3.2.4 Biological characteristics in natural ecosystems

3.2.4.1 Methodology

The data used here are those updated by the Institute of Ecology and Biology Resources from analytical results of samples collected in August 1999 in studied communes. The data was also referenced from those collected in 1995 by the same authors.

Methodology including: traditional, statistic systems analytical methods as well as ecological impact prediction based on setting up Environmental Matrix. Sample collection, pigment fixation as well as sample analysis were carried out by Institute of Ecology and Biology Resource procedure.

Some general aspects of natural conditions

The study area is located in the Red River delta. At present its natural character was agricultural area of peri-urban: the whole area were classified by the following ecosystem.

A. Water-watershed ecosystem

B. Terrestrial ecosystems: mainly agricultural ecosystem in delta

3.2.4.2 Status of ecosystems in the study areas - Dong Ngac

A. Aquatic ecosystems

A.(a) Phytoplankton

(i) Species composition

After analysing of samples collected from the field, 70 species of phytoplankton belonging 4 phyla (*Cyanophyta, Chlorophyta, Bacillariophyta* and *Euglenophyta* are determined. Amount of species as above is not enough to express real species composition in the nature. In species composition of phytoplankton, phylum *Chlorophyta* is the most abundant in species composition.

Table 3.2.4.1
Checklist of phytoplankton in waterbodies of Dong Ngac and its surrounding area

No.	Species	pond	rice-field	Red river
	Phylum Bcillariophyta			
1	Melosira variants			+
2	M. granulate var. valida			+
3	M. granulate var. angu for. spiralis			+
4	M. islandica		+	+
5	M. distans			+
6	Navicula gracilis			+
7	N. gastrum			+
9	N. radiosa	+		
10	N. placentula			+
11	Synedra ulla	+	+	+
12	Nitzschia recta		+	
13	N. philippinarum			+
14	Pinnularia gibba			+
15	Achnanthes laceolata			+
	Phylum Chlorophyta			
16	Ankistrodesmus falcatus		+	+
17	A. acicularis			
18	Closterium linneticum	+		
19	Closteriopsis microporum	+		
20	Coelastrum reliculatum	+		
21	Hyalotheca dissiliens	+		
22	Gonatozygon aculeatum	+		
23	Microspora willeana	+		
24	Pachycladella umbrina		+	+
25	Scenedesmus armatus var. bicaudatus	+		
26	S. dimorphus		+	
27	S. acuminatus var. acuminatus	+		
28	S. producto-capitatus var. indiscus	+		
29	S. protuberans	+		
30	S. carinatus		+	
31	S. quadricauda		+	+
32	S. ellipsoideus		+	
33	Schroederia setigera	+	+	
34	Crucigenia tetrapedia	+		
35	Cosmarium granatum	+		
36	Tetraedron minutissimum	+		

No.	Species	pond	rice-field	Red river
37	T. trigonum var. verrucosum	+		
38	T. minimum	+		
39	T. trigonum var. gracile		+	
	phylum Cyanophyta			
40	Lyngbya contorta	+		+
41	Oscillatoria angusta	+		
42	O. tenuis var. tergestina	+		
43	O. princeps		+	+
44	O. formosa		+	
45	O. quadripunctulata		+	
46	O. racibborskii	+	+	
47	Spirulina hanoiensis	+	+	
48	S. major		+	
	Phylum Euglenophyta			
49	Coccomonas orbicularis	+		
50	Euglena acus var. acus		+	
51	E. caudata	+		
52	E. oblonga	+		
53	E. oxyuris var. charkowiensis		+	
54	E. hemichromata	+		
55	E. limnophyla	+		
56	E. proxima	+		
57	E. wangi		+	
58	Phacus acuminatus var. megaparamylica	+		
59	P. helikoides		+	
60	P. lismorensis		+	
61	P. pleuronectes	+		
62	P. trimarginatrus		+	
63	Pteromonas aculeata	+		
64	Strombomonas cuneata	+	+	
65	S. fluviatilis	+		
66	Trachelomonas pseudobulla	+		
67	T. ensifera	+		
68	T. hispida	+		
69	T. nikliiwskii f. bourrellyi	+		
70	T. planctonica var. oblonga		+	

(ii) Quantitative distribution

Concentration of phytoplankton in rainy season fluctuates from 1,000 to 200,000 c/l. In types of waterbody for example water-rice field, *Cyanophyta* occupied a dominance in total concentration of algae, mean while in pond, *Euglenophyta* is dominant in species composition.

