

SECTION B

収集・機材整備に係る活動

B	収集・機材整備に係る活動	B-1
B.1	全体活動実績	B-1
B.2	部品調達	B-3
B.2.1	部品注文先リスト	B-3
B.2.2	部品注文のための書類(新明和工業株式会社)	B-4
B.3	研修会資料	B-6
B.3.1	ごみ収集車両維持管理ワークショップ	B-6
B.3.2	ごみ収集車両維持管理セミナー	B-10
B.3.3	ごみ収集車両維持管理セミナー	B-13
B.3.4	機材運用・維持管理報告書分析評価ワークショップ	B-21

B 収集・機材整備に係る活動

B.1 全体活動実績

機材整備業務実施表

2012/6/10

	2010年(プロジェクト1年次)			2011年(プロジェクト2年次)						2012年(プロジェクト3年次)		
	3月	4月		11月	12月	4月	5月	6月	3月	4月	5月	
	3/16	現地業務 4/14		11/20	第1次現地業務 12/19	4/5	第2次現地業務	6/3	3/27	現地業務 4/25		
	30			30			60			30		
A2.1	CMPUAのキャパシティアセスメントの実施			▲ 4/6 CAテスト実施								
A2.2	研修計画及び、研修教材の作成			▲ 4/1-4 研修教材作成 (始業点検、定期点検シート)			□ 4/11 研修計画策定			▲ 11/20-25 研修教材作成 (コンパクターボディ溶接指導)		
A2.3/ B2.3	現地国内研修の実施(ワークショップ、セミナー開催)			▲ 4/6 ごみ収集車維持管理ワークショップ			□ 12/9 車両維持管理セミナー			● 5/19 ごみ収集車両維持管理セミナー		
A2.4/ B2.4/ C2.4	CWS整備工場における実習訓練			▲ 4/7 定期点検指導 (CWS)			▲ 4/26 油圧シリンダー分解整備 (CWS)			● 5/10 定期点検指導 (CWS)		
B2.5	整備工場の運営管理計画に対する提言			▲ 3/15-21 CWS、NEDS車両維持管理状況調査			▲ 12/14 定期点検費用に関する提言			▲ 5/26 整備工場施設改善計画に関する提言		
B2.7	TUKに対するごみ収集車両の維持管理に関するワークショップの実施			▲ 4/12 定期点検指導 (Nalaikh)			▲ 12/15 作動油ヒーター点検整備指導 (BZD)			▲ 5/2 油圧シリンダー分解整備 (SBD)		
	TUKごみ収集車両の状態調査			▲ 3/23-24 TUK-BZD,SBD車両調査			▲ 11/23 TUK-BZD,BGD WSF, ND車両調査			▲ 4/14 ChD車両調査		
				▲ 3/25-26 TUK-ChD, SKhD, KhUD車両調査			▲ 11/25-27 TUK-BGD,KhUD, ChD, SKhD車両調査			▲ 4/15 TUK-BGD, SBD, ChD, SKhD車両調査		
				▲ 3/29-31 TUK-BGD, WSF, Nalaikh車両調査			▲ 11/29-30 TUK-SBD, CMPUA車両調査			▲ 4/18 BGD WSF CMPUA車両調査		
CR2.8	教材の運用・維持管理報告書のモニタリング			▲ 3/29-31 機材運用報告書、機材維持管理報告書作成			□ 4/14 月次報告書作成指導 (ChD)			▲ 4/2-5 O&Mレポートモニタリング		
	▲ 4/1-4 運行日報、整備日報、運行・整備月報作成			□ 4/15 月次報告書作成指導 (TUK-BGD, SBD, ChD, SKhD)			□ 4/18 月次報告書作成指導 (BGD WSF CMPUA)					
成果品	第1、2次現地業務成果品 日常点検用 1. 始業前点検ノート 2. 始業前点検チェックシート 3. グリスアップ箇所指示シート			定期点検用 1. 定期点検チェックシート (Ver.1) 2. 定期点検注意点シート 3. 定期点検部品交換表 (Ver.1) 運転手用 1. Driver's note			機材維持管理報告 (O&Mレポート) 1. 運転手日報 (Ver.1) 2. 車両月報 (Ver.1) 3. 機材維持管理報告書 (Ver.1) 整備用 1. コンパクターボディ修理方法			第3次現地業務成果品 機材維持管理報告 (O&Mレポート) 1. 運転手日報 (Ver.2) 2. 車両月報 (Ver.2) 3. 機材維持管理報告書 (Ver.2)		
	定期点検用 1. 定期点検チェックシート (Ver.2)			第4次現地業務成果品 機材維持管理報告 (O&Mレポート) 1. 機材維持管理報告書 (Ver.3)								

▲ : コンサルタント主導 □ : コンサルタント・C/P協働 ● : C/P主導

B.2 部品調達

B.2.1 部品注文先リスト

1. Mitsubishi Fuso Truck and Bus Corporation

Shenzhen Zhanbao Industrial Development Co., LTD.

Mr. Jianlin Huang (Director)

E-mail Address: zb@szzb.cn

Address: Northern Xinyi Autocity, Heng Gang, Long Gang strict, ShenZhen.

Tel: 86-755-89738868, 89738899, 89738833

2. Isuzu Motors

Local Distributor: KHET Company (Official Toyota Distributor)

Responsible person: Mr. Tumurkhuyag, Service Manager (mobile phone: 9911 7164)

Mr. Battugs, Officer for Spare Parts (mobile phone: 9911 9802)

3. ShinMaywa

Contact person in Japan (communicate by English or Japanese)

Mr. Keiji Yamanaka

E-mail Address: yamanaka.k@sb.shinmaywa.co.jp

Fax: +81-45-575-9837

Tel: +81-45-584-1321

Bank account:

The Bank of Tokyo-Mitsubishi UFJ,Ltd. Osaka Main Office

5-6, 3Chome, Fushimimachi, Chuo-Ku, Osaka, Japan

Savings Account No.7224

Swift Code : BOTKJPJT

Account Name : ShinMaywa Industries, Ltd.

4. Komatsu

Local Distributor: KOMIT SERVICE Company (Official Komatsu Distributor)

Responsible person: Mr. Damdinpurev, Service Manager (mobile phone: 9909 1029)

E-mail Address: damdinpurev_komit@komatsu.mn

Ms. Ganchimeg, (Office phone: 341 415)

5. Case

Local Distributor: MSM Company (Official Case Distributor)

Responsible person: Mr. Mark Gabel, General Manager of Automotive Department
(mobile phone: 9909 0744)

Mr.Unurbayar, Officer for Spare Parts (office phone: 7014 8141)

Office phone: 318 138

E-mail Address: mark.gabel@msmco.net

B.2.2 部品注文のための書類（新明和工業株式会社）

a. 見積依頼書

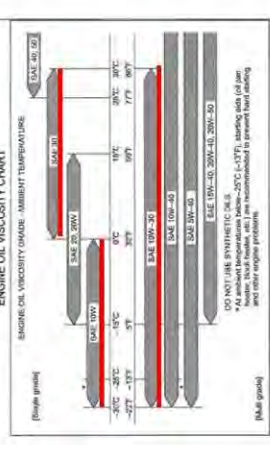
見積依頼書/ Нэхэмжлэх хүсэх тухай		No. _____	
		日付/ _____	
		Огноо _____	
新明和工業株式会社/ ШинМэйва ХХК			
山中様/К.Яманака			
Факс: + 81-45-575-9837	社名/Компанийн нэр	_____	
	住所/Шуудангийн хаяг	_____	
	電話番号/Утас	_____	
	F a x 番号/Факс	_____	
	E メール/E-mail	_____	
<p>下記の見積・納期の連絡をお願いいたします。 Дараах сэлбэгийн захиалгын үнэ, Монгол руу илгээх боломжит огноог мэдэгдэнэ үү.</p>			
部品名	部品番号	数量	備考
Сэлбэгийн нэр	Сэлбэгийн дугаар	Тоо ширхэг	Тайлбар
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
希望納期/Хүлээн авах боломжит огноо		_____	
送付先/Илгээх хаяг		_____	


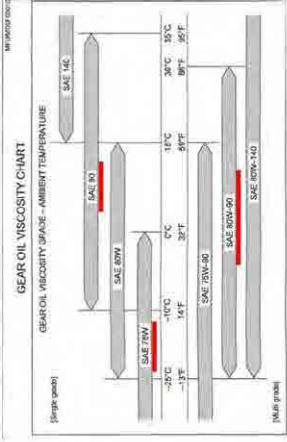



b. 部品発注書

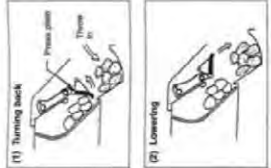
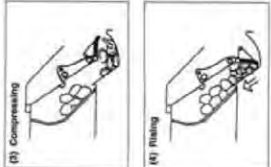


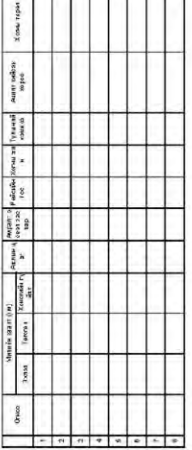

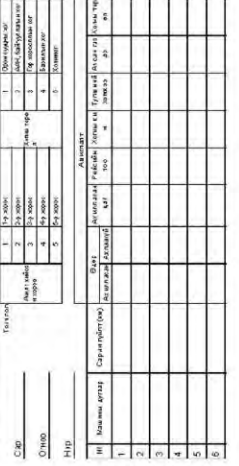
部品発注書/ Сэлбэгийн захиалга		No. _____		
		日付/ _____		
		Огноо _____		
新明和工業株式会社/ ШинМэйва ХХК				
山中様/К.Яманака				
Факс: +81-45-575-9837	社名/Компанийн нэр _____			
	住所/Шуудангийн хаяг _____			
	電話番号/Утас _____			
	F a x 番号/Факс _____			
	E メール/E-mail _____			
下記の部品を注文いたします。/ Дараах сэлбэгийн захиалгыг үүгээр хийж байна.				
部品名	部品番号	数量	単価	金額
Сэлбэгийн нэр	Сэлбэгийн дугаар	Тоо ширхэг	Нэгж үнэ	Нийт үнэ
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
合計金額 / Нийт үнийн дүн				
希望納期/ Хүргүүлэх огноо				
送付先/Илгээх хаяг				

B.3 研修会資料

B.3.1 ごみ収集車両維持管理ワークショップ

<p>Training on Maintenance of Collection Trucks</p> <p>Koji UZAWA JICA Expert Team 6th April 2010 Central Work Shop of CMPUA</p>	<p>Investigation of condition of collection trucks Mitsubishi 15m³</p> <table border="1"> <thead> <tr> <th>TRUCK</th> <th>NUMBER</th> <th>YEAR</th> <th>TYPE</th> <th>STATUS</th> <th>REMARKS</th> </tr> </thead> <tbody> <tr><td>1</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>2</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>3</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>4</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>5</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>6</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>7</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>8</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>9</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>10</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>11</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>12</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>13</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>14</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>15</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>16</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>17</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>18</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>19</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>20</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>21</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>22</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>23</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>24</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>25</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>26</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>27</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>28</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>29</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>30</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>31</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>32</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>33</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>34</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>35</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>36</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>37</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>38</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>39</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>40</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>41</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>42</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>43</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>44</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>45</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>46</td><td>1500</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> </tbody> 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<p>Investigation of condition of collection trucks Isuzu 8m³</p> <p>Mileage average(14 months) 23,917 km (68.3km/day) Max mileage 7243 28,156 km (80.4km/day) Changing the engine oil 8,000 km 8,000 km / 6months 1,300 km / month 52 km / day → 90 – 104km → 3 month change</p>	<p>Investigation of condition of collection trucks Isuzu 8m³</p> <p>Weight average 3.3 ton House waste weight 1m3 = 0.45 ton Isuzu capacity 8m3 = 3.6 ton 3.3 ton = 91.7 % 2.9 ton = 80.6 % 4.0 ton = 111.1 %</p>	<p>Investigation of condition of collection trucks Engine oil viscosity</p> 																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				

<p>Investigation of condition of collection trucks Engine oil viscosity</p>  <p style="text-align: right;">10</p>	<p>Investigation of condition of collection trucks Gear oil viscosity</p>  <p style="text-align: right;">11</p>	<p>Investigation of condition of collection trucks Gear oil viscosity</p>  <p style="text-align: right;">12</p>
<p>Investigation of condition of collection trucks Hydraulic system (1)</p>  <p style="text-align: right;">13</p>	<p>Investigation of condition of collection trucks Hydraulic system (2)</p>  <p style="text-align: right;">14</p>	<p>Investigation of condition of collection trucks Hydraulic system (3)</p> <p>Cause</p> <ul style="list-style-type: none"> Critical temperature: Below +10°C 1) The hydraulic oil becomes so "Stiff" → "Churned up" the pump is damaged due to resultant cavitations. 2) Oil heater → Working condition. Poor or Not? More than 30minute heating, start the bubbles in oil <p style="text-align: right;">15</p>
<p>Investigation of condition of collection trucks Hydraulic system (4)</p> <p>Countermeasure</p> <ol style="list-style-type: none"> 1. <u>Warming up engine running idle and the PTO ON position.</u> 2. <u>Keep the trucks in side of the warm garage.</u> Sukhbaatar and Chingeltei! 3. <u>Do not loading Ger waste and construction waste</u> <p style="text-align: right;">16</p>	<p>Fuel Consumption in Winter 25liter/100km?</p> <ul style="list-style-type: none"> ☐ Warm up Engine ☐ Warm up hydraulic Oil ☐ Heating up Cabin <p>→ Fuel Consumption in Winter should be more than in Summer</p> <ul style="list-style-type: none"> ☐ Good for Engine! Good for Hydraulic Pump! Good for Cylinder! Good for Worker! Good for Company! <p style="text-align: right;">17</p>	<p>Counter Measures for Insulating Cylinder</p>  <p style="text-align: right;">18</p>

<p>Investigation of condition of collection trucks Hydraulic system (5)</p>  <p>(1) Turning back The press plate turns forward to raise refuse in and compact it against the front plate of the bottom of the hopper. The press plate begins to turn back from the position shown.</p> <p>(2) Lowering The press plate lowers and crushes refuse by pressing against the bottom plate of the hopper.</p>	<p>Investigation of condition of collection trucks Hydraulic system (6)</p>  <p>(3) Compressing The press plate turns forward to raise refuse in and compact it against the front plate of the bottom of the hopper.</p> <p>(4) Fitting While working, the press plate rises with refuse and back a space back. The refuse is compacted into the body. The press plate returns to the step (1) and repeats the subsequent steps of loading.</p>	<p>Investigation of condition of collection trucks Hydraulic system (7)</p> 
<p>Investigation of condition of collection trucks Tire and puncture</p> 	<p>How to keep good condition of your trucks? Countermeasures → Reporting How to report? Drivers = Daily operation and maintenance report Engineers = Monthly operation and maintenance report</p>	<p>How to keep good condition of your trucks? Driver = Daily operation & maintenance report Mechanic = Monthly operation & maintenance report Engineer = Quarter operation & maintenance report Senior officer = input for DATABASE Budget → Spare parts Fuel Repairing</p>
<p>Daily operation and maintenance report -Daily operation report-</p> 	<p>Daily operation and maintenance report -Daily maintenance report-</p> 	<p>Monthly operation and maintenance report</p> 

Monthly operation and maintenance report

АШИЛГАЛ БА УЙЛЧИЛЭЭНИЙ САРЫН ТАВЬГА

Улаанбаатар	1	Баянгол (Сүхбаатар)	2	Төв (Хэнтий)	3	Хэнтий (Сүхбаатар)	4	Хэнтий (Сүхбаатар)	5	Хэнтий (Сүхбаатар)	6	Хэнтий (Сүхбаатар)	7	Хэнтий (Сүхбаатар)	8	Хэнтий (Сүхбаатар)	9	Хэнтий (Сүхбаатар)	10	Хэнтий (Сүхбаатар)
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Улаанбаатар	Хэнтий	Улаанбаатар	Хэнтий	Улаанбаатар	Хэнтий
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The end

B.3.2 ごみ収集車両維持管理セミナー

Seminar on Improvement for Maintenance of Collection Trucks

Koji UZAWA
JICA Expert Team

Kazutoshi MATSUDA
JOCV Senior volunteer

9th December 2010
Central Work Shop of CMPUA

Seminar on Improvement for Maintenance of Collection Trucks

1. Condition of waste collection trucks
2. Engine oil and Gear oil
3. Fuel filter
4. Periodic service
5. Body (Compactor)
6. Body (body and chassis)
7. Cold start (Isuzu and Mitsubishi)
8. Hydraulic operation at cold weather
9. How to change the brake lining
10. Operation & maintenance report

1. Condition of waste collection trucks

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Compactor	1503	4	2	4	2	2	2	2	1	0	0	0
Body truck	1503	1	0	1	0	1	0	0	0	0	0	0
Hydraulic machinery	1503	0	0	0	0	0	0	0	0	0	0	0
Hyd. pump	1503	0	0	0	0	0	0	0	0	0	0	0

Check point

- Mileage
- Periodic service
- Condition

Investigation of condition of collection trucks BZD TUK (23 Nov.)

