.
3.5. Construction of Medical Waste Pits	JICA ST	In order to separately dispose medical waste from MSW, medical waste pits are constructed.
3.6. Rehabilitation of completed landfill area by re-shaping, slope trimming of existing landfill surface and soil covering	MUB/Nuuts	MUB contractor has completed the rehabilitation works and about 8ha of land was rehabilitated. One wheel shovel, one excavator and three dump trucks were mobilized and it took around one month to complete. This work should be done during the summer time because soil will be frozen in winter time and it is impossible to excavate cover material.
3.7. Plan and conduct of waste disposal plan	Nuuts and JICA ST	A rule of UCDS and preliminary disposal plan is drafted by JICA ST. The Nuuts commenced to apply the rule and plan from November 1, 2005.
3.8. Conduct of waste compaction and leveling	Nuuts	There are two bulldozers to push and compact wastes in the end of 2006. But both are very old and frequent breakdown and this caused difficulty for the proper operation
3.9. Conduct of soil covering	Nuuts	Since almost all facilities required for sanitary operation are completed, MUB/Nuuts could conduct sanitary landfill operation, which shall conduct daily soil covering on waste disposed. However, due to lack of basic equipment for soil cover such as an excavator, dump truck, etc., Nuuts hardly conduct soil covering. Furthermore, it is almost impossible to take soil in winter season because soil is frozen.
3.10. Control of waste picking activities	Nuuts	Nuuts conducted registration of waste pickers except new comers in August 2005 and drafted a rule of the UCDS in cooperation with JICA ST. Waste pickers meetings were conducted since May 2006 at weekly basis and around 220 WPs were registered. Those registered WPs received ID card with photo.
3.11. Establishment of a monitoring committee of disposal sites and conduct of periodical monitoring	MUB and JICA ST	The monitoring committee that consists of 9 members was established. The periodical monitoring was conducted 4 times in July, October of 2005 and May, Sep of 2006. Chairman of the committee was changed to the City Specialized Inspection Agency in UB.

d. Before Improvement

UCDS is located around 13km north west from centre of the UB City. There is no exact boundary for UCDS but around 10 ha is used for current disposal activities. Following is the condition of UCDS before improvement as of April 2005.

e. Improvement Plan

Improvement of UCDS consists of facility construction and improved operation. Improved operation will be exercised after completion of facilities by the C/P.

