Appendix 3-1

Odour Patrol Report

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ODOUR PATROL SURVEY AT THE AREA OF SHATIN HORSE RACING COURSE

1 December 2005

Service provided for: **Ove Arup & Partners Hong Kong Limited**

Service provided by**:** **Odour Research Laboratory**
Dept. of Civil & Structural Engineering,
The Hong Kong Polytechnic University

Service scope: **On-site odour panel assessment**

THE HONG KONG POLYTECHNIC UNIVERSITY
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1. Background

An odour panel survey at the area of Shatin Horse Racing Course was required by the Ove Arup & Partners Hong Kong Limited to determine the odour intensity of ambient air on the designated 8 routes.

2. Scope of work

An one-day odour patrol exercise should be conducted at the area of the Shatin Horse Racing Course on 29 Nov. 2005 by three odour panelists from PolyU at three sessions during the day to determine the odour intensity of ambient air at the 8 routes as shown in Appendix A.

3. Methodology

The odour intensity should be determined at 5 different levels according to the criteria below:

0	Not detected	No odour perceived or an odour so weak that it can not be easily characterised or described
1	Slight	Identifiable odour, slight
2	Moderate	Identifiable odour, moderate
3	Strong	Identifiable, strong
4	Extreme	Severe odour

4. Performance of the odour patrol survey

4.1 Three qualified odour panellists, Ng Kinhung, Cheung Yanlung and Wang Xiaowen, were selected from our odour panel team of PolyU. The qualified panellists have their individual n-butanol thresholds within a required range of 20 to 80 ppb/v.

4.2 The odour patrol along with the 8 routes was conducted by the 3 qualified panellists on 29 Nov. 2005, which included 3 trips during morning, afternoon and also evening, respectively.

4.3 During the odour patrol survey, the weather conditions of wind direction and wind speed were recorded for the results assessment.

4.4 Odour intensity at each location was assessed by the 3 panellists, respectively, and all locations are marked on the map in Appendix A:

4.5 Three sets of raw records of the odour patrol exercise are attached in Appendix B.

5. Odour patrol results and on-site observations

5.1 All results of odour patrol survey are summarized in Tables 1-8 for different routes from 1 to 8.

5.2 During the odour patrol investigation, our odour panellists identified four types of flavours including horse faeces, horse feed, and sewage. It is identified by the panellists that these types of flavours mainly result from two odour emission sources of the horse shed of Jockey Club and the Shatin Sewage Treatment Works (STSTW).

5.3 The odour intensity detected at different locations was found to be in a wide range from level 0 up to level 3. While no significant odour was detected on the routes 2, 5, 6, 7 and 8, a relatively-significant odour was detected on the routes 1, 3, and 4.

5.4 It is confirmed that the odour impact on the route 1 is due to a very close distance from both odour emission sources. Since a north wind was dominated on the surveying day, it is believed that the odour impact on the routes 3 and 4 resulted from downwind locations. However, it was found that a farer location has a less odour impact. An odour level below 1 was detected at the location 2 of route 3 and the location 3 of route 4, respectively, where are about 100 m away from the identified sources.

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Table 1: Route 1

Location	Wind Records		Odour Intensity					On-site Observation	
	Speed (m/s)	Direction	Range*	10:00-12:00	12:45-15:00	17:40-20:30	**Mean**	Odour nature	Possible source
1	0.1-1.6	N	0~3	0.5	1.5	0.3	**0.77**	Feed/Faeces	horse shed
2	0.1-2.0	N	0~2	1.3	1.5	0.5	**1.10**	Feed	horse shed
3	0.0-1.5	N	0~2	1	0.6	1.3	**0.97**	Feed	horse shed
4	0.0-2.5	N	0~2	1	0.2	0.5	**0.57**	Feed	horse shed
5	0.0-3.2	N	1~3	1.7	1.7	2	**1.80**	Feed/Faeces/Sewage	horse shed/STSTW
6	0.0-0.9	N	0~3	1.3	0.7	1.7	**1.23**	Sewage/Feed/Faeces	horse shed/STSTW
7	0.0-0.7	N	1~3	1	2	1.8	**1.60**	Feed/Faeces	horse shed
8	0.0-1.1	N	1~3	1.7	2.2	2	**1.97**	Feed	horse shed
9	0.0-1.7	N	0~3	0.8	0.3	2	**1.03**	Feed	horse shed
10	0.0-1.1	N	0~3	1	1.7	2.2	**1.63**	Feed	horse shed