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	BZD TUK	15m3	7215	18,550	30,234	10,854	Nov 23	✓
2	BZD TUK	15m3	7230	23,301	39,304	16,003	Nov 23	✓
3	BZD TUK	15m3	7232	17,808	28,108	10,200	Nov 23	✓
4	BZD TUK	15m3	7233	21,227	32,810	11,581	Nov 23	✓
5	BZD TUK	8m3	7243	27,900	42,373	14,783	Nov 23	Dec 3 Hydraulic pump

Investigation of condition of collection trucks BGD WSF ND TUK (23 Nov.)

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	BGD WSF	15m3	7226	5,848	12,800	7,942	Nov 23	Not

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	ND TUK	15m3	7234	6,051	7,284	1,243	Nov 23	✓ (Over budget)
2	ND TUK	15m3	7235	4,782	6,274	1,492	Nov 23	✓ (Over budget)

Investigation of condition of collection trucks BGD TUK (24 Nov.)

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	BGD TUK	8m3	7245	28,708	41,743	13,074	Nov 24	Not
2	BGD TUK	15m3	7221	18,969	29,094	10,129	Nov 24	✓
3	BGD TUK	15m3	7221	7,425	18,681	11,256	Nov 24	Not
4	BGD TUK	8m3	7201	27,873	42,593	14,723	Nov 24	Not
5	BGD TUK	15m3	7229	19,107	28,925	9,818	Nov 24	✓
6	BGD TUK	15m3	7226	18,806	28,556	9,750	Nov 24	✓
7	BGD TUK	15m3	7225	18,143	-	-	Nov 24	Not Accident

Investigation of condition of collection trucks KhUD TUK (24 Nov.) ChD TUK(26 Nov.)

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	KhUD TUK	15m3	7225	18,005	27,458	11,458	Nov 24	✓
2	KhUD TUK	15m3	7218	14,261	24,818	10,578	Nov 24	✓

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	ChD TUK	15m3	7222	7,490	17,842	10,352	Nov 26	✓
2	ChD TUK	15m3	7228	2,800	-	-	Nov 26	✓
3	ChD TUK	15m3	7228	7,722	18,386	11,678	Nov 26	✓
4	ChD TUK	8m3	7241	20,800	35,886	15,086	Nov 26	Not
5	ChD TUK	8m3	7242	24,253	39,886	15,636	Nov 26	Not

Investigation of condition of collection trucks SKhD TUK (27 Nov.)

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	SKhD TUK	15m3	7216	11,830	18,031	6,401	Nov 27	Dec 3
2	SKhD TUK	15m3	7217	12,109	18,567	7,478	Nov 27	Dec 3
3	SKhD TUK	15m3	7218	14,533	22,873	8,340	Nov 27	Dec 3
4	SKhD TUK	8m3	7244	19,813	33,887	12,874	Nov 27	Dec 3 Brake cup

Investigation of condition of collection trucks SBD TUK (29 Nov.)

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	SBD TUK	15m3	7236	18,378	29,938	11,568	Nov 29	Not
2	SBD TUK	15m3	7237	12,151	21,984	9,833	Nov 29	Not
3	SBD TUK	15m3	7246	9,842	22,421	12,579	Nov 29	Not
4	SBD TUK	8m3	7239	18,786	39,066	20,300	Nov 29	Not Brake cup
5	SBD TUK	8m3	7240	25,917	44,789	18,872	Nov 29	Not

Investigation of condition of collection trucks CMPUA (30 Nov.)

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	CMPUA	8m3	7203	-	95,308	-	Nov 30	✓
2	CMPUA	8m3	7203	-	49,228	-	Nov 30	✓
3	CMPUA	8m3	7205	-	44,001	-	Nov 30	✓
4	CMPUA	8m3	7205	-	42,860	-	Nov 30	✓
5	CMPUA	8m3	7207	-	44,374	-	Nov 30	✓
6	CMPUA	8m3	7208	-	-	-	Nov 30	✓
7	CMPUA	8m3	7208	-	38,811	-	Nov 30	✓
8	CMPUA	8m3	7210	-	41,020	-	Nov 30	✓
9	CMPUA	8m3	7211	-	27,746	-	Nov 30	Not After shift
10	CMPUA	8m3	7212	-	50,845	-	Nov 30	✓
11	CMPUA	8m3	7235	-	47,809	-	Nov 30	✓
12	CMPUA	8m3	7234	-	32,099	-	Nov 30	✓

Investigation of condition of collection trucks NEDS (1 Dec.)

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	NEDS	8m3	7247	-	18,205	-	Dec 1	4-Dec
2	NEDS	8m3	7249	-	12,180	-	Dec 1	4-Dec
3	NEDS	8m3	7253	-	9,114	-	Dec 1	4-Dec
4	NEDS	8m3	8084	-	1,692	-	Dec 1	4-Dec
5	NEDS	8m3	8089	-	2,327	-	Dec 1	4-Dec
6	NEDS	8m3	8700	-	3,070	-	Dec 1	4-Dec
7	NEDS	8m3	8701	-	2,284	-	Dec 1	4-Dec
8	CMPUA	CASE	6762	-	202,114	-	Nov 30	Not
9	CMPUA	CASE	8763	-	-	-	Nov 30	Not

Brake down vehicles

No.	Company	Truck type	Vehicle No.	Year (Manufacture)	No. (Mileage)	Checking date	Periodic service (Oct)	Condition
1	SKhD TUK	15m3	7223	18,141	-	Nov 24	Not	Accident
2	ND TUK	8m3	7211	-	27,746	-	Nov 30	Not After shift
3	SKhD TUK	CASE	8763	-	-	Nov 30	Not	Tire
4	BZD TUK	8m3	7245	27,900	42,373	14,783	Nov 23	Dec 3 Hydraulic pump
5	SBD TUK	8m3	7239	18,786	39,066	20,300	Nov 29	Not Brake cup

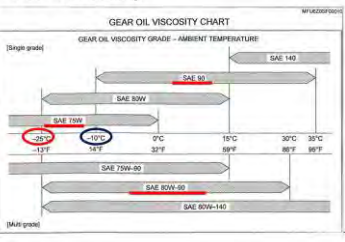


7223 Jan 2011 completion

7221 Underwear

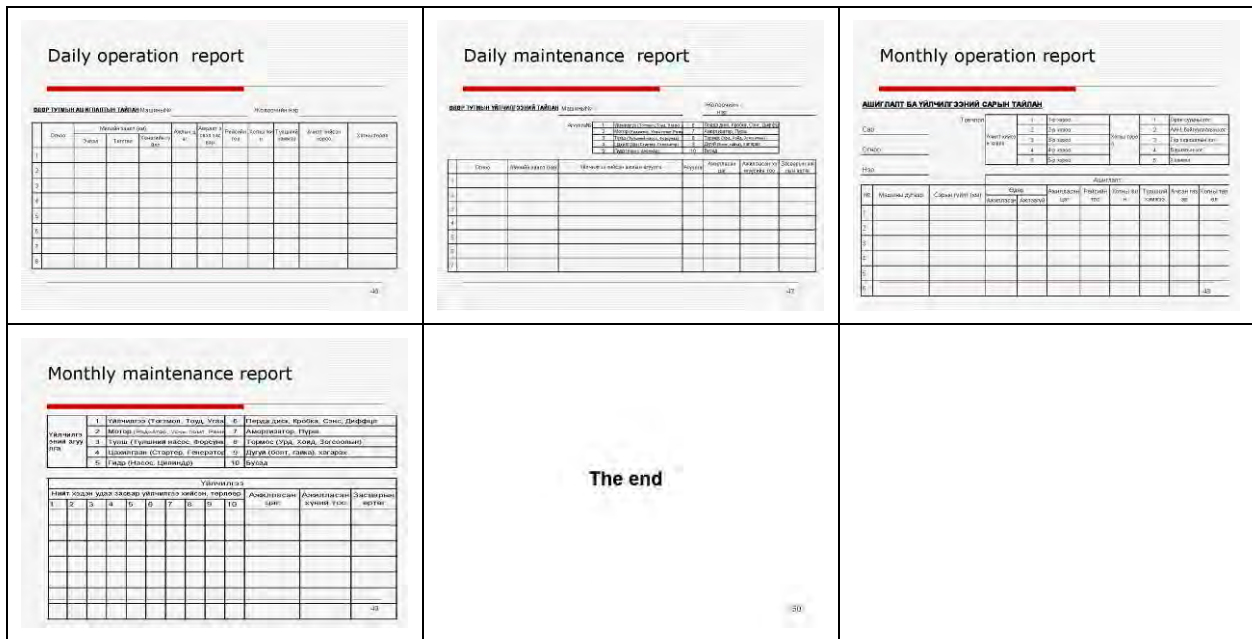
8703

2. Engine oil and Gear oil

- Viscosity
- Duration of the changing

<p>Engine oil viscosity</p> 	<p>Engine oil viscosity</p> <p><input type="checkbox"/> Using 15w-30 engine oil in winter time</p> <ol style="list-style-type: none"> 1. Keep the trucks in warm garage 2. Sufficient engine warm up check the oil pressure gauge 	<p>Gear oil viscosity</p> 																																				
<p>Duration of the Changing</p> <table border="1"> <tr> <td>Mitsubishi capacity</td> <td>22 liter + 4-4.5 liter</td> </tr> <tr> <td>duration</td> <td>12,000 km</td> </tr> <tr> <td>Isuzu capacity</td> <td>14.5 liter</td> </tr> <tr> <td>duration</td> <td>8,000km</td> </tr> </table>	Mitsubishi capacity	22 liter + 4-4.5 liter	duration	12,000 km	Isuzu capacity	14.5 liter	duration	8,000km	<p>Notice</p> <p>April and October</p> <p>At least 2 / year → Severe condition -30°C ~ +25°C = 55°C</p> <p>After filling the engine oil</p> <p>5 minutes idling → Check the amounts</p>																													
Mitsubishi capacity	22 liter + 4-4.5 liter																																					
duration	12,000 km																																					
Isuzu capacity	14.5 liter																																					
duration	8,000km																																					
	<p>3. Fuel filter</p> <ol style="list-style-type: none"> Remove filter using filter wrench Apply a thin coat of engine oil to gasket. Turn new filter until the gasket contacts sealing surface. 4. Filter turn in the filter 2/3 turn by hand. 																																					
<p>4. Periodic service</p> <p><input type="checkbox"/> April 2011 = Extensive periodic service</p> <ol style="list-style-type: none"> 1) Transmission, Differential, Hydraulic, Brake and Clutch oil 2) LLC 	<p>4. Periodic service</p> <table border="1"> <thead> <tr> <th>Periodic service</th> <th>Items</th> <th>Cycle</th> </tr> </thead> <tbody> <tr> <td>Changing oil and filter</td> <td>None</td> <td>Annually</td> </tr> <tr> <td>Change oil</td> <td>At 2000km / April and October</td> <td>12,000 km / April and October</td> </tr> <tr> <td>Change oil filter</td> <td>At 2000km / April and October</td> <td>12,000 km / April and October</td> </tr> <tr> <td>Change filter</td> <td>At 2000km / October</td> <td>24,000 km / October</td> </tr> <tr> <td>Air cleaner</td> <td>At 2000km / October</td> <td>24,000 km / October</td> </tr> <tr> <td>Transmission & Differential oil</td> <td>Every October</td> <td>Every October</td> </tr> <tr> <td>Grease</td> <td>33 months</td> <td>24 months</td> </tr> <tr> <td>Hydraulic & Clutch fluid</td> <td>24 months</td> <td>24 months</td> </tr> <tr> <td>Hydraulic oil</td> <td>24 months</td> <td>24 months</td> </tr> <tr> <td>Power steering oil & Power steering oil</td> <td>30 months</td> <td>36 months</td> </tr> <tr> <td>Wheel hub assembly grease</td> <td>Brake lining (oil)</td> <td>Brake lining (oil)</td> </tr> </tbody> </table>	Periodic service	Items	Cycle	Changing oil and filter	None	Annually	Change oil	At 2000km / April and October	12,000 km / April and October	Change oil filter	At 2000km / April and October	12,000 km / April and October	Change filter	At 2000km / October	24,000 km / October	Air cleaner	At 2000km / October	24,000 km / October	Transmission & Differential oil	Every October	Every October	Grease	33 months	24 months	Hydraulic & Clutch fluid	24 months	24 months	Hydraulic oil	24 months	24 months	Power steering oil & Power steering oil	30 months	36 months	Wheel hub assembly grease	Brake lining (oil)	Brake lining (oil)	<p>5. Body (Compactor)</p> <p><input type="checkbox"/> Cracks (top of hopper)</p> <p><input type="checkbox"/> Cracks (Lock plate for hopper pin)</p>
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<p>Reinforcements</p> 	<p>6. Body (body and chassis)</p> <ol style="list-style-type: none"> 1) Spacer between body and chassis 2) Hopper lock U-bolt 3) Hydraulic pump drive shaft 	<p>1) Spacer between body and chassis</p> 
<p>Countermeasure</p> <p>Tighten the bolt frequently</p> 	<p>2) Hopper lock U-bolt</p> <p>Tighten the bolt frequently</p> 	<p>3) Hydraulic pump drive shaft</p> <p>Grease up frequently</p> 
<p>7. Cold start (Isuzu)</p>  <p>Turn the starter key to the "H" position and hold until the control resistor becomes red hot.</p>  <p>CAUTION Do not keep the starter motor engaged for more than 10 seconds at a time, or the starter motor and battery will be adversely affected.</p>	<p>7. Cold start (Mitsubishi)</p>  <ol style="list-style-type: none"> 1. Turn the starter key to the ON position. 2. Place the Cold start switch in the ON position. 3. Hold down the Air heater switch. 4. Wait for 40 to 60 seconds. When the air heater indicator becomes completely red. <p>CAUTION The engine preheating system consumes a large amount of electricity. If it is used repeatedly at short intervals, the battery can be completely discharged.</p> 	<p>8. Hydraulic operation at cold weather</p> <p>Cause Critical temperature : Below 0°C 1) The hydraulic oil becomes so "Stiff" — "Churned up" the pump is damaged due to resultant cavitations. 2) Oil heater — Working condition. Poor or Not? More than 30minute heating, start the bubbles in oil</p>
<p>Countermeasure</p> <ol style="list-style-type: none"> 1. Warming up engine running idle and the PTO ON position. 2. Keep the trucks in side of the warm garage. 	<p>Amount of Hydraulic oil</p> <p>Shortage = Leakage</p> 	<p>9. How to change the brake lining</p> <p><input type="checkbox"/> How to rivet the brake lining</p>
<p>Riveting the brake lining</p> 	<p>10. Operation & maintenance report</p> <p>How to keep good condition of your trucks?</p> <p>Driver = Daily operation & maintenance report ↓ Mechanic = Monthly operation & maintenance report ↓ CMPUA Accountant = Combine All Monthly O&M report ↓ EPWMD Officer = Input for DATABASE → Budget</p>	<p>Operation & maintenance report</p> <p>Review and revise the document</p>