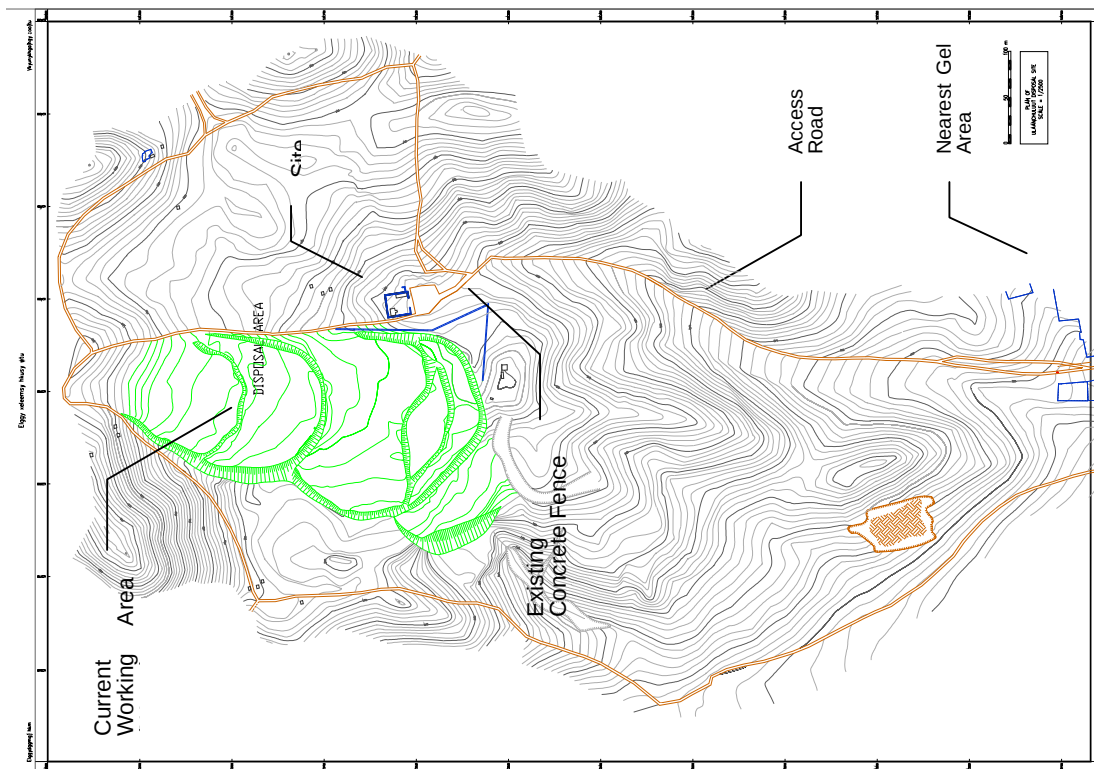


Figure 6-1: UCDS before Improvement as of April 2005

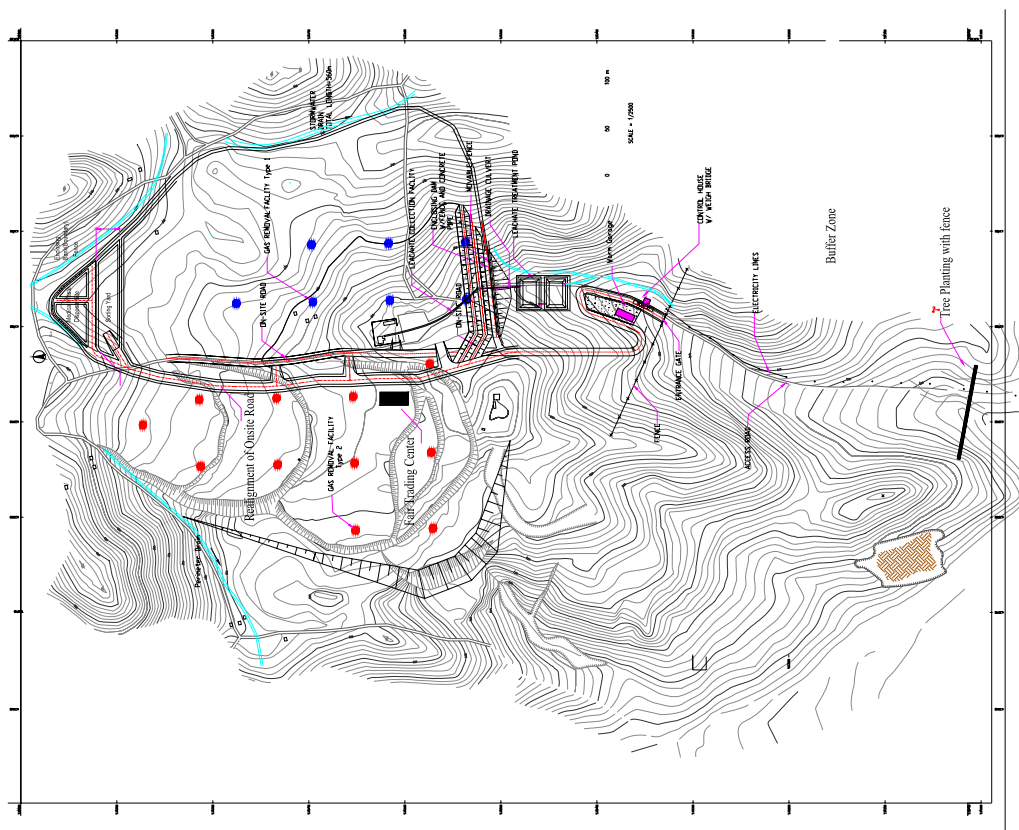


Figure 6-2: Improvement of UCDS: Facility Constructions

f. Facility Construction

1. Weighbridge and Control Building including Electricity Supply

The weighbridge was constructed at the entrance of UCDS in order to get the data on the amount of waste disposed of.

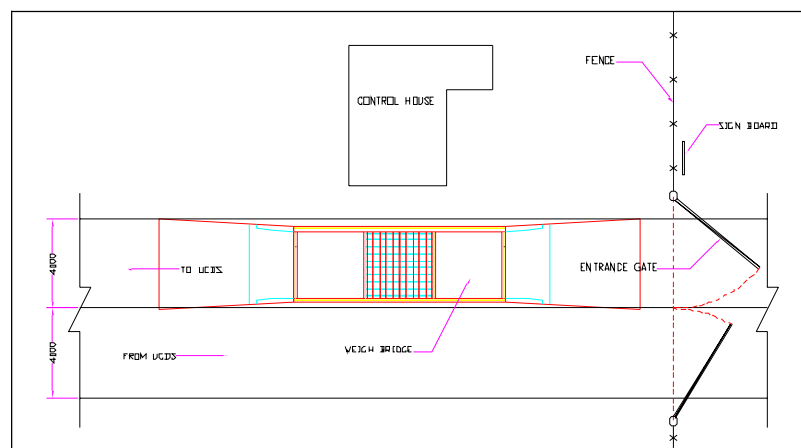


Figure 6-3: Layout of the Weighbridge and Control Building

2. Onsite road

Onsite road is the road starting from entrance of the UCDS through the embankment dam and continue up the north end of the boundary. The width of the road is 8 m and longitudinal gradient shall be less than 8 %. Surface is not paved but leveling and compacted by heavy machinery.

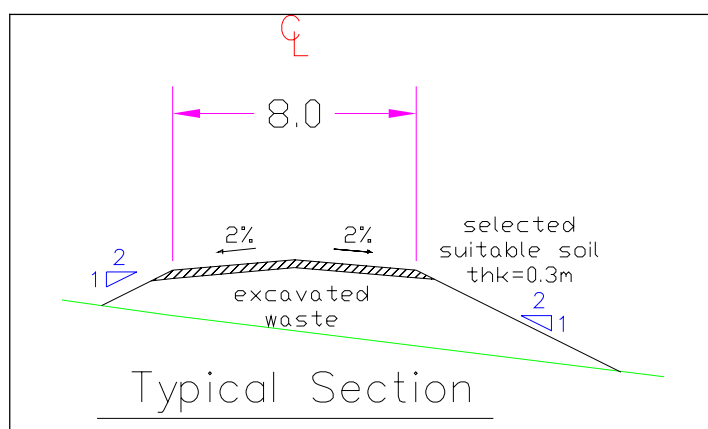


Figure 6-4: Cross Section of On Site Road

3. Demolition of Concrete Fence

Existing concrete fence was removed in order to construct onsite road. Removed fence was used for the boundary fence at the entrance of UCDS.

4. Enclosing Bank and Perimeter Drain

Enclosing bank and perimeter drain was constructed according to the plan. The purpose of the enclosing bank shall be clear indication of the boundary of disposal site in order to control the scattering surrounding disposal site. The height of the bank is 1 meter, the top width of the bank is around 3 meters, and the slope is 1 to 1.

Perimeter drain was excavated next to enclosing bank and prevent the water not to go into landfill area. Depth of the drain is around 50 cm.