A.(b) Macrophyte

Aquatic species composition of Macrophyte including species largely distributed in landscape of flat as hyacinth *Eichhornia cracipess, Lemna minor, Pistia stratiotes* . These species distribute only in ponds and some water rice-fields.

A.(c) Zooplankton

(i) Species composition

There are 37 species of zooplankton belonging to *Rotator, Cladocera, Copepoda*, and *Ostracoda* in waterbodies of this area. Amount of zooplantonic species as above is not enough to express real species composition in the nature. Among zooplankton, *Rotatoria*, and *Cladocera* occupied a dominance in species composition.

Table 3.2.4.2

Check list of zooplankton in waterbodies of Dong Ngac and its surrounding area

No	Species	Pond	Rice-field	Red river
	Rotatoria			
1	Filinia longiseta	+	+	
2	F. brachiata	+	+	
3	Brachionus calyciflorus	+	+	+
4	B. budapestinensis	+		
6	B. falcatus	+		
7	Diplois daviesiae		+	
8	Euchlanis dilatata	+		
9	Lecane (Lecane) luna	+		
10	L. (L) leotina	+		
11	Trichocerca (Diurella) tigris	+		
12	T. (T) rattus	+	+	
13	Plocsoma truncatum	+		
14	Keratella tropica	+		
15	K. cochlearis	+	+	
16	Polyarthra vulgaris	+		+

No	Species	Pond	Rice-field	Red river
17	Tetramastix opoliensis	+		
	Cladocera			
18	Bosmina longirostris	+	+	+
19	Ceriodaphnia rigaudi	+	+	+
20	Diaphnosoma sarsi	+	+	+
21	D. leuchtenbergianum	+	+	
22	Macrothrix spinosa	+	+	
23	Scapholeberis kingi	+		
24	Daphnia carinata	+		
25	Miona dubia	+		
26	Moinodaphnia macleayii	+		
27	Sida crystallina			+
28	Chydorus sphaericus	+		+
29	C. baraoi baraoi	+		
30	Alona rectangula	+	+	
	Copepoda			
31	Mongonodiaptomus formosanus	+	+	+
32	Microcyclops varicans	+	+	+
33	Mesocyclops leuckarti	+		+
34	Tropocyclops prasinus			+
35	Thermocyclops hyalinus	+		+
36	T. taihoquensis			+
	Ostracoda			
37	Heteocypris anomala	+	+	

(ii) Quantitative distribution

Generally, concentration of zooplankton ranged 1,000 - 30,000 indiv./m3. At ponds, *Cladocera* is abundant in species composition and occupy in quantity. *Cladocera* occupied a dominance in rice- fields.

A.(d) Benthos

Benthic fauna consists of Insectine larvae, shrimps *Macrura*, crabs *Brachyura*, and molluscs. Shrimps and molluscs mainly distribute in ponds, crabs distribute only in rice-fields. These species are common one in waterbodies of flat landscape. Non of the benthic species present are considered locally or nationally rare or are protected

Table 3.2.4.3
Check list of zoobenthos in waterbodies of Dong Ngac and its surrounding area

Species	Pond	river
Diptera		
Fam. Chironomidae	+	+
Fam. Culicidae	+	
Fam Tipulidae	+	
Lepidoptera	+	
Hemiptera		
Fam. Noctonectidae	+	
Fam. Corixidae		+
Fam. Pleidae	+	
Fam. Belostomatidae	+	
Odonata		
Fam. Macromiidae	+	+
Fam. Coenagrionidae	+	
Coleoptera		
Fam. Hydrophilidae	+	+
Fam. Dytiscidae	+	
Ephemeroptera		
Fam. Baetidae	+	+
Olygochaeta	+	+