B.3.3 ごみ収集車両維持管理セミナー

a. Contents of workshop: Presenter Mr. Kono (JET PM)


<p style="text-align: right;">Item1</p> <h2 style="text-align: center;">Contents of Workshop</h2> <p style="text-align: center;">May 19, 2011 JICA Expert Team For Strengthening the Capacity for Solid Waste Management in Ulaanbaatar City</p> <p style="text-align: right;">1</p>	<h2 style="text-align: center;">Agenda</h2> <ol style="list-style-type: none"> 1. Objective 2. Contents of Workshop 3. Principle of Utilizing Grant Aid Equipment <p style="text-align: right;">2</p>
<h2 style="text-align: center;">Objective of Workshop</h2> <ul style="list-style-type: none"> ■ To realise necessary reinforcement of the body frame and warming up measures for longer use of collection trucks ■ To realise the improvement of hydraulic system. ■ To realize the importance of "Operation and maintenance report" ■ To realize necessary periodical maintenance schedule in future ■ Discussion among parties concerned. <p style="text-align: right;">3</p>	<h2 style="text-align: center;">Date, Venue and Participants</h2> <ul style="list-style-type: none"> □ Date and Venue <ul style="list-style-type: none"> ■ Date: May 19th (Thu), 2011 ■ Place: Ulaanbaatar Hotel 6th Floor, Hall "Kharkhorin" □ Participants <ul style="list-style-type: none"> ■ EPWMD ■ CMPUA ■ CMPUA CWS ■ CMPUA NEDS ■ Sukhbaatar district TUK ■ Chingeltei district TUK ■ Songinokhairkhan district TUK ■ Bayanzurkh district TUK ■ Bayangol district TUK ■ Khan-Uul district TUK ■ Nalaikh district TUK ■ Bayangol Waste service fund <p style="text-align: right;">4</p>

<h3>Contents of Workshop</h3> <p>Chairperson: Senior officer of EPWMD Venue: Ulaanbaatar Hotel 6th Floor, Hall "Kharkhona"</p> <table border="1"> <thead> <tr> <th>Topic</th> <th>Expositor</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>Opening Address</td> <td>Director of EPWMD</td> <td>9:00 - 9:10</td> </tr> <tr> <td>1. Contents of workshop</td> <td>JICA expert team</td> <td>9:10 - 9:30</td> </tr> <tr> <td>2. Operation and maintenance report</td> <td>Senior officer of EPWMD</td> <td>9:30 - 9:50</td> </tr> <tr> <td>3. Future planning of maintenance of trucks introduced by grant aid</td> <td>Director of CMPUA</td> <td>9:50 - 10:10</td> </tr> <tr> <td>Tea Break</td> <td></td> <td>10:10 - 10:20</td> </tr> <tr> <td>4. Hydraulic system (Hydraulic power, Cylinder, Pump)</td> <td>JOCV senior volunteer</td> <td>10:20 - 10:50</td> </tr> <tr> <td>5. Improving maintenance of waste collection trucks (Body reinforcement, Daily checking)</td> <td>JICA expert</td> <td>10:50 - 11:30</td> </tr> <tr> <td>6. Questions and comments</td> <td>All participants</td> <td>11:30 - 12:00</td> </tr> <tr> <td>7. Lunch</td> <td></td> <td>12:00 -</td> </tr> </tbody> </table>	Topic	Expositor	Time	Opening Address	Director of EPWMD	9:00 - 9:10	1. Contents of workshop	JICA expert team	9:10 - 9:30	2. Operation and maintenance report	Senior officer of EPWMD	9:30 - 9:50	3. Future planning of maintenance of trucks introduced by grant aid	Director of CMPUA	9:50 - 10:10	Tea Break		10:10 - 10:20	4. Hydraulic system (Hydraulic power, Cylinder, Pump)	JOCV senior volunteer	10:20 - 10:50	5. Improving maintenance of waste collection trucks (Body reinforcement, Daily checking)	JICA expert	10:50 - 11:30	6. Questions and comments	All participants	11:30 - 12:00	7. Lunch		12:00 -	<h3>Separate Discussion</h3> <p>Group meeting : Management group (EPWMD, CMPUA, TUK directors) Chairperson: Senior officer of EPWMD Venue: Ulaanbaatar Hotel 5th Floor, Room No. 527</p> <table border="1"> <thead> <tr> <th>Topic</th> <th>Expositor</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1. Discussion on current issues</td> <td>EPWMD, CMPUA and TUK directors</td> <td>10:20 - 11:20</td> </tr> <tr> <td>2. Interview from JICA Mid Term Evaluation Team</td> <td>JICA Mid Term Evaluation Team</td> <td>11:20 - 12:20</td> </tr> </tbody> </table>	Topic	Expositor	Time	1. Discussion on current issues	EPWMD, CMPUA and TUK directors	10:20 - 11:20	2. Interview from JICA Mid Term Evaluation Team	JICA Mid Term Evaluation Team	11:20 - 12:20
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<h3>Principle of Utilizing GA Equipment</h3> <ul style="list-style-type: none"> ❑ Grant Aid Equipment is donated using Tax from Japanese People. ❑ These Equipment should be utilized for the people of Ulaanbaatar City ❑ These Equipment should not be utilized for the benefit of private company 	<h3>Agreement Between Japanese Government and MUB</h3> <pre> graph TD A[Grant Aid Equipment] --> B[Municipality of Ulaanbaatar City (CMPUA)] B --- C[Owner of the Equipment Periodical Maintenance and Inspection] B -- "Rental Contract" --> D[TUKs] D -- "Fee Payment" --> B D --- E["Daily Maintenance of the Equipment Proper Usage of the Equipment Keep record for Operation and Maintenance"] </pre>																																							
<p>Please Utilize Japanese Grant Aid Equipment as long as possible under good working Conditions</p>																																								

b. Operation and maintenance report: Presenter Mr. Ariguun (EPWMD)

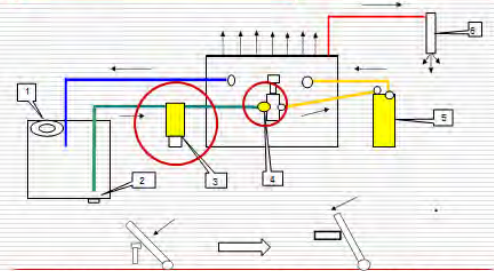

<p style="text-align: right;">Item 2</p> <h3>Operation and Maintenance report</h3> <p>May 19, 2011 EPWMD Workshop on Operation and Maintenance of Collection trucks</p>	<h3>Result of submission of O&M report</h3> <table border="1"> <thead> <tr> <th rowspan="2">Company</th> <th rowspan="2">Truck type</th> <th rowspan="2">Vehicle No.</th> <th colspan="10">2010</th> <th colspan="2">2011</th> <th rowspan="2">Submission Rate</th> </tr> <tr> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> <th>12</th> <th>1</th> <th>2</th> </tr> </thead> <tbody> <tr> <td>SBD TUK</td> <td>15m3</td> <td>7238</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td>9%</td> </tr> <tr> <td>ChD TUK</td> <td>15m3</td> <td>7220</td> <td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td>64%</td> </tr> <tr> <td>BZD TUK</td> <td>15m3</td> <td>7215</td> <td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td><td>64%</td> </tr> <tr> <td>SkhD TUK</td> <td>15m3</td> <td>7218</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td>9%</td> </tr> <tr> <td>BGD TUK</td> <td>8m3</td> <td>7245</td> <td></td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td><td>64%</td> </tr> <tr> <td>BGD WSF</td> <td>15m3</td> <td>7224</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0%</td> </tr> <tr> <td>KhUD TUK</td> <td>15m3</td> <td>7225</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td>9%</td> </tr> <tr> <td>ND TUK</td> <td>15m3</td> <td>7234</td> <td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>100%</td> </tr> <tr> <td>CMPUA</td> <td>8ton</td> <td>7203</td> <td></td><td></td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td><td>27%</td> </tr> </tbody> </table>	Company	Truck type	Vehicle No.	2010										2011		Submission Rate	4	5	6	7	8	9	10	11	12	1	2	SBD TUK	15m3	7238									✓						9%	ChD TUK	15m3	7220	✓	✓	✓	✓	✓	✓	✓	✓							64%	BZD TUK	15m3	7215	✓	✓	✓	✓	✓	✓	✓	✓							64%	SkhD TUK	15m3	7218									✓						9%	BGD TUK	8m3	7245			✓	✓	✓	✓	✓	✓	✓	✓					64%	BGD WSF	15m3	7224															0%	KhUD TUK	15m3	7225									✓						9%	ND TUK	15m3	7234	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100%	CMPUA	8ton	7203			✓						✓	✓					27%
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c. Future planning of maintenance of trucks introduced by grant aid:
Presenter Mr. Byambadorj (CMPUA director)

<p style="text-align: center;">Item 3 Project on Strengthening the Capacity of Solid Waste Management in Ulaanbaatar city</p> <hr/> <p style="text-align: center;">Future planning of maintenance of trucks introduced by grant aid</p>	<p>Purpose</p> <ul style="list-style-type: none"> <input type="checkbox"/> Improve operation and maintenance of waste collection trucks <input type="checkbox"/> Maintain service level of waste management in UBC in longer term 																																																																																																																																																								
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d. Hydraulic and Fuel system: Presenter Mr. Matsuda (JOCV SV)


<p style="text-align: right; font-size: small;">Item 4</p> <h2 style="text-align: center;">Hydraulic and Fuel system</h2> <p style="text-align: center;">May 19, 2011 JOCV Senior Volunteer Matsuda</p> <p style="text-align: right; font-size: x-small;">1</p>	<h3 style="text-align: center;">Agenda</h3> <ul style="list-style-type: none"> <input type="checkbox"/> Fuel system <input type="checkbox"/> Hydraulic system <p style="text-align: right; font-size: x-small;">2</p>
<h3 style="text-align: center;">Fuel system</h3>  <p style="text-align: right; font-size: x-small;">3</p>	



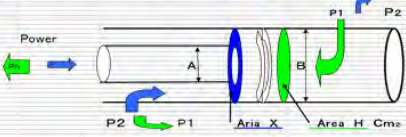
Hydraulic system (Pump)




Model	E/G	E/G rev.	Hyd. Pump rev.	Pump Model	Amount of oil exhalation	Oil pressure
Mitsubishi FV61SJA	1600cc	850rpm	520rpm		42 L/min	1.0 Mpa
15m GC16-4	PTO ON	781rpm	625rpm	GPP1-ADCB0	50 L/min	14.7 Mpa(150)
Isuzu JALF8R33F	1600cc	650rpm	488rpm		25 L/min	1.0 Mpa
8m GTO88-883-M	PTO ON	1205rpm	904rpm	SGP2A52F1H9-L	47 L/min	17.5 Mpa(180)



Hydraulic system (Cylinder)



	8m3	Isuzu	15m3	Mitsubishi
	Rod Outside diameter (A)	Tube Inside diameter (B)	Rod Outside diameter (A)	Tube Inside diameter (B)
Lift		45	50	75
Press	45	65	50	90
Pack	45	65	50	90
Ejection		40 - 60 - 80	65	120

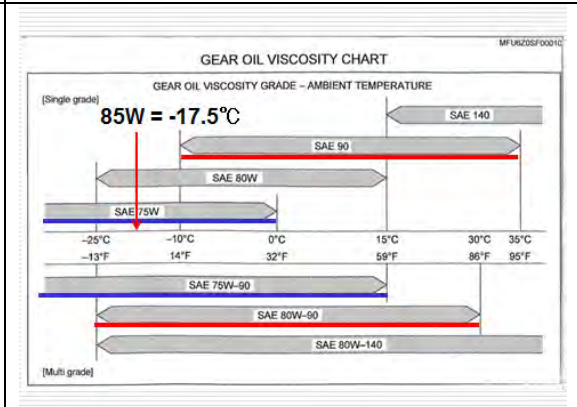
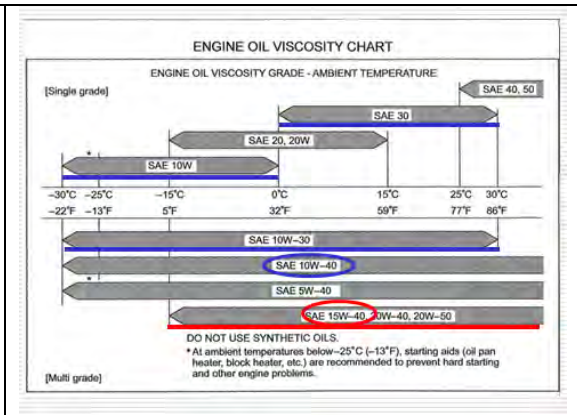