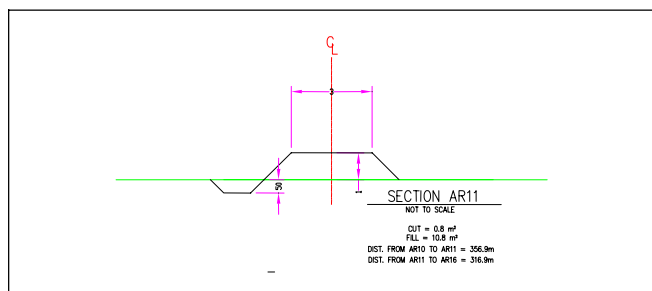


Figure 6-5: Cross Section of Enclosing Bank and Perimeter Drain

5. Enclosing Dam

Enclosing dam was constructed at the designated valley indicated in the plan. The height of the dam is around 8 meters, top width is 8 meters and the gradient of slope is 1 is to 2. The material for the dam filling is suitable soil obtained inside landfill area or designated area by the study team. Filling earth was spread and compacted layer by layer which is not more than 50 cm after compaction.

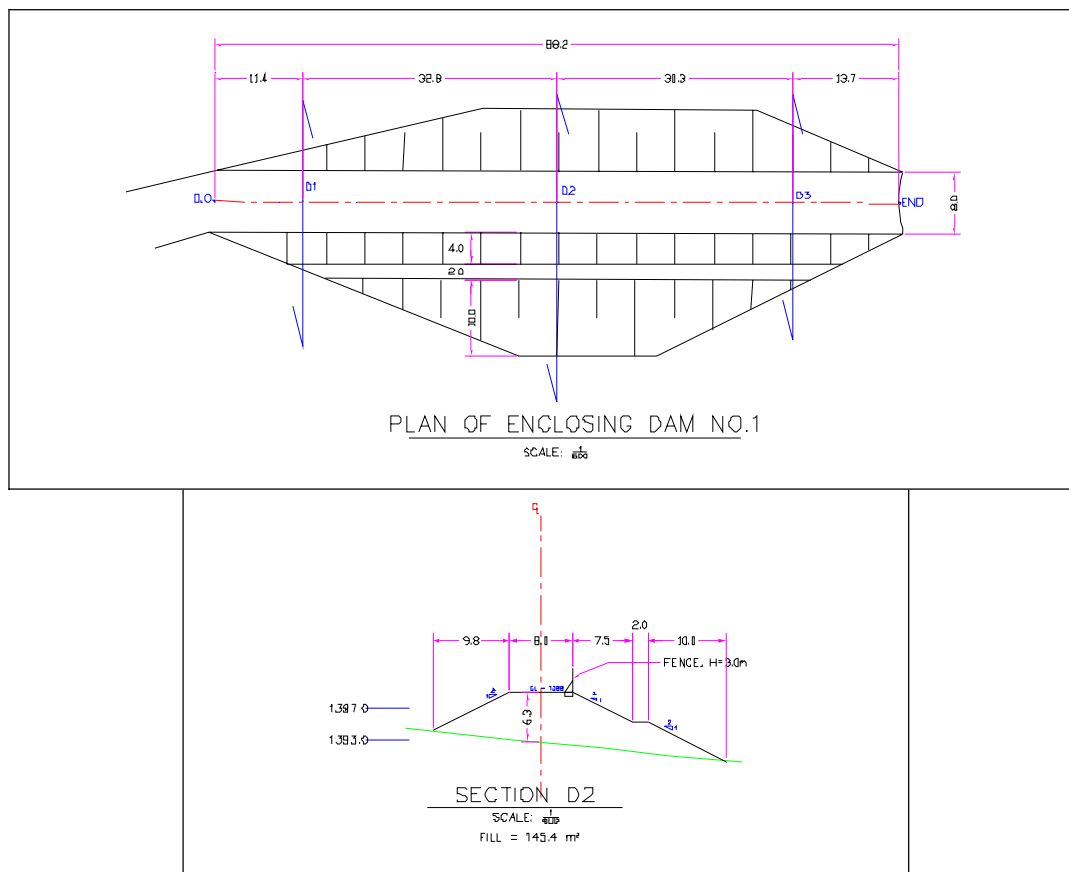


Figure 6-6: Enclosing Dam

6. Leachate Regulation Pond

Leachate regulation pond was constructed at the south of embankment dam. The size of regulation pond follows on the plan. Inlet of the pond was connected from culvert which buried under the enclosing dam. Depth of the pond is 1 m and is shallow enough to promote convection and enhance aerobic reaction.