Table 3.2.4.4
Check list of crustaceans, molluses in waterbodies of Dong Ngac and its surrounding area

Shrimps Macrura	8. Angulyagra boettgeri
1. Macrobrachyum nipponense	9. A. polyzonata
2. Caridina sp.	10. Sinotaia basicarinata
Crabs Brachyura	11. S. dispiralis
3. Somanniathelphusa sinensis	12. Allocinna longicornis
Gastropoda	**Bivalvia**
4. Melanoides tuberculatus	13. Corbicula baudoni
5. Tarebia granifera	14. C. morelentiana
6. Pila polita	15. Noduiaria douglasiae crassidens
7. Cipangopaludina lecythroides	

A.(e) Fish

By statistic, there are 7 species of natural fish in waterbodies of this area. These fishes are largely distributed species. Non of the species present are considered locally or nationally rare or are protected

Table 3.2.4.5
Check list of fish in waterbodies of Dong Ngac and its surrounding area

1.	Hemiculter leucisculus
2.	Cranoglanis sinensis
3.	Clarias fuscus
4.	Fluta alba
5.	Anabas tetudineus
6.	Carassius auratus
7.	Cirrhina molitonella

B. Terrestrial ecosystems

B.(a) Plant

Within the transfer station of wastes, beside of derelict lands, there are considerable areas with grass vegetation. The flora in this area is very poor in species composition. This feature is characterized by the rate between species/genus and genus/family. A genus is often has 1-2 species. Dominant species belong to families as *Poaceae, Moraceae, Asteraceae* etc. Plant form mainly is herbs and shrubs. These contribute up to 90% of the vegetation cover of this area. Therefore, this vegetation with poor flora has not rare species or need to protect.

B.(b) Invertebrates

A total of 29 species of springtail *Collebola*, and 8 species of soil worm *Oligochaeta* are identified in this area. By preliminary study, Insectine composition of this area has about 60 species.

Table 3.2.4.6
List of Colembolla in biotops of Dong Ngac and its surrounding area

Hypogastruridae	Entomobryidae
1.Xenylla humicola	18. Dicranocentrus indicus
2.Aherontiellina sabina	19.Entomobrya sp.
3.Onychiurus sp.	20. Sinella coeca
4.Protaphorura tamdaona	21. Sinella pseudomonoculata
5.Brachystomella parvulla	Cyphoderidae
6.Friesea sublimis	22. Cyphoderus javanus
7.Pseudachorutella sp.	Neelidae
8.P. assigilatus	23. Megalothrax minimus
9.Vitronura giselae	Sminthuridilidae
10.Lobella perfusionides	24. Sminthurides aquaticus
Isotomidae	25. Sphaeridia pumilis
11.Folsomides exiguus	26. Sphaeridia sp.
12.Proisotoma muscicola	Dicyrtomidae
13.P. tenella	27. Dicyrtomina antena
14.Isotomiella minor	28. Dicyrtomina sp.1
15.Cryptopygus thermophylus	29. Dicyrtomina sp.2
16.C. orientalis	
17.Isotomurus palustris	

Table 3.2.4.7
Check list of worm (Olygochaeta) in biotops of Dong Ngac and its surrounding area

Megascolegidae
1. Pheretima elongata
2. Ph. Exilis
3. Ph. Morrisi
4. Ph. Posthuma
5. Dichogaster bolaui
6. D. modigliani
7. X. lophotrichus
Ocnerodrilidae
8. Ocnerodrilus occidentalis

B.(c) Vertebrates

Vertebrate fauna in this area is poor in species composition. A preliminary total of animals species has been determined in this area, including mammals, birds, reptiles, and amphibians. The number of species recorded for the area is relatively small, with most species present only occuring is low densities. Non of the species present are considered locally or nationally rare or are protected.