Keep the good condition for Hydraulic system

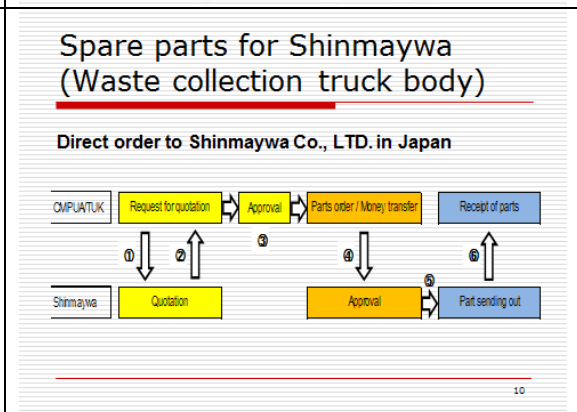
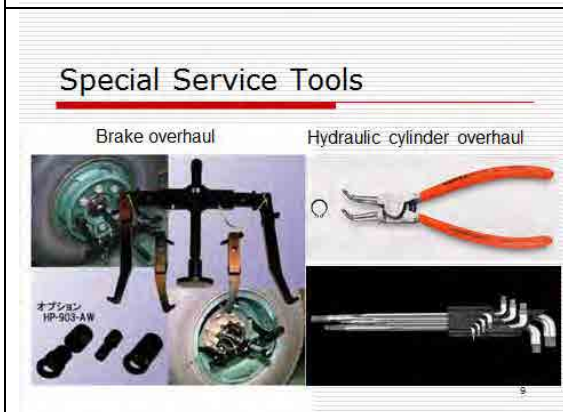
- Warming up engine running idle and the PTO ON position.
- Do not loading Ger waste and construction waste
- Keep the trucks in side of the warm garage.

e. **Improvement of waste collection truck maintenance:**
presenter Mr. Uzawa (JET consultant)

<p style="text-align: right;">Item 5</p> <h2 style="text-decoration: underline;">Improvement of waste collection truck maintenance</h2> <p>May 19, 2011 JICA Expert Team Maintenance of Equipment</p> <p style="text-align: right;">1</p>	<h2 style="text-decoration: underline;">Agenda</h2> <ul style="list-style-type: none"> <input type="checkbox"/> Oil viscosity and Grease up (Truck) <input type="checkbox"/> Daily inspection (Driver) <input type="checkbox"/> Special service tools (Mechanic) <input type="checkbox"/> Spare parts <input type="checkbox"/> Training Seminar (Chief) <hr/> <ul style="list-style-type: none"> <input type="checkbox"/> Role of Workshop chief <p style="text-align: right;">2</p>
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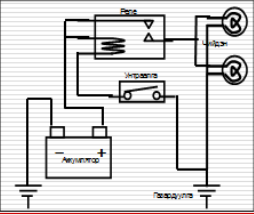
- ### Grease up Point
- Isuzu 12 points
 Every 4,000km
 - Mitsubishi 16 points
 Every 5,000km



Training/Seminar schedule

Electrical maintenance

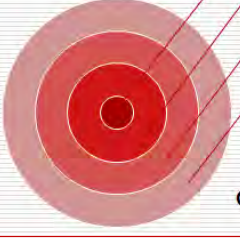
- Circuit diagram
- Relay



The diagram shows an electrical circuit. On the left, there is a transformer with a primary winding connected to a power source and a secondary winding connected to a relay. The relay is connected to two lamps. The circuit is grounded on both sides.

11

Role of Workshop chief



The target diagram has four concentric circles. From the outermost to the innermost, they are labeled: Truck, Driver, Mechanic, and Workshop chief. The innermost circle is the smallest and is labeled 'Workshop chief'. Below the target, the text 'Good management' is written.

Truck

Driver

Mechanic

Workshop chief

Good management

12

B.3.4 機材運用・維持管理報告書分析評価ワークショップ

<p>Submission of Operation and Maintenance Report for the Grant Aid equipment</p> <p>Chief advisor to the project JICA Expert Team</p>	<p>Purpose</p> <ol style="list-style-type: none"> 1. Maintain service level of waste management in UBC in longer term 2. Prepare relevant guidelines on timing to change spare parts under severe weather conditions 3. Important data for future procurement of collection trucks 																																																																																																																																																																																																										
<p>Result of submission of O&M report since May 2011</p> <ul style="list-style-type: none"> <input type="checkbox"/> ChD TUK, BZD TUK and CMPUA provided June to September reports <input type="checkbox"/> BGD TUK has submitted Aug and Sep reports <input type="checkbox"/> ND TUK provided July report (not full) and Sep report <input type="checkbox"/> Others are not fulfilling their commitments 	<p>Submission of O&M Report</p> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="6">2010</th> <th colspan="6">2011</th> </tr> <tr> <th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th> <th>10</th><th>11</th><th>12</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th> </tr> </thead> <tbody> <tr> <td>SBD TUK</td> <td></td><td></td><td></td><td></td><td></td><td></td><td>o</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>ChD TUK</td> <td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td></td><td></td><td></td><td></td><td></td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td> </tr> <tr> <td>BZD TUK</td> <td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>o</td><td>o</td><td>o</td><td>o</td> </tr> <tr> <td>SKHD TUK</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>BGD TUK</td> <td></td><td></td><td></td><td>o</td><td>o</td><td>o</td><td>o</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>o</td><td>o</td> </tr> <tr> <td>BGD WSF</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>KRUD TUK</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>o</td><td></td><td></td><td></td><td></td> </tr> <tr> <td>ND TUK</td> <td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td><td>o</td> </tr> <tr> <td>CMPUA</td> <td></td><td></td><td></td><td></td><td></td><td>o</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>o</td><td>o</td><td>o</td> </tr> </tbody> </table>		2010						2011						4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	SBD TUK							o												ChD TUK	o	o	o	o	o	o	o						o	o	o	o	o	o	BZD TUK	o	o	o	o	o	o	o								o	o	o	o	SKHD TUK																			BGD TUK				o	o	o	o										o	o	BGD WSF																			KRUD TUK														o					ND TUK	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	CMPUA						o										o	o	o
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Processing of Operation and Maintenance Report

- The operation and maintenance report made at each TUK is submitted to the internal affair officer (IAO) of the CMPUA **each month**. The IAO processes the operation and maintenance report into a cross-tabulation table and submits it to CWS's control mechanic
- After the operation and maintenance report are collected, the control mechanic analyzes the data, checks how the vehicles are being operated, attaches comments, and then submits it to the CWS director. The CWS director submits the analyzed operation and maintenance report to EPWMD **every 3 months**.

5

Maintenance report (to be filled by driver every day)

DAILY MAINTENANCE REPORT		Truck No.	Driver's name															
Contents of maintenance	1	Periodic service (April, October service)	8	Steering (Steering linkage, Ball joint)														
	2	General service (Grease, Oil change/Cleaning)	9	Body (Cabin, Frame, Compactor, Dump)														
	3	Engine (Radiator, Water pump, Belts, Oil filter)	10	Brake (Front, Rear, Parking)														
	4	Fuel (Fuel pump Nozzle, Filter)	11	Wheel (Clip bolt, nut, Hub)														
	5	Electric (Starter, Alternator, Lights, Wiring)	12	Puncture (Tube)														
	6	Chassis (Clutch, TIM, Propeller, Diff)	13	Hydraulic (Pump, cylinder)														
	7	Suspension (Spring, Absorber)	14	Others														
Operation		Maintenance																
Date	Days	Times of maintenance																
	Work	Off	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cost of spare parts	

Operation report (filled in by Mechanic or Engineer each month)

MONTHLY OPERATION AND MAINTENANCE REPORT																			
Administrative																			
Company name											1	Periodic service (April, October service)	8	Steering (Steering linkage, Ball joint)					
Monthly terms											2	General service (Grease, Oil change/Cleaning)	9	Body (Cabin, Frame, Compactor, Dump)					
Submission date											3	Engine (Radiator, Water pump, Belts, Oil filter)	10	Brake (Front, Rear, Parking)					
Contact person											4	Fuel (Fuel pump Nozzle, Filter)	11	Wheel (Clip bolt, nut, Hub)					
											5	Electric (Starter, Alternator, Lights, Wiring)	12	Puncture (Tube)					
											6	Chassis (Clutch, TIM, Propeller, Diff)	13	Hydraulic (Pump, cylinder)					
											7	Suspension (Spring, Absorber)	14	Others					
											Operation				Maintenance				
No.	Vehicle No.	Mileage (at the beginning of a month)	Mileage (at the end of a month)	Days of operation (for a month)	Days of repair	Times of maintenance				Cost of spare parts									
1						1	2	3	4	5	6	7	8	9	10	11	12	13	14
2																			
3																			

Combined O&M report

Operation & Maintenance report evaluation sheet		Month																	
No.	Vehicle No.	Mileage (at the beginning of a month)	Mileage (at the end of a month)	Days of operation (for a month)	Days of repair	Times of maintenance													
						1	2	3	4	5	6	7	8	9	10	11	12	13	14
						Cost of spare parts													
						Average													
						Total													
						Average													

Schedule for periodic service

Replacement interval	Engine oil	Engine oil filter	Fuel filter	Air filter	Transmission, Differential oil	Brake, Clutch oil	Hydraulic	Power steering oil
4/2011	✓	✓	-	-	18	24	24	36
10/2011	✓	✓	✓	✓	✓	✓	✓	-
4/2012	✓	✓	-	-	-	-	-	-
10/2012	✓	✓	✓	✓	-	-	-	✓
4/2013	✓	✓	-	-	✓	✓	-	-
10/2013	✓	✓	✓	✓	-	-	✓	-
4/2014	✓	✓	-	-	-	-	-	-
10/2014	✓	✓	✓	✓	✓	-	-	-
4/2015	✓	✓	-	-	-	✓	-	-
10/2015	✓	✓	✓	✓	-	-	✓	✓
4/2016	✓	✓	-	-	✓	-	-	-
10/2016	✓	✓	✓	✓	-	-	-	-

Thank you very much for
 your kind attention


SECTION C

処分場の運営に係る活動

C	処分場の運営に係る活動	C-1
C.1	衛生埋立てマニュアル	C-1
C.2	GPSによる簡易処分量(容積)計測マニュアル	C-10
C.2.1	GPSマニュアル	C-10
C.2.2	Manual for calculation of landfill volume at NEDS	C-12
C.3	NEDS処分場で行う環境モニタリングガイドライン	C-22
C.4	処分場評価会	C-30
C.4.1	2010年11月9日	C-30
C.4.2	2011年7月27日	C-35
C.4.3	2012年5月14日	C-41

C 処分場の運営に係る活動

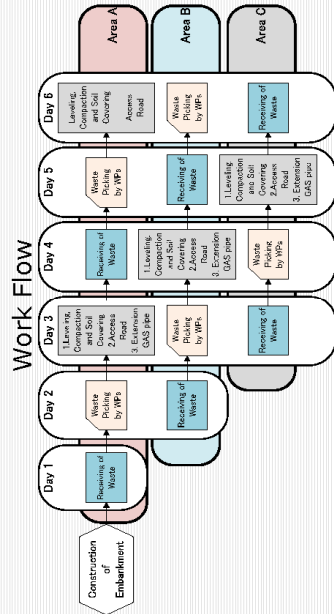
C.1 衛生埋立てマニュアル

<p>1. Current status of NEDS (1)</p> 	<p>2. Objective (1)</p> <p>Why do we need to introduce sanitary landfilling method?</p> <ol style="list-style-type: none">1. Protection of Environmental Condition<ul style="list-style-type: none">■ Mitigation of waste scattering■ Reducing of Odor■ Prevention of water contamination■ Prevention of self-ignite
<p>Landfill Operation Manual</p> <p>Naragiin Enger Disposal Site</p> <p>June 2010 JET</p>	<p>1. Current status of NEDS (2)</p> <ul style="list-style-type: none">□ Landfill amount of Waste and Soil<ul style="list-style-type: none">April 2009 – April 2010 (13 months)Weight (Weight bridge data)<ul style="list-style-type: none">□ Waste : 282,000 tones□ Soil : 100,000 tonesVolume (survey by JET)<ul style="list-style-type: none">□ Waste + Soil : 327,500m³□ Density of landfill : 0.96 t/m³ <p>⇒ Well compacted!</p>

2. Objective (2)

2. For safety work
 - Establishing routing work
 - Safely work together with WPs
3. Keep long life time for NEDS
 - Appropriate compaction to received waste

3. Required activities (1)



3. Required activities (2)

1. Construction of Embankment
 - Prior to receive the waste, embankment shall be construct at Administration side
 - ✓ Embankment height shall be minimum 3m
 - ⇒ Mitigation of waste scattering
2. Transporting of waste to designated area
 - Dumping up the waste with landfill supervisor instruction
 - ✓ Supervisor shall instruct the dumping location to driver according to daily landfill plan
 - ⇒ Mitigation of waste scattering, safety work

3. Required activities (3)

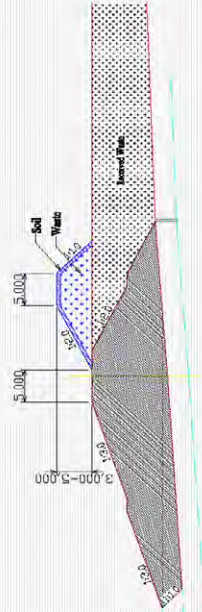
2. Waste picking
 - Just leave received waste for one (1) day for WPs to picking up the valuables
 - ⇒ Separation of working area (WPs and CMPUA), It is related with Safety working
3. To conduct Landfilling (laying and compaction etc) according to designed method
 - Leveling and compaction of received waste
 - ⇒ WPs are not working together, therefore leveling and compaction activity will be much efficiently conducted. It is introducing for saving of fuel consumption.