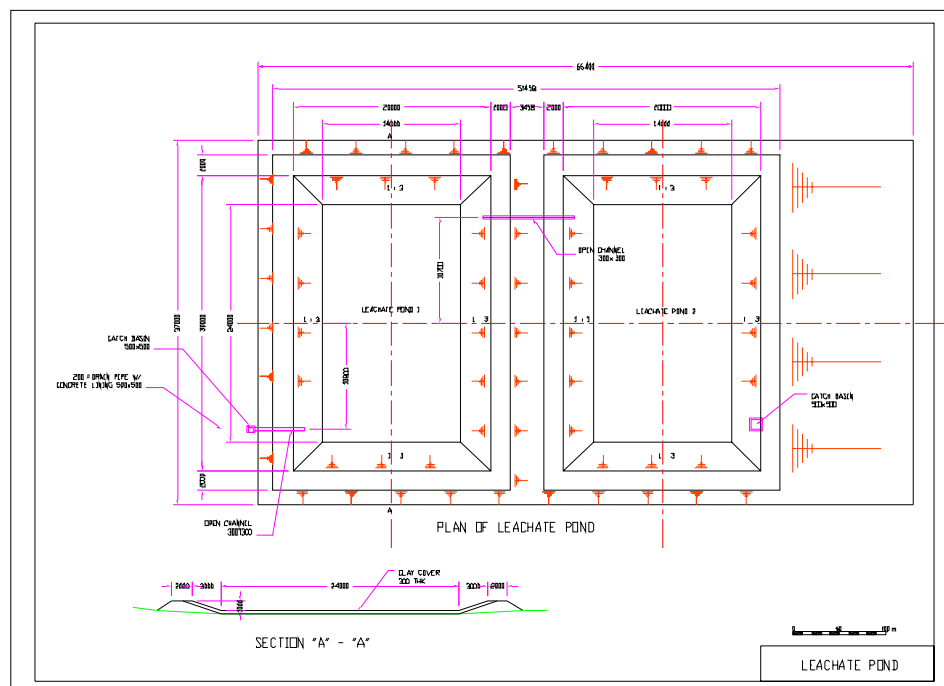


Figure 6-7: Leachate Regulation Pond

7. Gas Extraction Pipe

Gas extraction pipes were installed to vent generated gases and steam into the atmosphere smoothly. The location and its structure are shown in the following drawing.

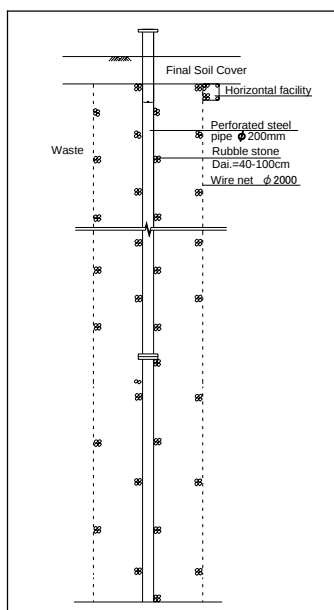


Figure 6-8: Gas Extraction Pipe

8. Movable Fence

Movable fence was installed along the top of enclosing dam in order to prevent scattering of plastic wastes by the heavy wind. This fence is a movable type and once complete the filling of 1st layer, the fence was shifted to the upper layer. The structure of the fence is shown in the following drawings.

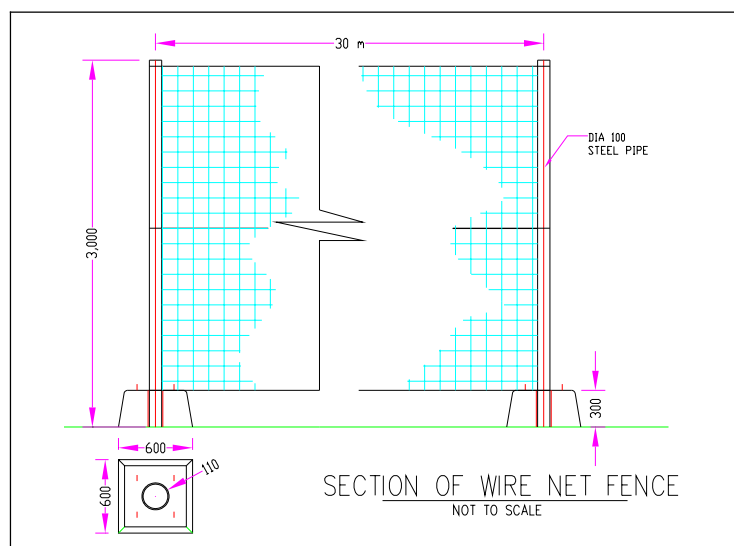


Figure 6-9: Movable Fence

9. Warm Garage

It is very difficult to start engine of bulldozer in the morning because of very low temperature in winter season, therefore bulldozer shall be kept in the warm garage after finish operation. Warm garage which accommodate two bulldozers was constructed for operation of sanitary landfilling.

10. Gate and Fence with Signboard.

Gate and Fence was installed at the entrance of UCDS near weighbridge. It is important to indicate the boundary of the landfilling area in order to prevent illegal dumping surround the disposal site. The signboard was installed outside the gate and indicate operation hours, operation procedures and prohibited actions to keep the disposal site at sanitary conditions.

11. Green Belt

The purpose of the green belt is;

- To identify the clear boundary of the disposal site.
- To prevent scattering of the wastes especially light wastes which are scattered by the wind such as papers and plastics.
- To protect view of disposal site from residential area.



Around 50 m length x 3m width green belt which is surrounded by the net fence was constructed at 400m south of the entrance of the UCDS. Tree planting was done on May 2006 and green leaf was seen on Jul 2006. One ger house was constructed nearby green belt and Nuuts staff stayed and looked after this green belt.

It was proved that the trees can be grown under the soil condition of UCDS with proper maintenance and green belt is anticipated to be effective after several years.

12. Fair Trade Center

Fair trade center was constructed at the west hill near the entrance of UCDS. The purpose of this facility is;

- To provide fair trading opportunities among waste pickers and recycle traders with certified scale.
- To provide welfare facilities for waste pickers to facilitate mutual trust with landfill operator.
- To provide meeting place for organizing waste pickers in order to conduct sanitary landfilling in near future.

Construction work was commenced on Jul 2006 and it took 4 months to complete. Two certified scale was provided to solve weighing problems between traders and waste pickers. The facilities are handover to Nuuts Co to manage and maintain properly.

13. Sorting Yard

Improvement of collection system including separate collection was carried out as a 3Rs promotion at phase 3 study. This separated waste including valuables was transported to the sorting yard and waste pickers salvaged these valuables from separated wastes at this sorting yard.

In order to verify whether these sorting operation is feasible or not, construction of sorting yard was implemented as a pilot project.

Sorting yard was constructed at the north end inside landfill site. After sorting operation was done, residue was disposed and finally, sorting yard will be filled with wastes.