* The range of odour levels from minimum to maximum

Table 2: Route 2

Location	Wind Records		Odour Intensity					On-site Observation	
	Speed (m/s)	Direction	Range*	10:00-12:00	12:45-15:00	17:40-20:30	**Mean**	Odour nature	Possible source
1	0.1-2.0	N	0~1	0.8	0.5	0.5	**0.60**	Green grass	Grass field
2	0.0-0.8	N	0~1	0.3	0.3	0.2	**0.27**	Green grass	Grass field

* The range of odour levels from minimum to maximum

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Table 3: Route 3

Location	Wind Records		Odour Intensity					On-site Observation	
	Speed (m/s)	Direction	Range*	10:00-12:00	12:45-15:00	17:40-20:30	**Mean**	Odour nature	Possible source
1	0.2-3.0	N	1~2	1.2	1.8	1.3	**1.23**	Feed/Sewage	horse shed/STSTW
2	0.0-2.2	N	0~1	0.6	0.3	0.8	**0.57**	Sewage/Feed	STSTW/horse shed
3	0.0-1.5	N	0~1	0.6	0.2	0.3	**0.37**	Sewage	STSTW

* The range of odour levels from minimum to maximum

Table 4: Route 4

Location	Wind Records		Odour Intensity					On-site Observation	
	Speed (m/s)	Direction	Range*	10:00-12:00	12:45-15:00	17:40-20:30	**Mean**	Odour nature	Possible source
1	0.3-3.0	N	0~2	1	1.2	1	**1.07**	Sewage	STSTW
2	2.4-4.8	N	1~2	1.7	1.2	1.7	**1.53**	Sewage	STSTW
3	2.2-4.0	N	0	0	0	0	**0**	-	-

* The range of odour levels from minimum to maximum

Table 5: Route 5

Location	Wind Records		Odour Intensity					On-site Observation	
	Speed (m/s)	Direction	Range*	10:00-10:20	12:45-13:05	17:40-18:12	**Mean**	Odour nature	Possible source
1	0.5-1.6	N	0~1	0.2	0	1.2	**0.47**	Sewage	STSTW
2	0.2-4.9	N	0~1	0	0.2	0.2	**0.13**	Sewage	STSTW
3	0.0-3.0	N	0	0	0	0	**0**	-	-

* The range of odour levels from minimum to maximum

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Table 6: Route 6

Location	Wind Records		Odour Intensity					On-site Observation	
	Speed (m/s)	Direction	Range*	10:00-12:00	12:45-15:00	17:40-20:30#	**Mean**	Odour nature	Possible source
1	0.1-0.5	N	0~1	0.7	0.2	-	**0.45**	Feed	horse shed
2	0.2-1.1	N	0~2	1	1.7	-	**1.35**	Feed	horse shed
3	0.0-0.9	N	0~1	0.2	1	-	**0.6**	Feed	horse shed
4	0.2-1.3	N	0~1	0.2	0.2	-	**0.2**	Feed	horse shed
5	0.1-1.7	N	0	0	0	-	**0**	-	-
6	0.1-2.9	N	0~1	0.3	0.5	-	**0.4**	Green grass	Grass field
7	0.2-3.6	N	0~2	0.5	1.2	-	**0.85**	Green grass	Grass field
8	0.4-3.0	N	0~1	1.2	0.7	-	**0.95**	Green grass	Grass field

* The range of odour levels from minimum to maximum; #The location is closed after 5:00pm

Table 7: Route 7

Location	Wind Records		Odour Intensity					On-site Observation	
	Speed (m/s)	Direction	Range*	10:00-12:00	12:45-15:00	17:40-20:30	**Mean**	Odour nature	Possible source
1	0.1-1.2	N	0~1	0.2	0.2	0.2	**0.2**	Feed	horse shed