3. Required activities (4)

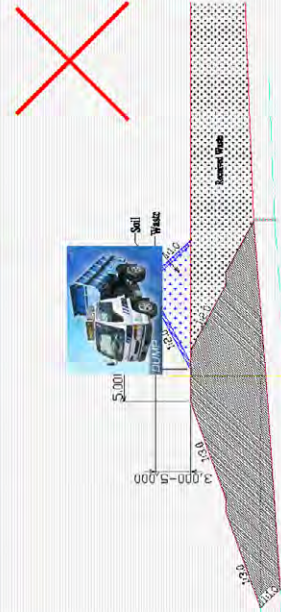
4. Soil covering
 - Covering of received waste by soil. It just lay thin layer of soil (about 10cm)
 - ⇒ Prevention of waste scattering, self-ignite and mitigation of odor generation
5. Prepare access road for transport vehicles
 - Preparing access road to receive next day waste, if necessary

4. Procedure of Landfilling (1)

1st Step: Preparation of Embankment
 Construct of embankment Using received waste and soil



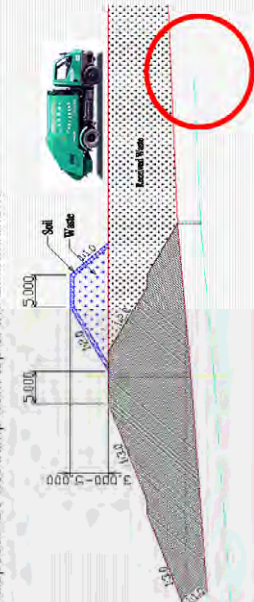
Do not dump waste from top of the embankment dam



4. Procedure of Landfilling (2)

2nd Step: Receiving of Waste

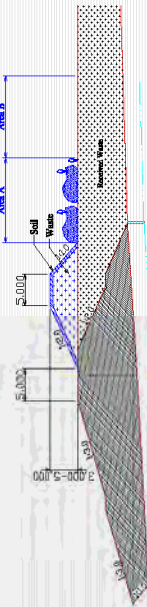
Waste Collection Truck shall go down to the landfill area and start to dispose. Do not dump from top of the Embankment



4. Procedure of Landfilling (3)

3rd Step: Waste Picking by WPs

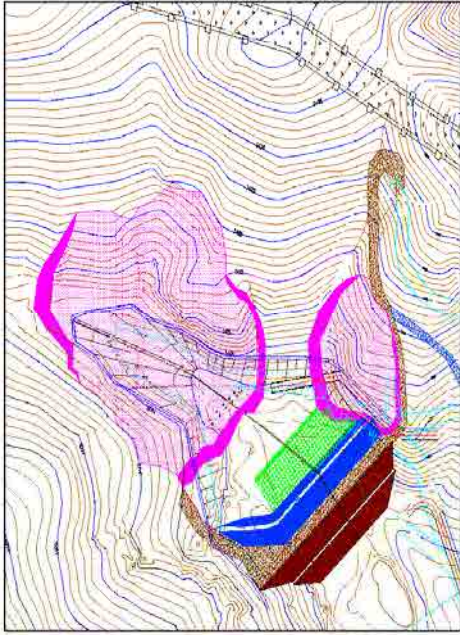
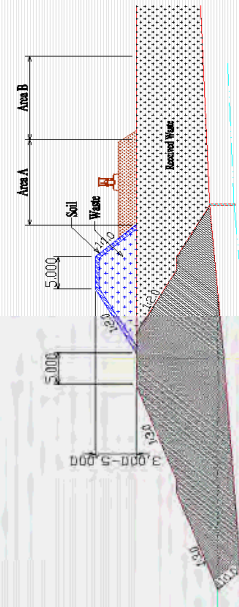
Waste picking by WPs, it allowed only the day permitted area
 Everyday more then 250 units of truck are coming in. Approximately
 220m² (30m x 70m) of area is required to receive daily waste.



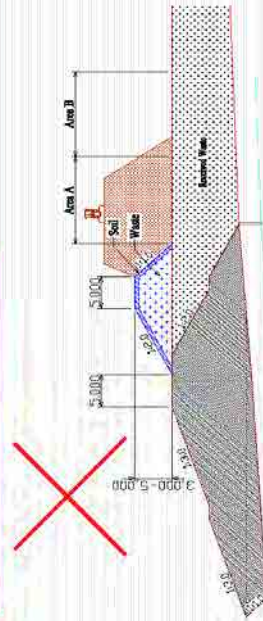
4. Procedure of Landfilling (4)

4th Step: Leveling and Compaction

Received waste shall be leveled and compacted horizontally



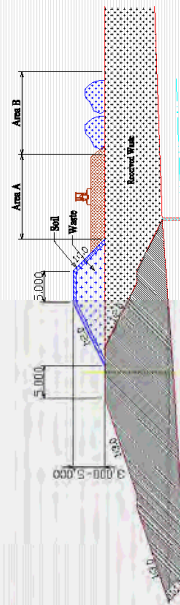
Waste shall not be filled over the
 top of embankment dam



4. Procedure of Landfilling (5)

5th Step: Shift to next Area

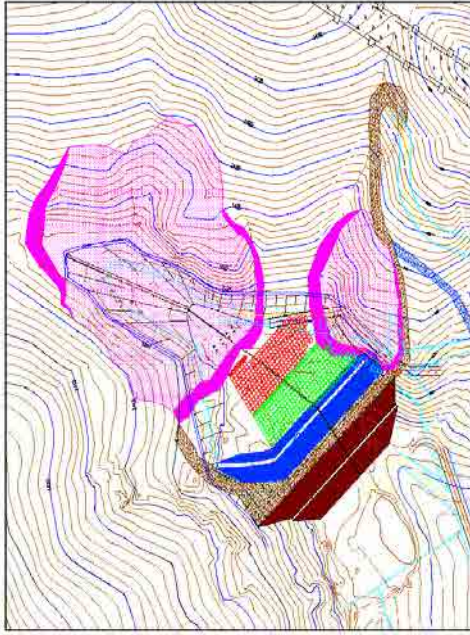
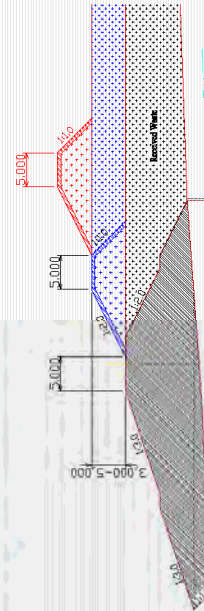
Shifting waste receiving area from Area A to Area B. Area shifting shall be continued until no more area to dispose and then back to starting area.



4. Procedure of Landfilling (6)

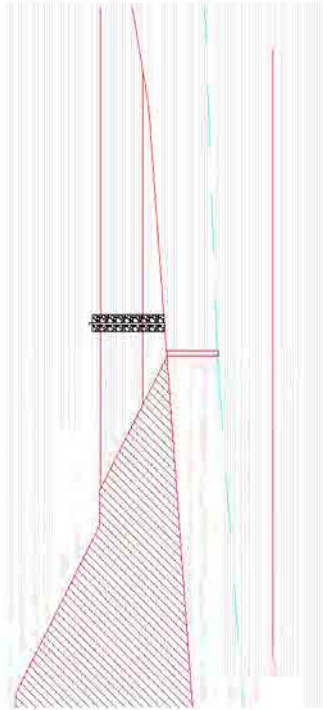
Waste shall be filled up to the level of embankment dam.

Continue previous steps up to the final level which is 45 m higher than the original ground level



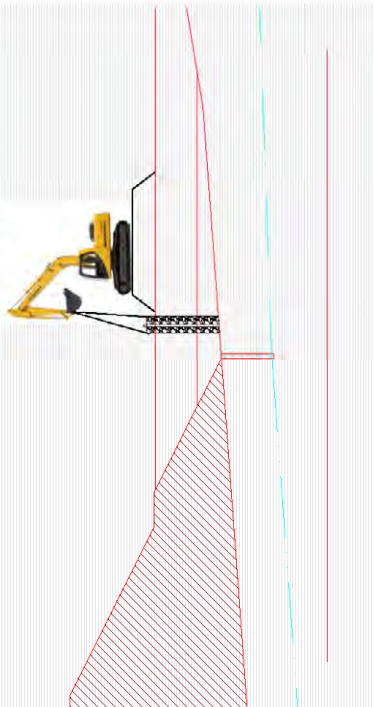
5. Other activities (Extension of Gas Removal Pipe) (1)

Filling wastes up to 1m* below the top of steel pipe (this length* shall be adjusted depend of the friction between steel pipe and wastes.



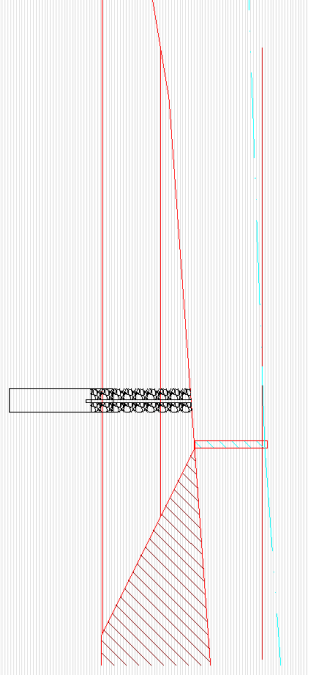
5. Other activities (Extension of Gas Removal Pipe) (2)

Setting excavator in order to extract embedded steel pipe.



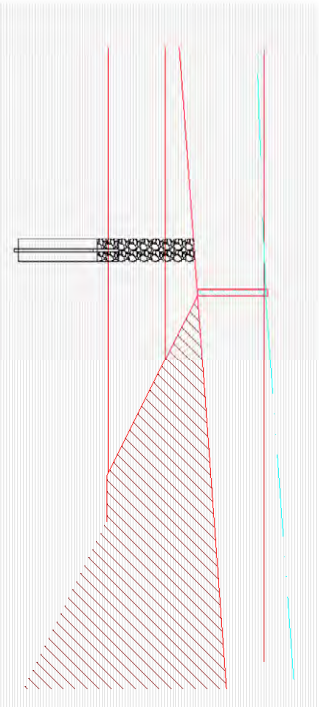
5. Other activities (Extension of Gas Removal Pipe) (3)

Extraction of External Steel Pipe by the Excavator and set at a stable level.



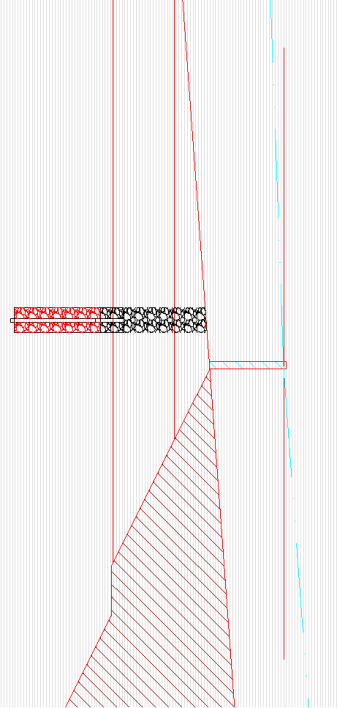
5. Other activities (Extension of Gas Removal Pipe) (4)

Extraction of Internal Pipe and vertical gravel layer remains as a function of gas removal



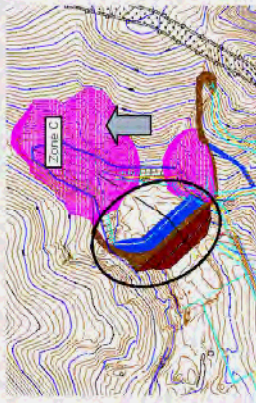
5. Other activities (Extension of Gas Removal Pipe) (5)

Filling Gravel inside uplifted Steel Pipe.



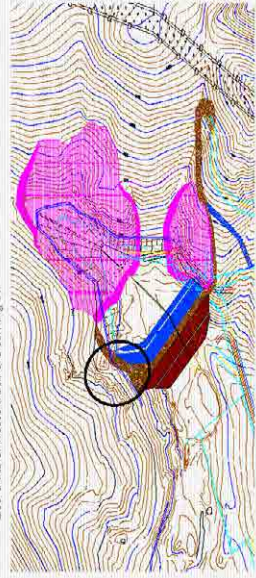
6. How to manage for sanitary landfilling from now (1)

- 1st action: Construction of embankment and preparing of access road to Zone C
It is necessary to secure access road to Zone C for closing west side access road.



6. How to manage for sanitary landfilling from now (2)

- 2nd action: Extension of lower embankment toward to north-east hill
It is necessary to close existing embankment to secure more landfill area. Everyday more than 200 units of waste truck are coming in.

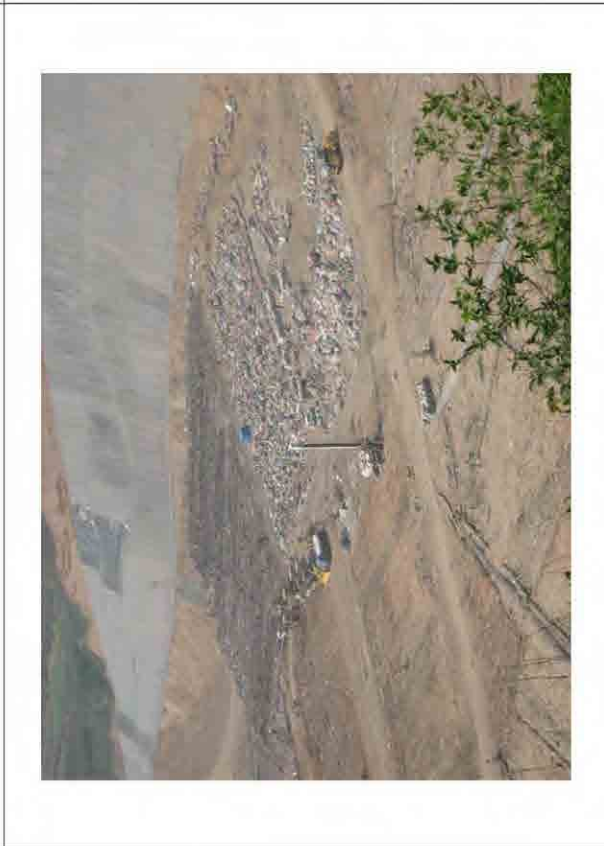
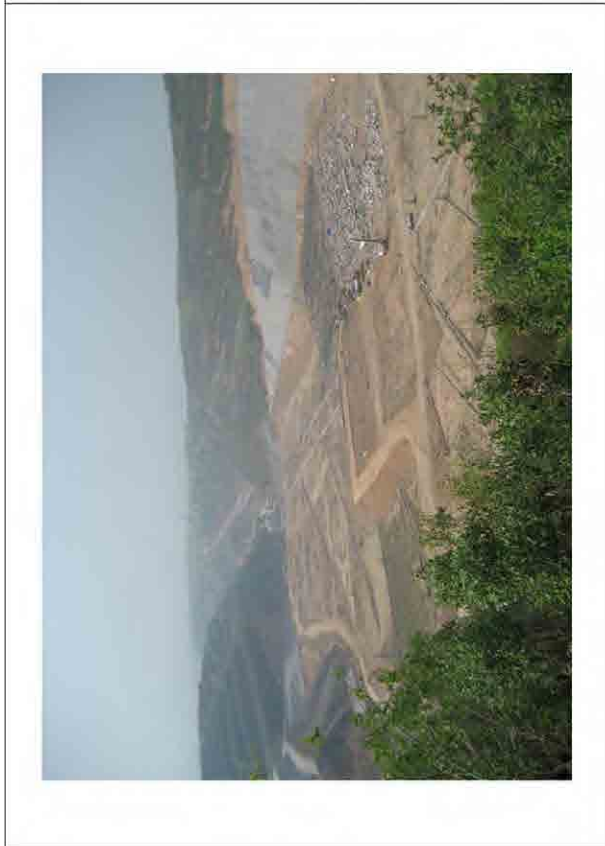
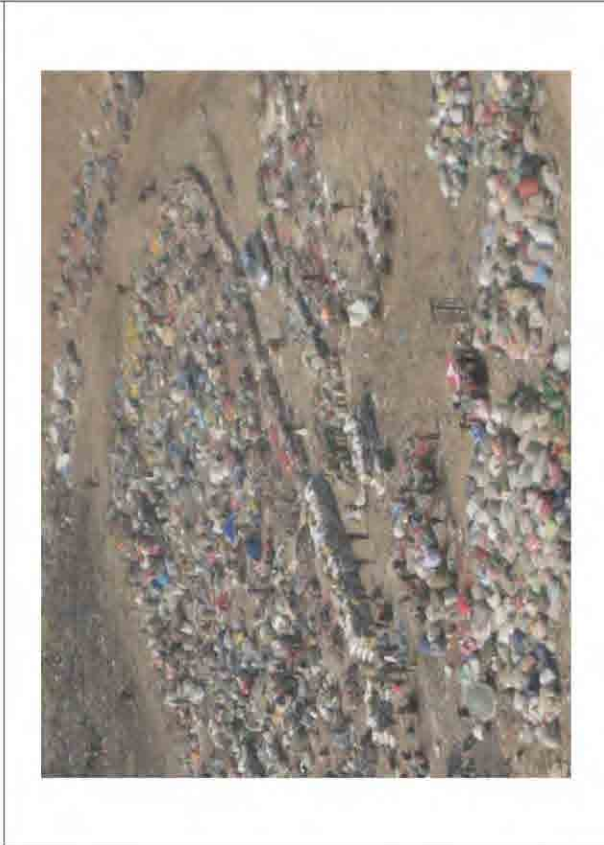
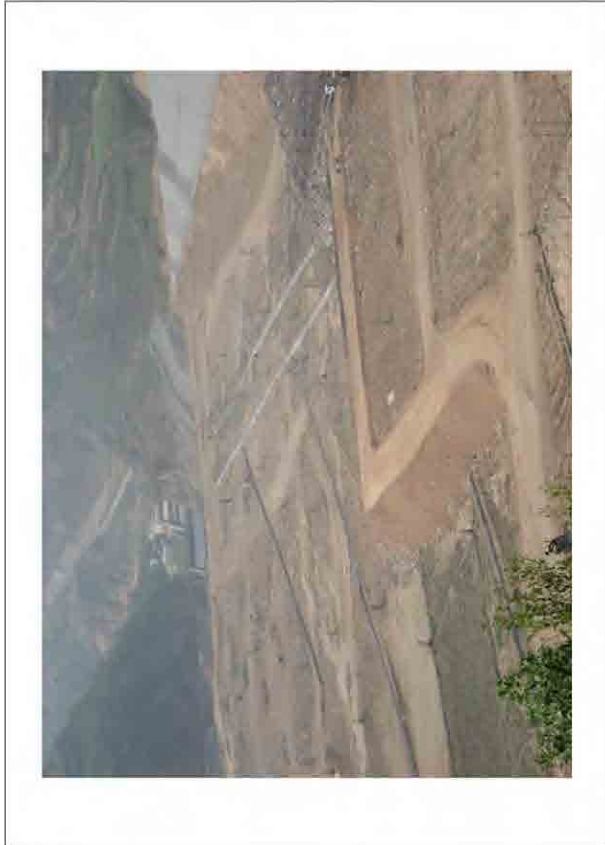