As of December 2006, the sorting yard was filed with wastes fully, when the big fire was occurred in sometime September 2006, and this yard was used as emergency landfill site in order to avoid expanding fire at UCDS.

g. Improved Operation : Sanitary Landfilling

After completion of the construction of facilities, MUB implements sanitary landfilling at east half of the disposal site. Detailed operation guideline is presented in the next paragraph.

h. Schedule

The schedule for implementing improvement of UCDS is shown in following table.

Weighbridge construction was delayed because the contractor is not familiar with weighbridge and actual operation commenced on December 2005.

Table 6-2: Schedule for Improvement of UCDS

Item		2005												2006		
		3	4	5	6	7	8	9	10	11	12	1	2	3		
JICA Contract																
Study Phase		Phase 1						Phase 2								
Weigh Bridge	Construction Work															
	1. Design and Procurement															
	2. Electricity Supply															
	3. Civil Work															
	4. Building Work															
	5. Installation Work															
	6. Verification and Training															
	7. Weigh Bridge Operation															
Improvement of Ulaan Chuluut	Preparation Work															
	1. Planning and Design															
	2. Cost Estimation															
	3. Work Assignment															
	4. Approval of JICA for PP															
	5. Preparation/Approval of															
	6. Tender															
	7. Approval of Contract from JICA															
	8. Contract															
	Construction Work															
1. Facility Construction																
2. Sanitary Landfilling																

i. Operation Plan

In order to conduct a sanitary landfill operation as much as possible, it is very important to prepare daily, weekly and monthly operation plans. To set up those plans, a landfilling plan was prepared as shown in the following figures. Landfill operation shall be conducted according to the waste layers. The thickness of each waste layer is 2.5 m. when the first layer of landfill operation completed an enclosing bank of 2.5 m height shall be constructed. Then, landfill operation of the second layer will commence.

Each layer will have the following volumes for waste disposal.

Table 6-3: Landfill Volume of Each Layer

	Area of Wastes m2	Average Area m2	Height of Wastes m	Volume of Wastes m3	Volume of Bank m3	Total Volume m3	Accum. Volume m3
original	0.0						
1st Fill	7,540.0	3,770.0	4.4	16,588.0	3,125.0	19,713.0	19,713.0
2nd Fill	10,210.0	8,875.0	2.5	22,187.5	4,125.0	26,312.5	46,025.5
3rd Fill	11,770.0	10,990.0	2.5	27,475.0	5,250.0	32,725.0	78,750.5
4th Fill	13,200.0	12,485.0	2.5	31,212.5	6,500.0	37,712.5	116,463.0
5th Fill	16,400.0	14,800.0	2.5	37,000.0	7,500.0	44,500.0	160,963.0
6th Fill	19,230.0	17,815.0	2.5	44,537.5	8,500.0	53,037.5	214,000.5
7th Fill	24,600.0	21,915.0	2.5	54,787.5	9,250.0	64,037.5	278,038.0
8th Fill	36,080.0	30,340.0	2.5	75,850.0	10,250.0	86,100.0	364,138.0
9th Fill	52,240.0	44,160.0	2.5	110,400.0	11,250.0	121,650.0	485,788.0

As of the end of January 2006, the 1st layer was filled full and 2nd layer is being used to fill. Following table indicates the incoming waste from year 2005 to 2008

Table 6-4: Incoming Waste in UCDS

year	disposal amount	daily amount
	m3/year	m3/day
2005	85,009	233
2006	107,821	295
2007	120,158	329
2008	132,313	363

Based on the average daily amount shown on the above table, filling schedule is calculated as follows.

Table 6-5: Filling Schedule

	Volume m3	Days for Fill days	Acc. Days days	Acc Month months	Year
1st layer	19,713	full			
2nd layer	26,312	89	89	3	2006
3rd layer	32,725	111	200	7	2006
4th layer	37,712	128	328	11	2006
5th layer	44,500	135	463	15	2007
6th layer	53,037	161	624	21	2007
7th layer	64,037	177	800	27	2008
8th layer	86,100	238	1,038	35	2008
9th layer	121,650	336	1,374	46	2009

As a result, two to three enclosing banks have to be constructed every year. So, covering soil shall be stockpiled during the summer time, when the soil is not frozen, for the construction of enclosing bank for the winter season.

In order to construct an enclosing bank, one excavator and two dump trucks for two weeks will be necessary, therefore, necessary arrangement for hire those equipment is required.