* The range of odour levels from minimum to maximum

Table 8: Route 8

Location	Wind Records		Odour Intensity					On-site Observation	
	Speed (m/s)	Direction	Range*	10:00-12:00	12:45-15:00	17:40-20:30	**Mean**	Odour nature	Possible source
1	0.2-1.7	N	0~1	0.7	0	0	**0.23**	Feed	horse shed

* The range of odour levels from minimum to maximum

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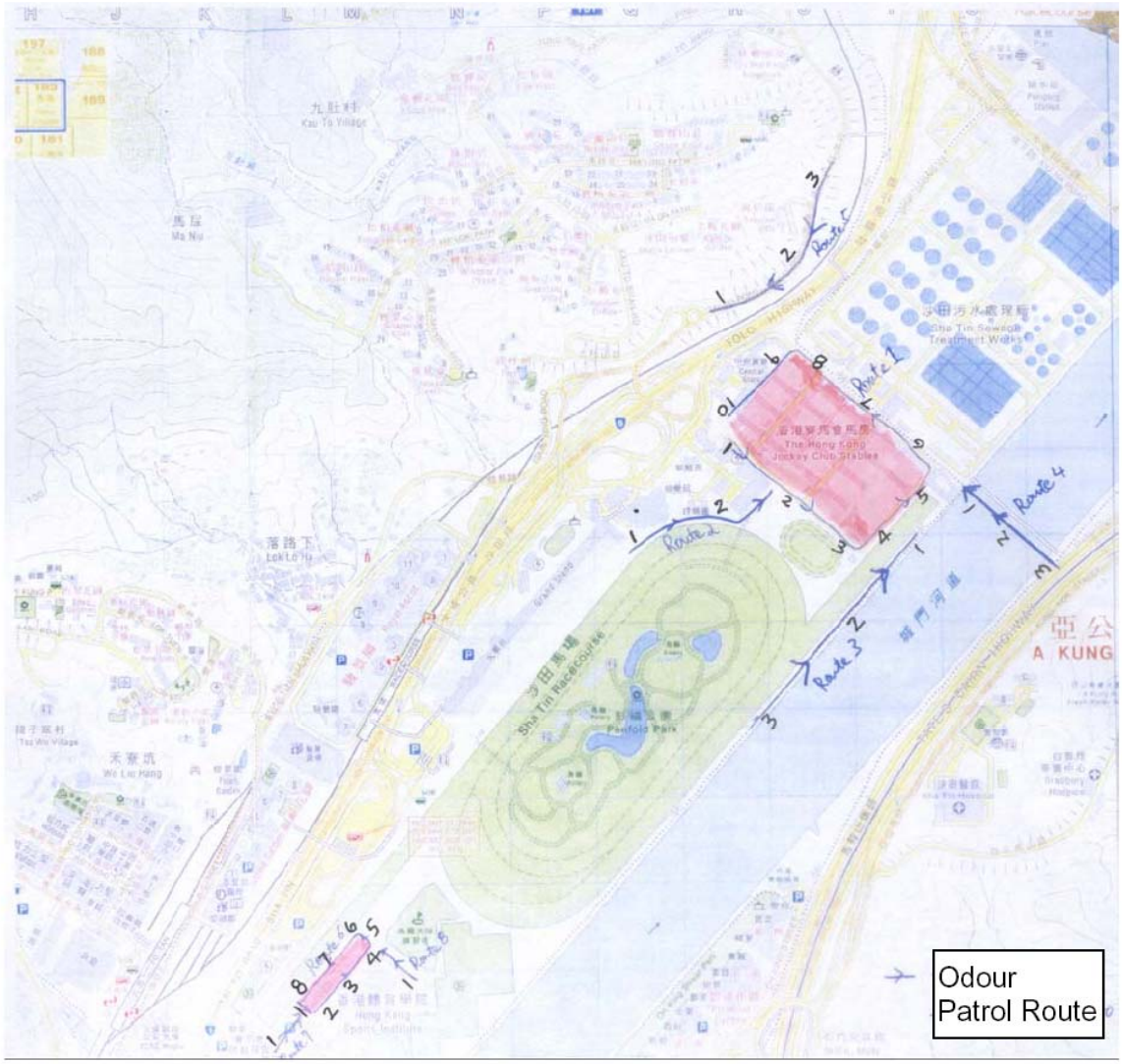
Appendix A:



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Appendix B:

Panellist 1:

	No.	Location	Time	Wind Speed (m/s)	Wind Direction	Odour Intensity	On-Site Observation	
							Odour Nature	Possible Source
Route 1	1	1	10:00	1.6	N	0~1	Faeces	Horse shed
	2	2	10:02	0.4	N	2	Feed	Horse shed
	3	3	10:04	0.0	N	1	Feed	Horse shed
	4	4	10:06	0.8	N	1	Feed	Horse shed
	5	5	10:08	0.5	N	1~2	Feed	Horse shed
	6	6	10:10	0.3	N	1	Sewage	Horse shed
	7	7	10:12	0.7	N	1	Faeces	Horse shed
	8	8	10:14	0.2	N	2	Feed	Horse shed
	9	9	10:16	0.2	N	0~1	Feed	Horse shed
	10	10	10:18	0.5	N	1~2	Feed	Horse shed
	11	1	13:03	0.4	N	1~2	Feed	Horse shed
	12	2	13:01	1.2	N	1~2	Feed	Horse shed
	13	3	12:59	0.0	N	0~1	Feed	Horse shed
	14	4	12:57	0.4	N	0~1	Feed	Horse shed
	15	5	12:55	1.8	N	1~2	Sewage	STSTW
	16	6	12:53	0.5	N	0~1	Sewage	STSTW
	17	7	12:51	0.0	N	1	Feed	Horse shed
	18	8	12:49	0.0	N	2~3	Feed	Horse shed
	19	9	12:47	0.7	N	0~1	Feed	Horse shed
	20	10	12:45	0.6	N	2	Feed	Horse shed
	21	1	17:40	0.7	N	1	Feed	Horse shed
	22	2	17:43	0.8	N	0~1	Feed	Horse shed
	23	3	17:46	1.5	N	1~2	Feed	Horse shed
	24	4	17:49	0.4	N	1	Feed	Horse shed
	25	5	17:52	0.2	N	2~3	Feed	Horse shed
	26	6	17:55	0.3	N	2	Sewage	Horse shed
	27	7	17:58	0.1	N	2	Feed	Horse shed
	28	8	18:02	0.2	N	1~2	Feed	Horse shed
	29	9	18:05	0.0	N	2~3	Feed	Horse shed
	30	10	18:08	0.0	N	2	Feed	Horse shed
Route 2	31	1	11:20	0.6	N	1	Green grass	Grass field
	32	2	11:24	0.0	N	0		
	33	1	14:30	0.1	N	0~1	Green grass	Grass field
	34	2	14:28	0.4	N	0		
	35	1	19:46	0.5	N	0~1	Green grass	Grass field
	36	2	19:48	0.3	N	0~1	Green grass	Grass field
Route 3	37	1	12:22	1.1	N	1	Feed	Horse shed
	38	2	12:24	1.3	N	1	Sewage	STSTW
	39	3	12:26	0.9	N	1	Sewage	STSTW
	40	1	14:08	1.2	N	1~2	Sewage	STSTW
	41	2	14:10	0.3	N	0~1	Feed	Horse shed