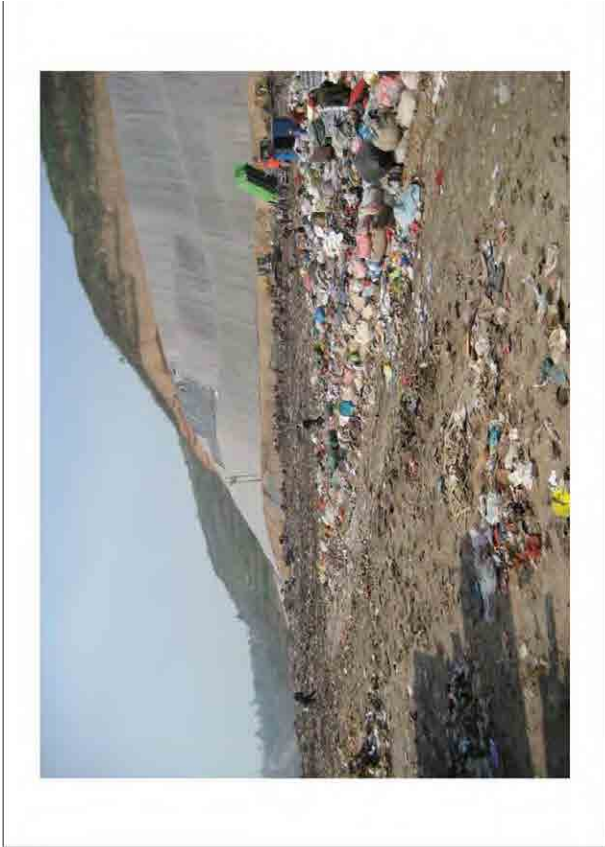
6. How to manage for sanitary landfilling from now (3)

Site is ready.
Let's start proper sanitary landfilling.

Thank you very much.








C.2 GPSによる簡易処分量(容積)計測マニュアル

C.2.1 GPSマニュアル

a. Key functions

 <p>The diagram shows a Garmin eTrex GPS device with five labels pointing to specific controls: 'IN/OUT Zoom' points to the top left buttons, 'ROCKER' points to the circular rocker button on the left side, 'MENU/FIND' points to the button below the rocker, 'QUIT/PAGE' points to the top right button, and 'POWER' points to the button below the rocker.</p>	<ol style="list-style-type: none">1. In/Out Zoom keys: Press to zoom the map in or out2. Quit/Page: Cycle through or quit the pages3. Power: (a) to turn on and off (long press), (b) to adjust contrast or backlighting (quick press and use Rocker key).4. Menu/Find: (a) to view Options Menu (quick press), (b) to view Find Menu (long press)5. Rocker: (a) Move through lists, (b) move map panning arrow, (c) select and enter fields or icons (quick press), mark waypoints (long press)
---	--

b. Working with waypoints

b.1 Marking waypoints

Two methods can be used when marking waypoints:

b.1.1 Marking waypoint from Main Menu

1. Press Quit/Page entering Main Menu.
2. Select Mark icon using Rocker key. Press Rocker key to enter Mark Waypoint page.
3. Press OK (If necessary, record a name using Rocker key before pressing OK).

b.1.2 Marking waypoint using Rocker key

Press and hold Rocker key on any page to enter Mark Waypoint page.

b.2 Editing and deleting marked waypoint

b.2.1 Editing waypoint

1. Enter Find page form Main Menu (or press and hold Menu/Find button).
2. Select Waypoints.
3. Navigate and press Rocker key to select the waypoint to be edited.
4. Edit information in editable fields using Rocker key and press OK.
5. Press Quit/Page quitting.

b.2.2 Deleting waypoint

1. Enter waypoints list from Find page.
2. Select the waypoint to be deleted and press Delete using Rocker key.

b.3 Searching for marked waypoints

b.3.1 Searching nearest waypoints

1. Enter waypoints list from Find page.
2. Press Menu/Find key to show Options Menu and select Nearest. Select waypoint from the list shown.

b.3.2 Searching by name

1. From Find page enter the Waypoints list.
2. Press and release Menu/Find key and select find by Name from the Options Menu.
3. Input the name of the waypoint and press OK.
4. Select the waypoint from the list.

c. Working with tracks

c.1 Activating track log and creating tracks

1. From Main Menu, select Tracks icon.
2. Activate the checkbox “On” using Rocker key in order to activate track log.
3. Press Quit/Page quitting or cycling through pages.
4. Hold the GPS unit and change location. The GPS unit will track the route automatically.

c.2 Saving tracks

1. From Main Menu, select Tracks icon.
2. From the window appeared, select save using Rocker key.

c.3 Deleting tracks

1. From Main Menu, select Tracks icon.
2. From the Saved Tracks field in the page, select the track to be deleted and press Rocket key.
3. Select Delete and press Rocket key.

c.4 Items to consider when saving multiple tracks at a time

Each track should be saved at the end of the route in order not to combine the data with those of other tracks.

d. Transferring data from GPS to PC

In order to transfer GPS data, the software “MapSource” should have been installed in the PC in advance. Initiate “MapSource” and connect GPS to the PC using the USB cable. From “MapSource”, enter Transfer menu and select Receive from Device. Check the type of data to transfer and press Receive button.

In order to view the data in Google Earth, select View on Google Earth from the View menu of “MapSource”.

C.2.2 Manual for calculation of landfill volume at NEDS

a. Objective

This manual is to identify the estimated land filled volume using handy GPS. The GPS shows figures are just indicated figures only, there are some tolerances (errors), and it would normally 3-10m in location wise and 5-10m in high wise.

The calculated figures are indicative figures only. If the correct figures are required the survey shall be conducted.

b. Required equipment and tools

Required equipment and tools are shown as below.

- ✓ Handy GPS
- ✓ Microsoft Excel

- ✓ Map source
- ✓ Computer
- ✓ Printer
- ✓ Internet connection
- ✓ Google map application

c. Output

There are two outputs.

- ✓ Land filled volume
- ✓ Land filled area

c.1.1 Land filled volume

Calculated level difference

	A	B	C	D	E	F	G	H	I	J	
24											24
23											23
22			0	0	0						22
21			0	0	0	0	0				21
20			0	0	0	0	0				20
19			0	0	0	0	0				19
18			0	0	0	0	0	0			18
17		0	0	0	0	0	0	0	0		17
16		0	0	0	0	0	0	0	0		16
15		0	0	0	0	0	0	0	0		15
14		0	0	0	0	0	0	0	0		14
13		0	0	0	0	0	0	0	0		13
12		0	0	0	0	0	0	0	0		12
11		0	0	0	0	0	0	0	0		11
10	0	0	0	0	0	0	0	0	0		10
9	0	0	0	0	0	0	0	0	0		9
8	0	0	0	0	11	5	0	0	0		8
7	0	0	0	6	17	6	0	0	0		7
6	0	0	5	9	13	5	0	0	0		6
5	0	-8	4	12	0	-4	0	0	0		5
4		4	6	9	-4	0	0	0	0		4
3		0	10	16	9	0	0	0			3
2											2
1											1
	A	B	C	D	E	F	G	H	I	J	

Difference	0	-4	25	52	46	12	0	0	0	0
Total Difference	131									
Total Filling Volume	327,500 m ³									

c.1.2 Land filled area



d. Method

d.1 Calculation for Land filled volume

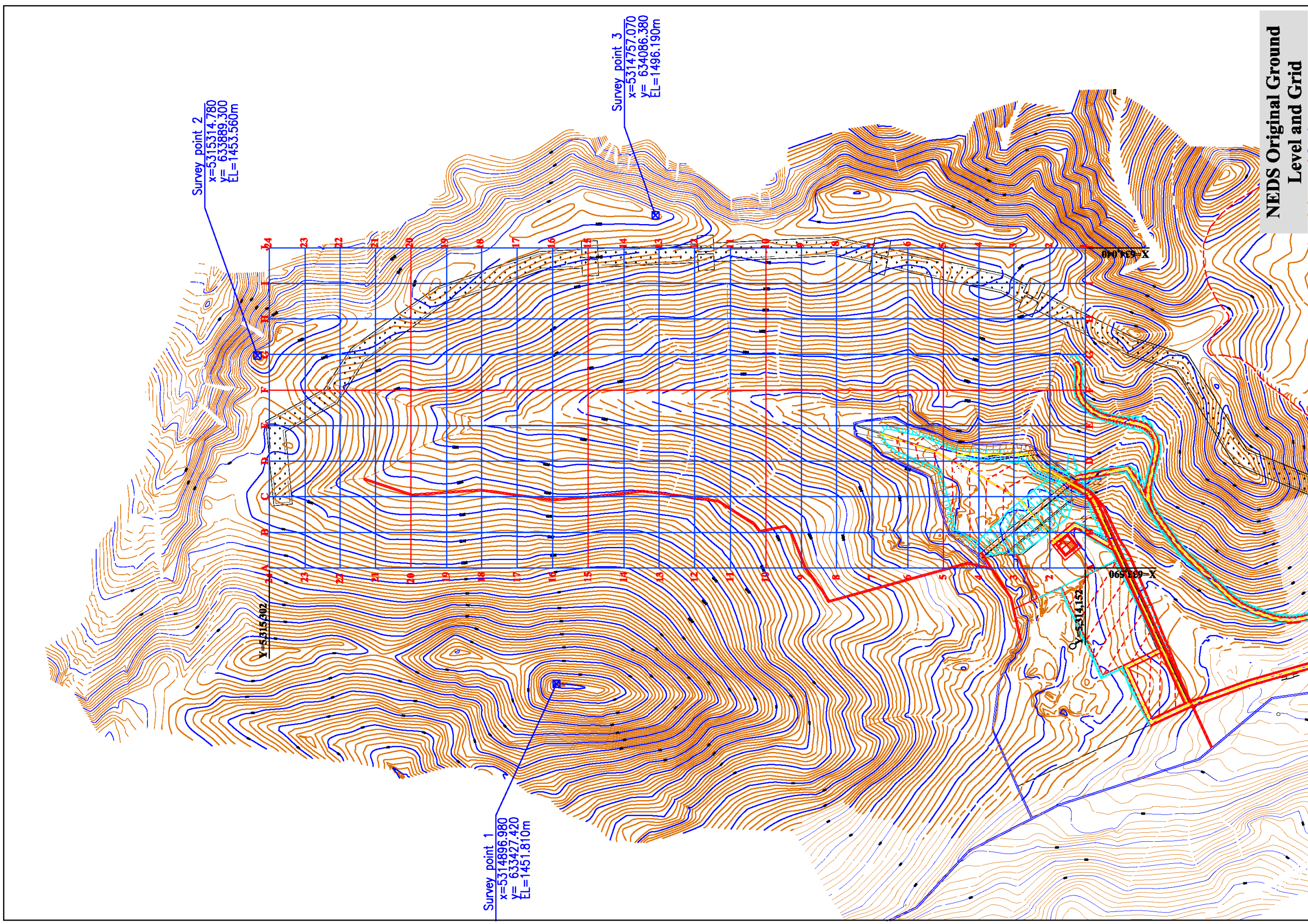
Land filled volume calculation shall be adopts grid method. The method is using following formula;

$$\text{Volume} = (\text{Current ground level} - \text{Original ground level}) \times \text{area (50m x 50m)}$$

d.1.1 Original ground level

- Fix of Grid

At first the grid interval shall be fixed. The calculated volume would be indicated figures therefore grid shall be fixed 50m by 50m. In case more corrected figures required, grid distance shall be shortened. The grid shall be covered whole landfill area. The fixed grid is shown as below.



d.1.2 Finding out original ground level on each grid

Overlapping original ground contour map of NEDS and Grid map, finding out original ground level and key in the excel file.