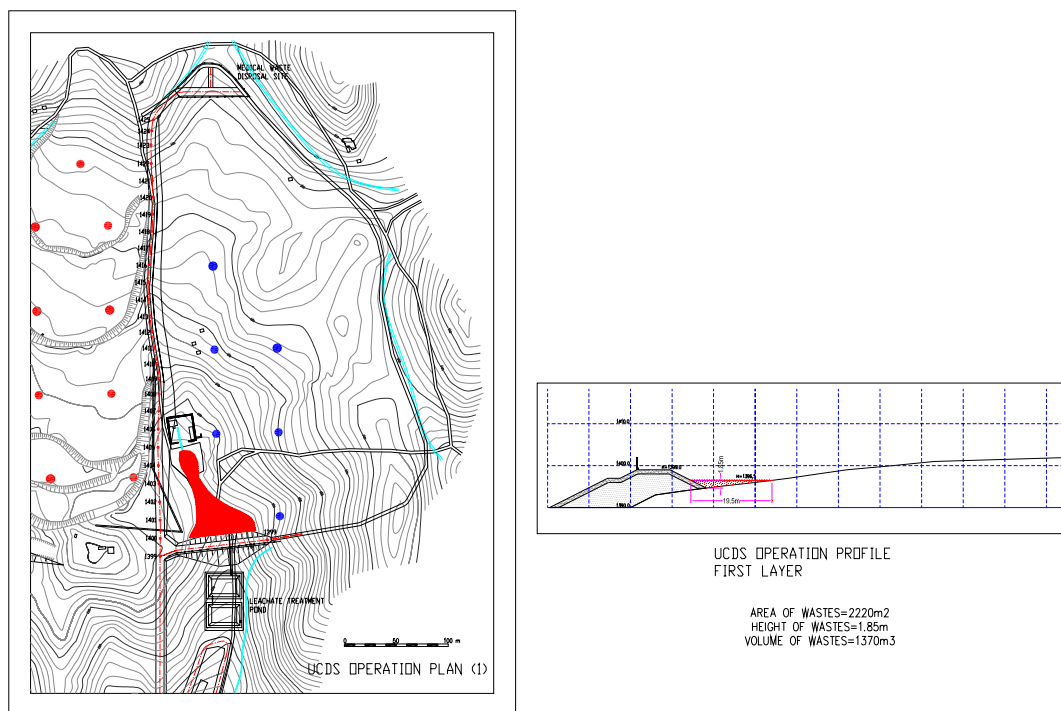


Figure 6-10: First Layer

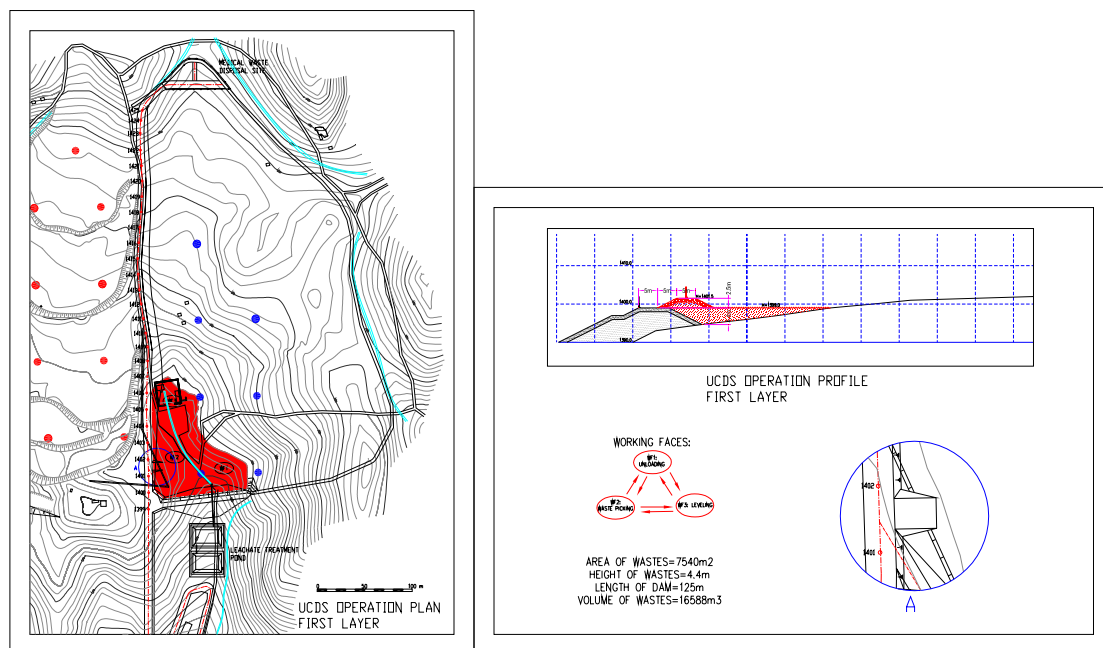


Figure 6-11: Completion of First Layer and Preparation for Second Layer