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	42	3	14:12	0.0	N	0		
	43	1	19:20	0.2	N	1~2	Feed	Horse shed
	44	2	19:22	0.6	N	1	Sewage	STSTW
	45	3	19:24	1.2	N	0~1	Sewage	STSTW
Route 4	46	1	12:06	2.1	N	1	Sewage	STSTW
	47	2	12:08	3.2	N	1~2	Sewage	STSTW
	48	3	12:10	4.0	N	0		
	49	1	13:52	0.4	N	0~1	Sewage	STSTW
	50	2	13:54	3.4	N	1	Sewage	STSTW
	51	3	13:56	3.5	N	0		
	52	1	19:06	2.6	N	1	Sewage	STSTW
	53	2	19:08	3.2	N	1	Sewage	STSTW
	54	3	19:10	2.7	N	0		
Route 5	55	1	11:40	0.5	N	0		
	56	2	11:42	0.9	N	0		
	57	3	11:44	0.2	N	0		
	58	1	13:22	1.2	N	0		
	59	2	13:24	4.5	N	0~1	Sewage	STSTW
	60	3	13:26	0.0	N	0		
	61	1	18:34	0.4	N	0~1	Sewage	STSTW
	62	2	18:36	1.5	N	0		
	63	3	18:38	1.1	N	0		
Route 6	64	1	10:32	0.0	N	0~1	Feed	Horse shed
	65	2	10:46	0.3	N	1~2	Feed	Horse shed
	66	3	10:44	0.6	N	0~1	Feed	Horse shed
	67	4	10:42	0.4	N	0~1	Feed	Horse shed
	68	5	10:40	0.8	N	0		
	69	6	10:38	1.2	N	1	Green grass	Grass field
	70	7	10:36	2.6	N	1	Green grass	Grass field
	71	8	10:34	1.3	N	1	Green grass	Grass field
	72	1	14:46	0.4	N	0		
	73	2	15:00	0.6	N	1	Feed	Horse shed
	74	3	14:58	0.0	N	1	Feed	Horse shed
	75	4	14:56	0.2	N	0		
	76	5	14:54	0.2	N	0		
	77	6	14:52	0.1	N	0~1	Green grass	Grass field
	78	7	14:50	0.3	N	1	Green grass	Grass field
	79	8	14:48	0.5	N	1	Green grass	Grass field
Route 7	80	1	10:45	0.5	N	0~1	Feed	Horse shed
	81	1	15:10	0.1	N	0~1	Feed	Horse shed
	82	1	20:25	0.4	N	0		
Route 8	83	1	10:54	0.2	N	0~1	Feed	Horse shed
	84	1	15:17	0.3	N	0		
	85	1	20:32	0.6	N	0		

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Panellist 2:

	No.	Location	Time	Wind Speed (m/s)	Wind Direction	Odour Intensity	On-Site Observation	
							Odour Nature	Possible Source
Route 1	1	1	10:02	1.1	N	0~1	Feed	Horse sheds
	2	2	10:04	0.1	N	2	Feed	Horse sheds
	3	3	10:06	0.1	N	1	Feed	Horse sheds
	4	4	10:08	1.0	N	1~2	Feed	Horse sheds
	5	5	10:10	0.5	N	2	Faeces	Horse sheds
	6	6	10:12	0.9	N	2~3	Faeces	Horse sheds
	7	7	10:14	0.0	N	1	Feed	Horse sheds
	8	8	10:16	1.0	N	2	Feed	Horse sheds
	9	9	10:18	0.0	N	1~2	Feed	Horse sheds
	10	10	10:20	0.3	N	0~1	Feed	Horse sheds
	11	1	13:05	1.3	N	0~1	Feed	Horse sheds
	12	2	13:03	2.0	N	1	Feed	Horse sheds
	13	3	13:01	0.0	N	1	Feed	Horse sheds
	14	4	12:59	2.5	N	0		
	15	5	12:57	3.2	N	2	Sewage	STSTW
	16	6	12:55	0.0	N	1	Sewage	STSTW
	17	7	12:53	0.0	N	2~3	Feed	Horse sheds
	18	8	12:51	1.1	N	2	Feed	Horse sheds
	19	9	12:49	1.7	N	0		
	20	10	12:47	1.1	N	0~1	Feed	Horse sheds
	21	1	17:42	0.8	N	0		
	22	2	17:45	1.8	N	0~1	Feed	Horse sheds
	23	3	17:48	0.2	N	1	Sewage	STSTW
	24	4	17:51	0.0	N	0		
	25	5	17:54	0.0	N	1~2	Feed	Horse sheds
	26	6	17:57	0.0	N	2	Sewage	STSTW
	27	7	18:00	0.0	N	2	Feed	Horse sheds
	28	8	18:03	0.0	N	2	Feed	Horse sheds
	29	9	18:06	0.3	N	1~2	Feed	Horse sheds
	30	10	18:09	0.0	N	1~2	Feed	Horse sheds
Route 2	31	1	11:22	2.0	N	1	Green grass	Grass field
	32	2	11:26	0.1	N	0		
	33	1	14:32	0.5	N	1	Green grass	Grass field
	34	2	14:30	0.3	N	0		
	35	1	19:48	1.1	N	0~1	Green grass	Grass field
	36	2	19:50	0.8	N	0		
Route 3	37	1	12:24	2.3	N	1	Feed	Horse sheds
	38	2	12:26	0.7	N	0~1	Sewage	STSTW
	39	3	12:28	0.6	N	0~1	Sewage	STSTW
	40	1	14:10	3.0	N	2	Feed	Horse sheds
	41	2	14:12	0.0	N	0		
	42	3	14:14	0.9	N	0~1	Sewage	STSTW