Original Ground Level of NEDS

	A	B	C	D	E	F	G	H	I	J	
24											24
23											23
22			1,442	1,442	1,444						22
21			1,438	1,436	1,438	1,436	1,444				21
20			1,437	1,432	1,432	1,435	1,441				20
19			1,437	1,432	1,429	1,434	1,439				19
18			1,437	1,432	1,425	1,430	1,436	1,443			18
17		1,444	1,437	1,430	1,423	1,427	1,433	1,440	1,445		17
16		1,444	1,436	1,429	1,423	1,424	1,430	1,436	1,442		16
15		1,445	1,436	1,429	1,422	1,421	1,426	1,433	1,440		15
14		1,446	1,436	1,428	1,420	1,418	1,426	1,431	1,439		14
13		1,444	1,436	1,427	1,419	1,416	1,423	1,429	1,437		13
12		1,441	1,435	1,426	1,418	1,413	1,421	1,429	1,436		12
11		1,436	1,430	1,423	1,415	1,411	1,419	1,427	1,435		11
10	1,434	1,432	1,426	1,420	1,412	1,411	1,419	1,427	1,436		10
9	1,428	1,426	1,422	1,416	1,409	1,411	1,421	1,429	1,437		9
8	1,423	1,421	1,421	1,413	1,406	1,412	1,421	1,429	1,437		8
7	1,417	1,414	1,413	1,409	1,399	1,413	1,421	1,428	1,434		7
6	1,415	1,408	1,409	1,403	1,400	1,411	1,419	1,427	1,432		6
5	1,411	1,408	1,398	1,396	1,410	1,416	1,422	1,431	1,436		5
4		1,394	1,394	1,395	1,408	1,418	1,421	1,435	1,440		4
3		1,397	1,392	1,394	1,403	1,417	1,426	1,435			3
2											2
1											1

d.1.3 Measurement of current ground level

- Setting up Grid
 - (a) Turn on the switch of GPS
 - (b) Select main menu
 - (c) Go to Mark menu
 - (d) Key in Grid number (example “A1”) and Location (example “633590, 5314152”).
And press “OK” to save data.
 - (e) Continue to save all of the grid data
- Setting up GPS
 - (a) Go out from NEDS site office and then turn on the switch of GPS.
 - (b) Wait for while until GPS accuracy become 3 or 4m.
 - (c) Take current level at entrance of NEDS site office entrance which showing on GPS
 - (d) Compare (current ground level -1m) and actual level (1,384m)

- (e) The difference the above shall be take recorded
- Taking current ground level
- (a) Go to “Main Menu”
 - (b) Select “Find”
 - (c) Select “Waypoints”
 - (d) Key in Grid number (example “A1”)
 - (e) Press “Go To”
 - (f) Select “Off Road”
 - (g) Follow instruction by the GPS
 - (h) When reach to the Grid point, go to “Main Menu” and select “Mark” to save current ground level.
 - (i) Go back to “Main Menu” and repeat (b) to (g) until end of recording

d.1.4 Calculate land filled volume

To calculate land filled volume, key in the taken recorded to excel sheet.

Current Ground Level

Date: 2010/5/13

	A	B	C	D	E	F	G	H	I	J	
24											24
23											23
22			1,442	1,442	1,444						22
21			1,438	1,436	1,438	1,436	1,444				21
20			1,437	1,432	1,432	1,435	1,441				20
19			1,437	1,432	1,429	1,434	1,439				19
18			1,437	1,432	1,425	1,430	1,436	1,443			18
17		1,444	1,437	1,430	1,423	1,427	1,433	1,440	1,445		17
16		1,444	1,436	1,429	1,423	1,424	1,430	1,436	1,442		16
15		1,445	1,436	1,429	1,422	1,421	1,426	1,433	1,440		15
14		1,446	1,436	1,428	1,420	1,418	1,426	1,431	1,439		14
13		1,444	1,436	1,427	1,419	1,416	1,423	1,429	1,437		13
12		1,441	1,435	1,426	1,418	1,413	1,421	1,429	1,436		12
11		1,436	1,430	1,423	1,415	1,411	1,419	1,427	1,435		11
10	1,434	1,432	1,426	1,420	1,412	1,411	1,419	1,427	1,436		10
9	1,428	1,426	1,422	1,416	1,409	1,411	1,421	1,429	1,437		9
8	1,423	1,421	1,421	1,413	1,417	1,417	1,421	1,429	1,437		8
7	1,417	1,414	1,413	1,415	1,416	1,419	1,421	1,428	1,434		7
6	1,415	1,408	1,414	1,412	1,413	1,416	1,419	1,427	1,432		6
5	1,411	1,400	1,402	1,408	1,410	1,412	1,422	1,431	1,436		5
4		1,398	1,400	1,404	1,404	1,418	1,421	1,435	1,440		4
3		1,397	1,402	1,410	1,412	1,417	1,426	1,435			3
2											2
1											1

Key in the recorded figure, if the key in the figures are different with original ground level, the cell will be highlighted.

The land filled volume shall be calculated automatically.

Calculated level difference

	A	B	C	D	E	F	G	H	I	J	
24											24
23											23
22			0	0	0	0	0				22
21			0	0	0	0	0				21
20			0	0	0	0	0				20
19			0	0	0	0	0				19
18			0	0	0	0	0	0			18
17		0	0	0	0	0	0	0	0		17
16		0	0	0	0	0	0	0	0		16
15		0	0	0	0	0	0	0	0		15
14		0	0	0	0	0	0	0	0		14
13		0	0	0	0	0	0	0	0		13
12		0	0	0	0	0	0	0	0		12
11		0	0	0	0	0	0	0	0		11
10	0	0	0	0	0	0	0	0	0		10
9	0	0	0	0	0	0	0	0	0		9
8	0	0	0	0	11	5	0	0	0		8
7	0	0	0	6	17	6	0	0	0		7
6	0	0	5	9	13	5	0	0	0		6
5	0	-8	4	12	0	-4	0	0	0		5
4		4	6	9	-4	0	0	0	0		4
3		0	10	16	9	0	0	0			3
2											2
1											1

Difference	0	-4	25	52	46	12	0	0	0	0
Total Difference	131									
Total Filling Volume	327,500 m3									

e. Drawing for Land filled area

e.1 Record two edge line (Top and Bottom)

Making land filled area drawing, it need top of filled line and bottom of filled line. Using GPS "Track" command to record the both of edge line.

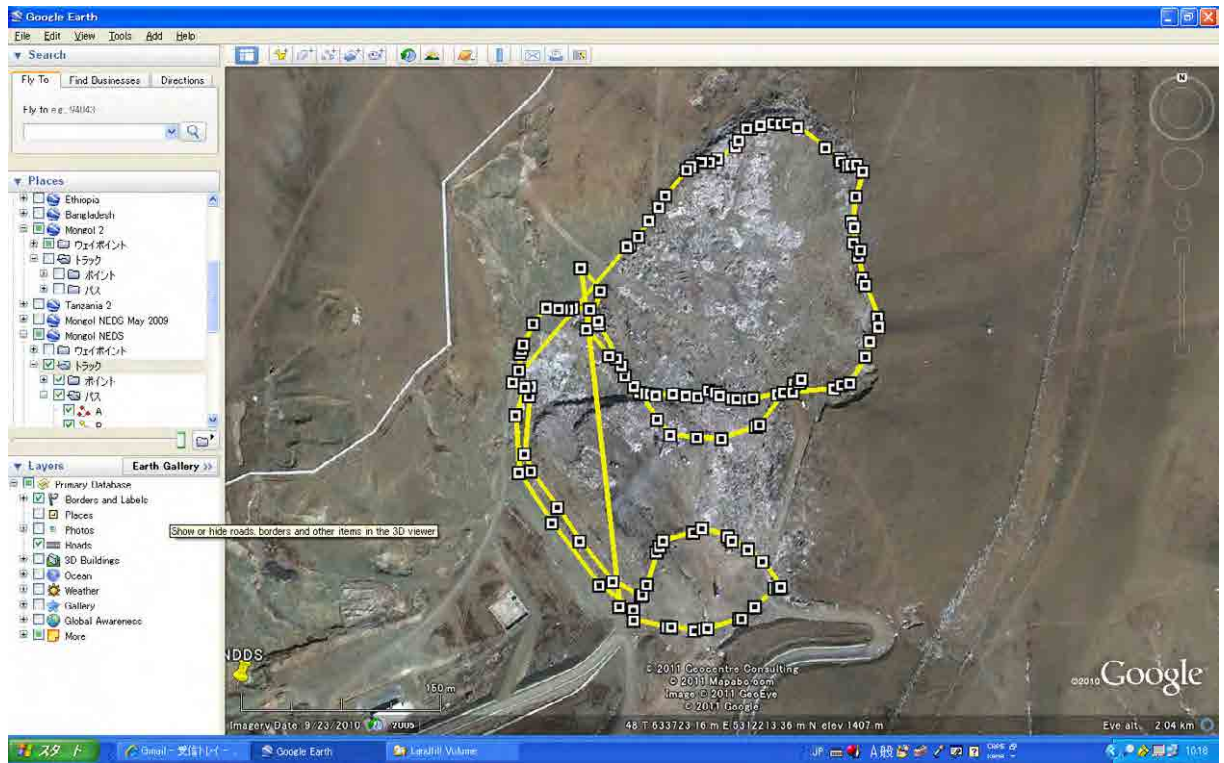
- (a) Go to "Main Menu"
- (b) Select "Tracks"
- (c) Select "Off"
- (d) Press "Clear" and "Yes"
- (e) Confirm "0%", if it still "**%" repeat (b) to (d)
- (f) Go to anywhere of Top of land filled point
- (g) Select "Tracks"
- (h) Select "On"

- (i) Walk along the edge of top of land filled point (clock or un clockwise whatever) until starting point
- (j) Press “Save”
- (k) Key in any name
- (l) Confirm the saved name in saved tracks
- (m) Select “Off”
- (n) Press “Clear”
- (o) Confirm “track log 0%”
- (p) Go to anywhere of Bottom edge of land filled point
- (q) Repeat (g) to (l)

e.2 Loading track log to computer

- (a) Launch “Map source” program
- (b) Connect GPS to the computer by USB cable
- (c) Select “receiving from device”
- (d) Pop up message will appear and select all of data
- (e) Recorded Track log will appear automatically
- (f) Select “Display”
- (g) Select “display on Google Earth”
- (h) Recorded track log will appear on the Google Earth
- (i) Save the data into Google Earth with some name “recommended with date”
- (j) Press “Print screen”
- (k) Launch “Microsoft word” or “Microsoft Excel” whatever you preferred.
- (l) Press “paste”

The sample map is shown as below.



C.3 NEDS処分場で行う環境モニタリングガイドライン

a. 環境モニタリングについて

a.1 環境モニタリングの意義

NEDS 処分場で実施される環境モニタリングは、搬入されたゴミの埋立処分によって、ゴミに含まれるもしくはゴミの分解によって生成される有害物質が、地中に浸透し地下水や表流水に混入しこれらを汚染していないか、または、ゴミの分解によって、有害なガスが発生していないか、これらが大気汚染を引き起こしていないかを、定期的に観察するものです。NEDS は設計時に地中に浸出水が浸透しない設計に基づき建設されていますので、基本的に地下水、表流水への浸出水の混入は「ゼロ」ですが、何かの影響で染み出していく可能性がないわけではありません。

a.2 モニタリング項目

NEDS 処分場の運営が環境に与える影響のある項目としては、NEDS 設計時の環境影響評価で、提言された、a)大気汚染、b)土壌汚染、c)地下水汚染、d)表流水汚染、e)騒音、f)悪臭が挙げられます。この内、e)騒音、f)悪臭については第三者によるモニタリングコミッティによって6ヶ月に1回調査されます。また、b)土壌汚染についてですが、土壌汚染は多くの場合、水を媒体として広がっていきますので、c)地下水汚染、d)表流水汚染のモニターを行うことで代替できます。従って CMPUA 職員で実施する項目は a)大気汚染、c)地下水汚染、d)表流水汚染となります。

a.3 大気汚染に関するモニタリング

NEDS 処分場運営において大気汚染を引き起こす可能性のある事象は、搬入されたゴミが微生物等により発酵・分解していく段階で、いろいろなガスを発生させます。これかのガスの発生は、大気汚染を引き起こすばかりではなく、NEDS で働く収集車やブルドーザーの作業員に対して健康被害を引き起こす可能性があります。主なガス種類の内無害なものとしては酸素 (Oxygen : O₂)、二酸化炭素 (Carbon Dioxide : CO₂)、有害なものとしては硫化水素 (Hydrogen Sulfide : H₂S)、一酸化炭素 (Carbon Monoxide : CO)、メタンガスなどの (Methane Gas : CH₄) 可燃性ガス (Flammable Gas : HC) があり、それぞれに対して以下に説明します。

a.3.1 硫化水素

硫化水素は空気より重く (比重 1.1905)、無色、水によく溶け弱い酸性を示し、腐った卵に似た特徴的な強い刺激臭があり、目、皮膚、粘膜を刺激する有毒な気体です。高濃度での暴露を受けた場合には数呼吸で肺の酸素分圧が低下することによる呼吸麻痺を起こし、呼吸中枢が活動できなくなる結果昏倒に至ります。また、皮膚粘膜への刺激は、気管支炎や肺水腫を起こすことがあります。日本の労働安全規則では硫化水素の許容濃度は 5 ppm¹以下と規定されています。

a.3.2 一酸化炭素

一酸化炭素は、常温・常圧で無色・無臭・可燃性の気体で、炭素を含む物が燃焼すると二酸化炭素が発生するが、酸素の不十分な環境で燃焼 (不完全燃焼) が起こると一酸化炭素が発生します。一酸化炭素は酸素の約 250 倍も赤血球中のヘモグロビンと結合しやすく、一酸化炭素が体内に入ると血液の酸素運搬能力が下がり、体の中に酸素を取り込むことができなくなり死に至ることがあります。このため日本では、大気汚染に係る環境基準についてで「1時間値の1日平均値が 10 ppm 以下であり、かつ、8時間平均値

¹ ppm: parts par million (百万分の一)

が 20 ppm 以下であること」と規定されています。

a.3.3 可燃性ガス

可燃性ガスとは、「空気または酸素とガスがある一定の割合で混合しているときに、火源を近づけると爆発現象が起こるガス」のことです。可燃性ガスには水素、メタン、プロパン、ブタンなど数十種類ありますが、ここでは、処分場で発生すると考えられるメタンガスについて説明します。

メタンガスは常温、常圧で無色、無臭の気体で人に対する毒性はありません。また、メタンガスは水素と炭素から構成されるガスで、処分場に搬入される生ゴミ（野菜くずなど）が発酵・分解される過程で発生します。生ゴミが発酵・分解するためには、いろいろな条件が必要で、酸素、水分、温度などが揃わなくてはなりません。NEDS ではこの中の水分、温度が極端に低いため、生ゴミの分解はあまり進んでいないため、NEDS ではあまり発生していないと考えられます。

a.4 表流水、地下水に関するモニタリング

NEDS 下流には多くの市民が生活しています。NEDS 運営において表流水、地下水による汚染を引き起こす可能性があるのは、搬入されたゴミから出る水分の中に飲用に適さない有害部室が含まれている場合があり、これが表流水及び地下水に混入し、これを飲用した人に健康被害を及ぼす可能性があります。これに対して UB 市では飲料水に関する水質基準を設けています。