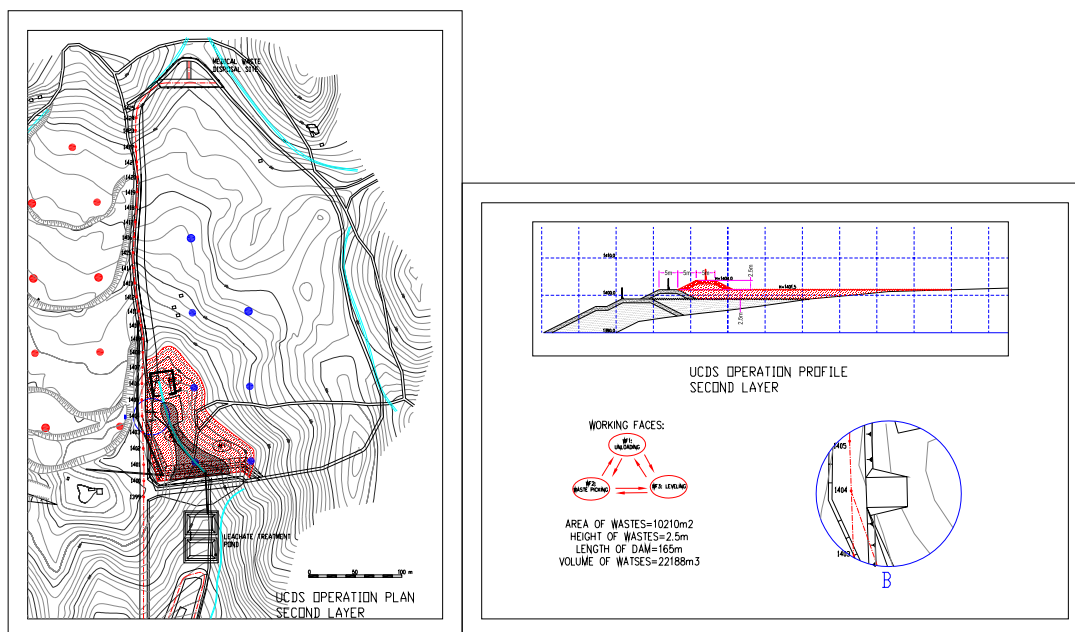


Figure 6-12: Second Layer

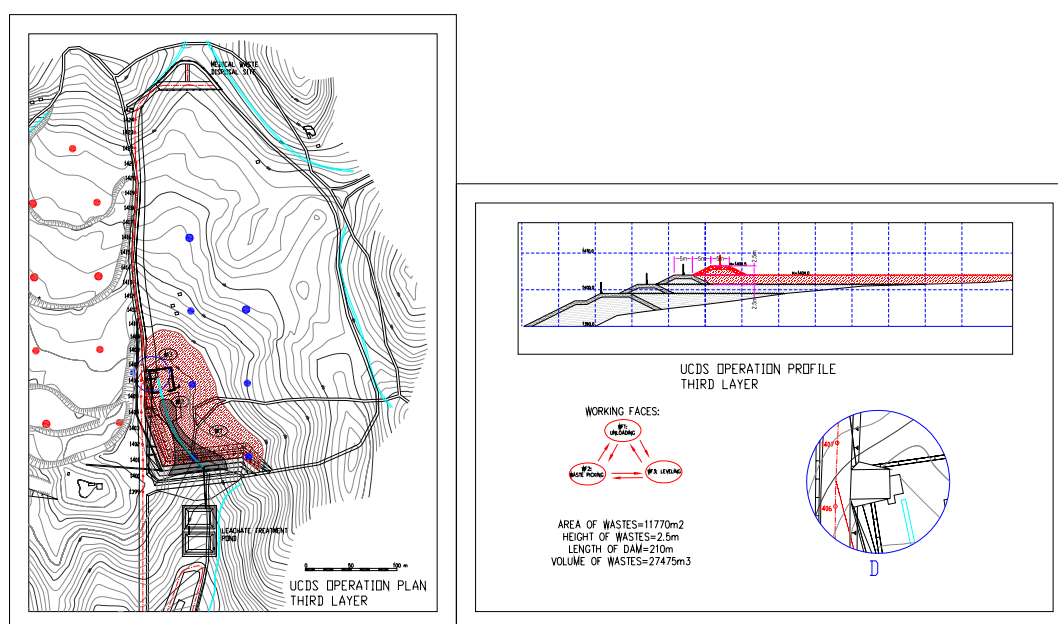


Figure 6-13: Third Layer

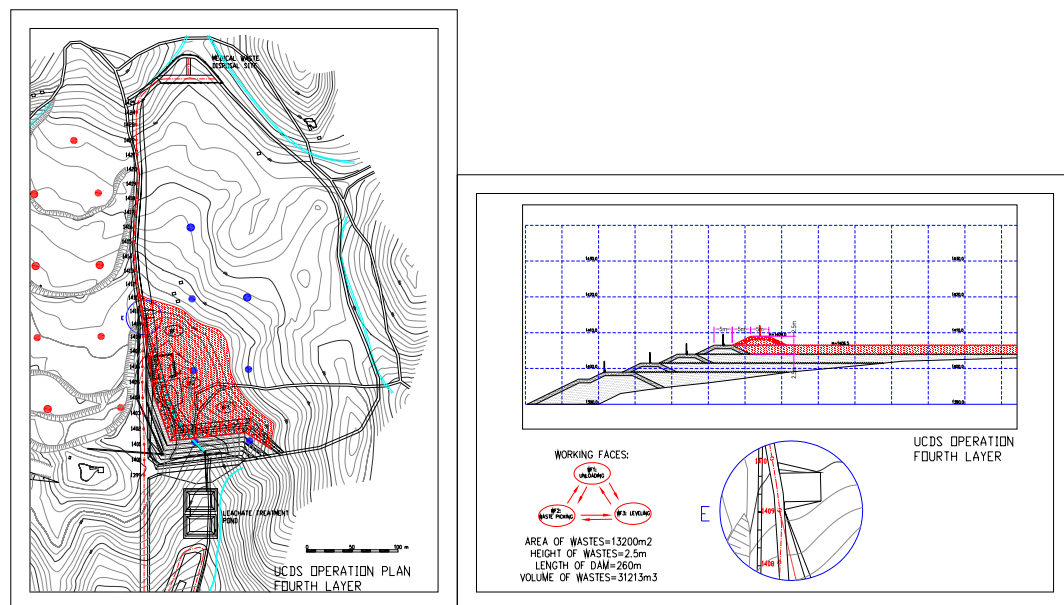


Figure 6-14: Fourth Layer