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	43	1	19:22	0.7	N	1	Feed	Horse sheds
	44	2	19:24	1.3	N	1	Sewage	STSTW
	45	3	19:26	1.5	N	0~1	Sewage	STSTW
Route 4	46	1	12:08	0.5	N	1	Sewage	STSTW
	47	2	12:10	4.8	N	1~2	Sewage	STSTW
	48	3	12:12	3.2	N	0		
	49	1	13:54	0.8	N	2	Sewage	STSTW
	50	2	13:56	3.6	N	1~2	Sewage	STSTW
	51	3	13:58	2.4	N	0		
	52	1	19:08	3.0	N	1~2	Sewage	STSTW
	53	2	19:10	3.5	N	2	Sewage	STSTW
	54	3	19:12	2.8	N	0		
Route 5	55	1	11:42	1.6	N	0		
	56	2	11:44	0.4	N	0		
	57	3	11:46	0.5	N	0		
	58	1	13:24	0.6	N	0		
	59	2	13:26	4.9	N	0		
	60	3	13:28	3.0	N	0		
	61	1	18:36	1.6	N	0		
	62	2	18:38	1.9	N	0~1	Sewage	STSTW
	63	3	18:40	0.7	N	0		
Route 6	64	1	10:34	0.3	N	0~1	Feed	Horse sheds
	65	2	10:48	0.2	N	0~1	Feed	Horse sheds
	66	3	10:46	0.4	N	0		
	67	4	10:44	0.3	N	0		
	68	5	10:42	1.7	N	0		
	69	6	10:40	2.4	N	0		
	70	7	10:38	3.6	N	0~1	Green grass	Grass field
	71	8	10:36	3.0	N	1	Green grass	Grass field
	72	1	14:48	0.3	N	0~1	Feed	Horse sheds
	73	2	15:02	1.1	N	2	Feed	Horse sheds
	74	3	15:00	0.0	N	1	Feed	Horse sheds
	75	4	14:58	1.3	N	0~1	Feed	Horse sheds
	76	5	14:56	1.2	N	0		
	77	6	14:54	2.0	N	0~1	Green grass	Grass field
	78	7	14:52	0.9	N	1	Green grass	Grass field
	79	8	14:50	1.2	N	0		
Route 7	80	1	10:47	1.2	N	0		
	81	1	15:12	0.3	N	0		
	82	1	20:27	0.8	N	0~1	Feed	Horse sheds
Route 8	83	1	10:56	1.7	N	0		
	84	1	15:19	0.4	N	0		
	85	1	20:34	0.6	N	0		

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Panellist 3:

	No.	Location	Time	Wind Speed (m/s)	Wind Direction	Odour Intensity	On-Site Observation	
							Odour Nature	Possible Source
Route 1	1	1	10:04	0.5	N	0~1	Feed	Horse sheds
	2	2	10:06	0.7	N	0		
	3	3	10:08	0.8	N	1	Feed	Horse sheds
	4	4	10:10	0.3	N	0~1	Feed	Horse sheds
	5	5	10:12	1.5	N	1~2	Faeces	Horse sheds
	6	6	10:14	0.1	N	0~1	Feed	Horse sheds
	7	7	10:16	0.2	N	1	Feed	Horse sheds
	8	8	10:18	0.1	N	1	Feed	Horse sheds
	9	9	10:20	0.0	N	0~1	Feed	Horse sheds
	10	10	10:22	0.2	N	1	Feed	Horse sheds
	11	1	13:07	0.1	N	2~3	Feed	Horse sheds
	12	2	13:05	0.8	N	2	Feed	Horse sheds
	13	3	13:03	0.1	N	0~1	Feed	Horse sheds
	14	4	13:01	0.7	N	0		
	15	5	12:59	1.9	N	2~3	Sewage	STSTW
	16	6	12:57	0.1	N	0~1	Sewage	STSTW
	17	7	12:55	0.0	N	2~3	Feed	Horse sheds
	18	8	12:53	0.3	N	2	Feed	Horse sheds
	19	9	12:51	1.1	N	0~1	Feed	Horse sheds
	20	10	12:49	0.3	N	2~3	Feed	Horse sheds
	21	1	17:45	1.4	N	0		
	22	2	17:48	1.0	N	0~1	Feed	Horse sheds
	23	3	17:51	0.7	N	1~2	Feed	Horse sheds
	24	4	17:54	0.1	N	0~1	Feed	Horse sheds
	25	5	17:57	0.5	N	2	Feed	Horse sheds
	26	6	18:00	0.2	N	1	Sewage	STSTW
	27	7	18:03	0.0	N	1~2	Feed	Horse sheds
	28	8	18:06	0.1	N	2~3	Feed	Horse sheds
	29	9	18:09	0.3	N	2	Feed	Horse sheds
	30	10	18:12	0.0	N	3	Feed	Horse sheds
Route 2	31	1	11:24	0.5	N	0~1	Green grass	Grass field
	32	2	11:28	0.1	N	1	Green grass	Grass field
	33	1	14:34	0.2	N	0		
	34	2	14:32	0.0	N	0		
	35	1	19:50	0.7	N	0~1	Green grass	Grass field
	36	2	19:52	1.2	N	0		
Route 3	37	1	12:26	0.6	N	1~2	Feed	Horse sheds
	38	2	12:28	0.5	N	0~1	Sewage	STSTW
	39	3	12:30	0.5	N	0~1	Sewage	STSTW
	40	1	14:12	1.0	N	2	Sewage	STSTW
	41	2	14:14	0.2	N	0~1	Feed	Horse sheds
	42	3	14:16	0.1	N	0		

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	43	1	19:24	1.0	N	1~2	Feed	Horse sheds
	44	2	19:26	2.2	N	0~1	Sewage	STSTW
	45	3	19:28	1.4	N	0		
Route 4	46	1	12:10	0.8	N	1	Sewage	STSTW
	47	2	12:12	3.5	N	2	Sewage	STSTW
	48	3	12:14	3.0	N	0		
	49	1	13:56	0.3	N	1	Sewage	STSTW
	50	2	13:58	2.4	N	1	Sewage	STSTW
	51	3	14:00	2.8	N	0		
	52	1	19:10	1.8	N	0~1	Sewage	STSTW
	53	2	19:12	3.1	N	2	Sewage	STSTW
	54	3	19:14	2.2	N	0		
Route 5	55	1	11:44	0.3	N	0~1	Sewage	STSTW
	56	2	11:46	0.2	N	0		
	57	3	11:48	0.2	N	0		
	58	1	13:26	1.1	N	0		
	59	2	13:28	0.4	N	0		
	60	3	13:30	0.6	N	0		
	61	1	18:38	0.5	N	0		
	62	2	18:40	1.3	N	0		
	63	3	18:42	0.6	N	0		
Route 6	64	1	10:36	0.5	N	1	Feed	Horse sheds
	65	2	10:50	0.4	N	1	Feed	Horse sheds
	66	3	10:48	0.9	N	0		
	67	4	10:46	0.6	N	0		
	68	5	10:44	1.2	N	0		
	69	6	10:42	2.9	N	0		
	70	7	10:40	2.0	N	0		
	71	8	10:38	2.6	N	0~1	Green grass	Grass field
	72	1	14:50	0.1	N	0		
	73	2	15:04	0.9	N	2	Feed	Horse sheds
	74	3	15:02	0.0	N	1	Feed	Horse sheds
	75	4	15:00	0.2	N	0		
	76	5	14:58	0.1	N	0		
	77	6	14:56	0.2	N	0~1	Green grass	Grass field
	78	7	14:54	0.2	N	1~2	Green grass	Grass field
	79	8	14:52	0.4	N	1	Green grass	Grass field
Route 7	80	1	10:49	1.0	N	0		
	81	1	15:14	0.3	N	0		
	82	1	20:29	0.2	N	0		
Route 8	83	1	10:58	0.4	N	0~1	Feed	Horse sheds
	84	1	15:21	0.6	N	0		
	85	1	20:36	0.6	N	0		