表 C.1 モンゴル国飲料水基準

	分析項目	単位	モンゴル基準
1	味覚	score	0,1,2
2	臭気	score	0,1,2
3	色	degree	20,0
4	濁度	mg/l	1.5
5	モリブデン (Mo)	mg/l	0.07
6	バリウム (Ba)	mg/l	0.7
7	ホウ素 (Bo)	mg/l	0.5
8	銅 (Cu)	mg/l	1.0
9	カルシウムイオン (Ca ²⁺)	mg/l	100.0
10	マグネシウムイオン (Mg ²⁺)	mg(as Mg)/l	30.0
11	マンガン(Mn)	mg/l	0.1
12	ナトリウム(Na)	mg/l	200.0
13	磷酸 (PO ₄ ²⁺)	mg/l	3.5
14	セレンウム (Se)	mg/l	0.001
15	ストロンチウム (Sr)	mg/l	2.0
16	硫酸(SO ₄ ²⁺)	mg(as SO ₄)/l	500.0
17	硬度	mg-equivalent/L	7.0
18	塩素 (CL ⁻)	mg(as CL)/L	350.0
19	クロム (Cr)	mg(as Cr)/L	0.05
20	硫化水素 (H ₂ S)	mg/l	0.1
21	固形物	mg/l	1000.0
22	ウラン (U)	mg/l	0.015
23	総バクテリア	個/ml	20
24	大腸菌郡	個/100ml	0
25	二酸化硫黄	個/100ml	0
26	大腸性病原体バクテリア	個/100ml	0
27	pH		6.5-8.5
28	砒素 (As)	ppm	0.05
29	フッ素 (F)	ppm	0.7-1.5
30	全窒素	mg/l	10

これらの項目を毎月検査することは、費用的に無理がありますし、そもそも地下水というものは長い時間を掛けて地中を移動していますので、毎月の結果はほぼ同じものが出てくるのが予想されます。NEDS 施設は、ゴミから出る水分を処分場の外に排出させないように、設計されています。まず、表流水についてですが、処分場の低い部分には、ゴミから出てきた水を集めるパイプが設置されており、このパイプに集められた汚水は、浸出水処理池（Leachate collection pond）に集められます。ここに集水された汚水はポンプを使って埋立地内に戻されます。この工程を繰り返すことにより、汚水は蒸発し、外部に流出することが内容になっています。また、地下水への混入防止ですが、NEDS 処分場の地表面から約 3 m 下から岩盤となっており、6 m を超えると全く割れ目の入っていない岩盤で形成されています。基本設計調査ではこの亀裂のない岩盤で、透水試験を行いこの岩盤から水が漏れることがないことを確認しています。

このように、NEDS は表流水及び地下水汚染が起こらないような設計に基づいて建設されていますが、100% 完全であると言い切れるものではありません。このため、日常的にモニタリングをする必要があります。飲料水基準に基づいて試験を行うことは難しいことは上に述べましたが、水質の変化をもっと簡易的にモニターできる方法があります。NEDS ではこの方法を採用し、測定した値に大きな変化があった場合には水質検査を行えばよいです。

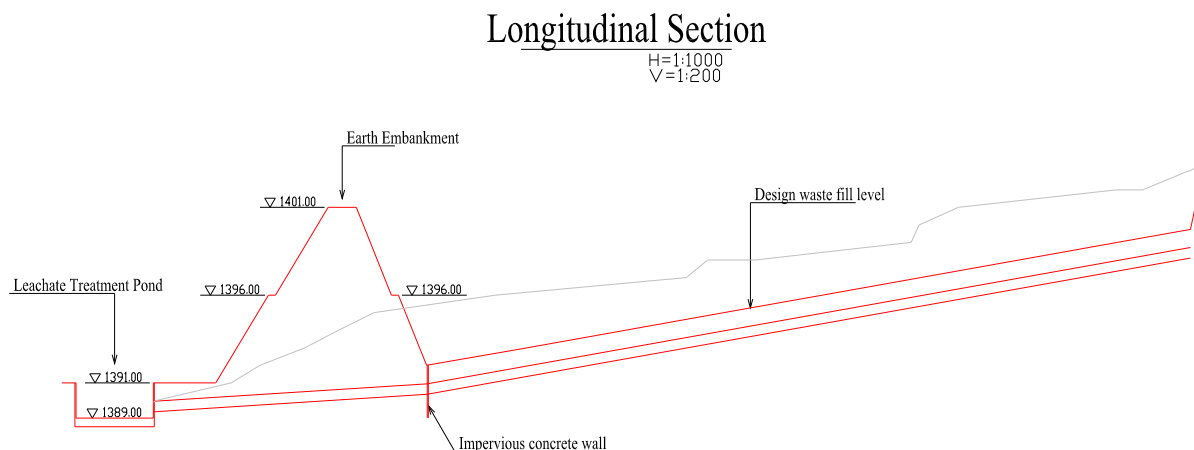


図 C-1 NEDS 断面図

測定項目は①酸化還元電位（ORP : Oxidation-reduction Potential）、②水素イオン指数（pH : Potential Hydrogen）、③電気伝導度（EC : Electrical Conductivity）の 3 種類とします。それぞれの指数の意味と水質との関連性を以下に説明します。

a.4.1 ORP（Oxidation-reduction Potential）酸化還元電位

酸化還元電位とは、水に含まれる物質の電子の放出しやすさ、あるいは受け取りやすさを定量的に評価する尺度です。水は水素（H）と酸素（O）から成り立っていますが、水素イオンの持つ酸化還元電位は -420mV 、酸素は $+820\text{mV}$ で、汚染されていない水の ORP 値はこの間で変化します。ではこの値で何がわかるのか？水素や酸素以外にも水中に溶解する物質は、数多くあります。このような物質が水中に溶解していると ORP の値が変化します。一般的には鉄（Fe）などの有機物が多く含まれていると、ORP 値が下がっていきます。モニタリングをしている中でこの値が変化してした場合には、何らかの物質が水中に溶け出していると判断できます。

a.4.2 水素イオン指数（pH : Potential Hydrogen）

水素イオン濃度指数とは、物質の酸性、アルカリ性の度合いを示す数値で、酸性が強

いと低い値を示し、アルカリ性が強い場合には高い値を示します。pH 数値の大小は直接人間の健康に影響するものではありません。ではなぜ測定するかというと、前述の測定した水に鉄 (Fe) が多く含まれると ORP 値が大きくなると説明しましたが、Fe が多く含まれると pH 値は低く出ます。ORP と同様に測定値の変化から、何かが混入しているのではと推測できます。

a.4.3 EC (Electrical Conductivity) 電気伝導度

電気伝導度とは、水がどのくらい電気を通しやすいかを示す値で、純水 (Pure Water) は電気伝導度が 0 です。水の中にいろいろな物質が溶け込んでくると、電気伝導率が大きくなります。電気伝導度は採取した水の温度によっても変化し、低い場合には伝導度は低く、高い場合には伝導度は高くなります。電気伝導度の値も上記の 2 種類と同様に、この値は水の中へのその他物質の混入の度合いを示すものであり、この値を持って何が混入しているかを判断することはできませんが、水質の変化を知る目安となります。

b. モニタリング

b.1 測定場所

b.1.1 大気汚染に関するモニタリング

有害ガスのモニタリング場所として最適な場所は、NEDS 場内に設置されている、Gas Removable Pipe です。第 1 章で説明したとおり、有害ガスは埋め立てたゴミから発生します。埋め立てられるゴミは毎日入ってきますし、日によって埋め立てられる場所も異なってきます。また、埋め立てられてからもしくは家庭で排出されてから、ゴミの発酵・分解は始まり、時間と共に発酵・分解の度合いが進んでいきます。つまり、処分場に埋め立てられたばかりのゴミは、発酵・分解が進んでおらず、今回問題としている有毒ガスはほとんど発生しません。従って、重点的にモニタリングすべきものは、埋め立てられてから時間のたっているもの、つまり、発酵・分解が進んでいるものです。測定箇所として推奨する場所を以下に示します。

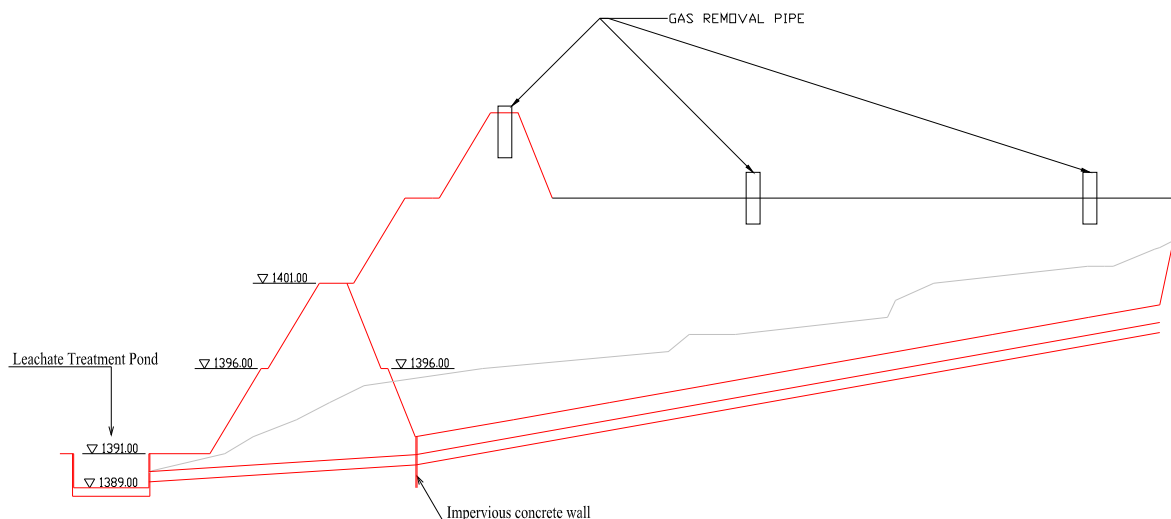


図 C-2 測定箇所

測定箇所①は堰堤の小段、これは埋め立て完了後も継続してガスモニタリングを行いことが可能な場所です。測定箇所②、③は埋め立て作業を実施している場所です。②、③に関してはできる限り長期間ガス抜き管を設置しておけ、かつ、埋め立てたゴミの厚さの厚いところが適しています。

b.1.2 表流水、地下水に関するモニタリング

測定する場所は、NEDS より下流側（水の流れを考慮して）設置すべきです。既に表流水及び地下水に関しては、NEDS 運用前から測定している場所で計測を行っていますので同じ場所での継続計測が原則です。しかしながら、地下水計測地点が、今年の雪解け水による濁流で水没してしまったとのことですので、新たに計測場所を早急に設定する必要があります。設定する場所としては、NEDS 下流の民家で井戸を利用しているところがよいと考えます。

b.2 測定頻度

b.2.1 大気汚染に関するモニタリング

有害ガスの発生は、天候や気温などの気象条件や埋め立てられたゴミの種類によって変化が大きいため、1回/週の測定が望ましいです。

b.2.2 表流水、地下水に関するモニタリング

表流水、地下水のモニタリングは、NEDS の運用に対して変化がすぐに起きる可能性も低いため、1回/月の測定でよいと考えます。

b.3 測定方法

計測機器の使用方法については既に実施していますのでここでは割愛します。

b.4 測定項目シート

測定記録シートを以下に示します。

b.4.1 大気汚染に関するモニタリングシート

No. _____

Air Quality Analysis Data Sheet

Date : _____
 Place : _____
 Weather : _____
 Analyst name : _____
 Device : Air Quality Test (GX-2003 RIKEN KEIKI instrument)

No.	Sampling point	Measured time	LEL Combustible Gas	Volume Combustible Gas	Oxygen (O ₂)	Hydrogen Sulfide H ₂ S	Carbon Monoxide (CO)
			(%)	(%)	(%)	(ppm)	(ppm)
1							
2							
3							
4							
5							
6							

Memo :

b.4.2 表流水、地下水に関するモニタリングシート

No. _____

Water Analysis Data Sheet

Date : _____
 Place : _____
 Weather : _____
 Analyst name : _____
 Device : Water test (HANNA instruments)

No.	Sampling point	Measured time	pH	EC	ORP	Temp (Water)	Temp (Air)
			(-)	(μ S)	(mV)	($^{\circ}$ C)	($^{\circ}$ C)
1							
2							
3							
4							
5							
6							

EC : Electric conductivity
 ORP : Oxidation-Reduction potential
 Temp : Temperature

Memo :

b.5 測定に関する注意事項

b.5.1 大気汚染に関するモニタリング

有毒ガスは第1章で説明したとおり、人体に有害なガスで、高濃度のガスを吸うと死に至る場合もあります。測定機器は先の無償資金協力で供与された2台逃す検知器で行

いますが、この検知器では有毒ガスを検知すると以下の警報が（ブザー）になります。もし、ガス測定時に警報機がなった場合には、周りで作業している作業員、WPs をすぐに対処させてください。また、火気の使用は爆発の危険性がありますので絶対に使用しないようにしてください。

その後、時間を置いて測定器のスイッチを動作状態にしたまま、警報機がなったところにゆっくりと近づき、継続して警報機がなる場合にはしばらくこの場所周辺には近づかないようにし、その周りも同様に（警報機のスイッチを入れたまま）計測し、ガスの発生している範囲を特定させて、その範囲に立ち入らないように周知徹底してください。

下表には酸素の項目がありますが、酸素については下表の数値以下になった場合警報機になりますので間違えないようにしてください。

表 C.2 警報のレベル

	酸素 (Oxygen)	可燃性ガス (HC)	硫化水素 (H ₂ S)	一酸化炭素 (CO ₂)
第1警報	19.5%	10%LEL	10 ppm	25 ppm
第2警報	18.0%	50% LEL	30 ppm	50 ppm
Over 警報	40.0%	100% LEL ²	100 ppm	500 ppm

b.5.2 表流水、地下水に関するモニタリング

モニタリングを行う場所を決定の後、初期値を計ります。このときに第 1 章で説明した標準的な値を大きく上回る値を示す場合がありますが、値が大きいかしくはおかしい＝処分場の影響ではありません。地下水の場合にはこのようなことは余りありませんが、表流水の場合、近隣家屋の排水が混ざっていたりして、標準的な値を超える値が計測されることはよくあります。モニタリングは初期値に対して、どのように変化しているかを把握することが目的です。従って、測定する場所を変えたり、測定器を洗わずに使ったりすると、モニタリング効果がなくなってしまいまので注意が必要です。

c. モニタリングデータの評価

c.1 環境モニタリングデータの評価

測定データが一定の範囲内を示している間は、NEDS の運営が大气や水質に影響を及ぼしていないと考えてよいでしょう。しかしながら、計測データに変化があり、初期測定値との差異が大きい場合には、注意が必要です。

大气汚染に関するモニタリング、つまり、有毒ガスの発生については警報機がなるので明確ですが、水質検査に関しては、測定値＝水質汚濁とはなりません。水質検査項目の測定値に変動があった場合、水質検査会社に連絡し、正式な水質検査を行ってもらい結果を受け取ってください。

水質検査の結果、水質汚染が確認された場合、水質検査範囲を広げ、NEDS 上流側、右岸側（北西側）、左岸側（南東側）の井戸で水のサンプルを採取し、水質検査会社に検査を依頼してください。これは周辺の地下水の水質を調べることで、水質汚染の原因が NEDS であるかどうかを判断するものです。専門的な判断はこれらの結果を専門家に預け、総合的な判断を仰いでください。

c.2 環境モニタリングデータの報告

計測したデータは整理してグラフを作成してください。これにより変化の有無が非常にわかりやすくなります。また、計測データの集計表とグラフを、1年に2回行われる環境モニタリングコミッティに提出し、モニタリングの状況を報告してください。

² LEL:LEL%は爆発下限界を100%として表したもので接触燃焼式の検知器の表示方法です。