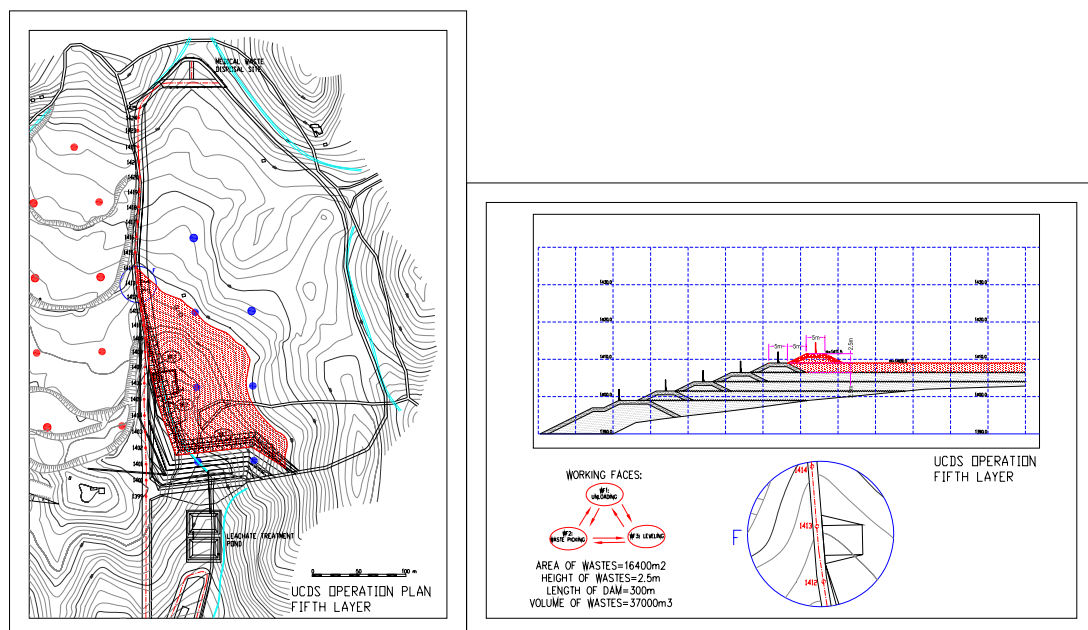


Figure 6-15: Fifth Layer

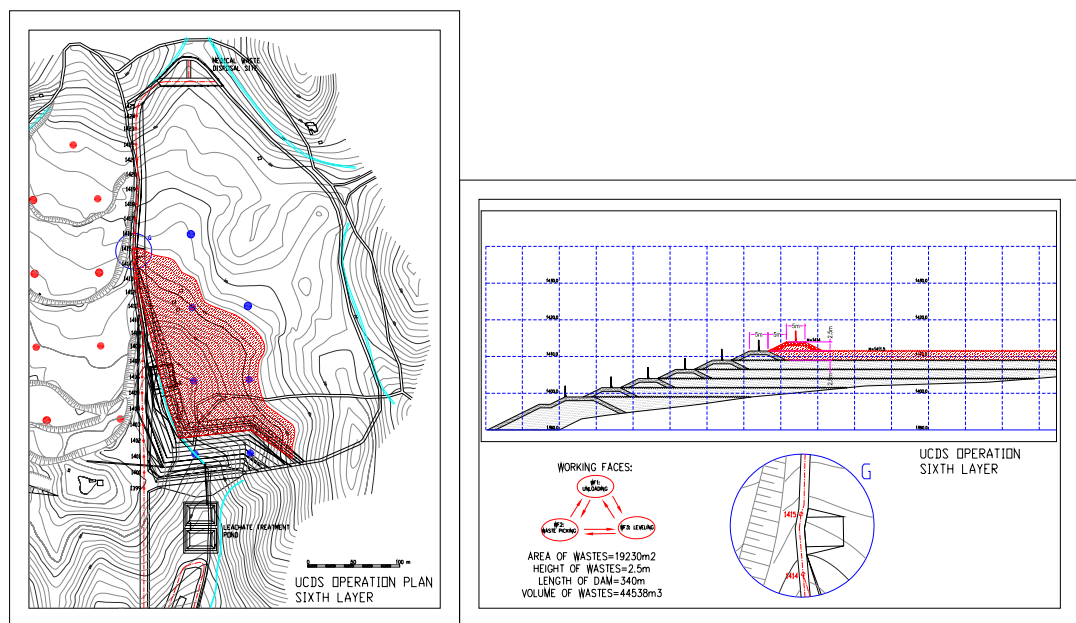


Figure 6-16: Sixth Layer

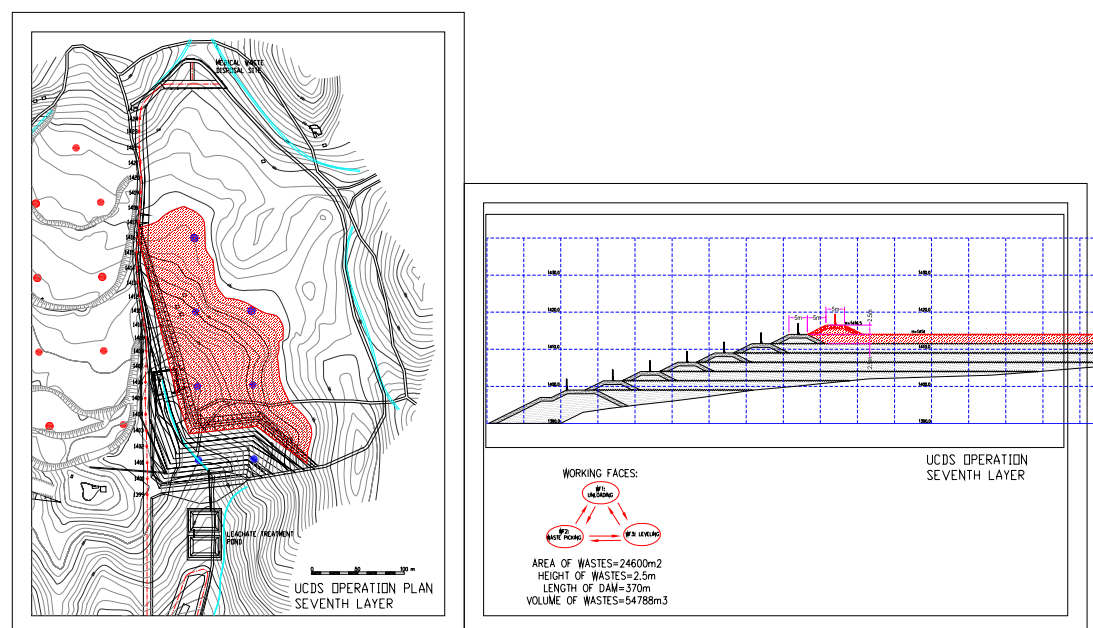


Figure 6-17: Seventh Layer