3.2.4.3 Status of ecosystems in the study areas - Duc Giang

A. Aquatic ecosystems

A.(a) Phytoplankton

(i) Species composition

There are 83 species of phytoplankton belonging 4 phyla (green-blue algae *Cyanophyta*, green algae *Chlorophyta*, *Bacillariophyta* and *Euglenophyta* in this area. A total of phytoplanktonic species as above is not enough to express real species composition in the nature. In species composition of phytoplankton, phylum *Chlorophyta* is the most abundant in species composition.

Table 3.2.4.8 List of phytoplankton in waterbodies of Duc Giang and its surrounding area

No	Species	Pond	Rice-field	Duongri ver
	Phylum Bcillariophyta			
1	Melosira varians			+
2	M. granulata var. valida			+
3	M. granulata var. angu for. Spiralis			+
4	M. islandica		+	+
5	M. distans			+
6	Navicula gracilis			+
7	N. gastrum			+
9	N. radiosa	+		
10	N. placentula			+
12	Amphora ovalis		+	
14	Synedra ulla	+	+	+
15	Suriella robusta			+
16	Nitzschia recta		+	
18	N. philippinarum			+
20	Pinnularia gibba			+

No	Species	Pond	Rice-field	Duongri ver
21	Achnanthes laccolata			+
	Phylum green algae Chlorophyta			
22	Ankistrodesmus falcatus		+	+
23	A. acicularis			
24	Closterium limneticum	+		
25	Closteriopsis microporum	+		
26	Coelastrum reliculatum	+		
27	Hyalotheca dissiliens	+		
28	Gonatozygon aculeatum	+		
29	Microspora willeana	+		
30	Monoraphidium caribeum	+		
31	M. griffithii	+		
32	Pachycladella umbrina		+	+
33	Scenedesmus armatus var. bicaudatus	+		
34	S. dimorphus		+	
35	S. acuminatus var. acuminatus	+		
36	S. producto-capitatus var. indiscus	+		
37	S. protuberans	+		
38	S. carinatus		+	
39	S. quadricauda		+	+
40	S. ellipsoideus		+	
41	Schrocderia setigera	+	+	
42	Crucigenia tetrapedia	+		
43	Cosmarium granatum	+		
44	Tetraedron minutissimum	+		
45	T. trigonum var. verrucosum	+		
46	T. minimum	+		
47	T. trigonum var. gracile		+	
	Phylum green-blue algae Cyanophyta			
48	Lyngbya contorta	+		+
49	L. circumereta		+	
50	Merismopedia minima	+		
51	M. tenuissima	+		
52	M. glauca	+	+	+
53	Oscillatoria augusta	+		

No	Species	Pond	Rice-field	Duongri ver
54	O. tenuis		+	
55	O. tenuis var. tergestina	+		
56	O. princeps		+	+
57	O. formosa		+	
58	O. quadripunctulata		+	
59	O. racibborskii	+	+	
60	Spirulina hanoiensis	+	+	
61	S. major		+	
	Phylum Euglenophyta			
62	Coccomonas orbicularis	+		
63	Euglena acus var. acus		+	
64	E. caudata	+		
65	E. oblonga	+		
66	E. oxyuris var. charkowiensis		+	
67	E. hemichromata	+		
68	E. limnophyla	+		
69	E. proxima	+		
70	E. wangi		+	
71	Phacus acuminatus var. megaparamylica	+		
72	P. helikoides		+	
73	P. lismorensis		+	
74	P. pleuronectes	+		
75	P. trimarginatrus		+	
76	Pteromonas aculeata	+		
77	Strombomonas cuneata	+	+	
78	S. fluviatilis	+		
79	Trachelomonas pseudobulla	+		
80	T. ensifera	+		
81	T. hispida	+		
82	T. nikliiwskii f. bourrellyi	+		
83	T. planctonica var. oblonga		+	

(ii) Quantitative distribution

Density of phytoplankton in rainy season fluctuates from 1,000 to 200,000 c/l. In types of waterbody as water-rice field, green blue algae *Cyanophyta* occupied a dominance in total density of algae, mean while in pond, *Euglenophyta* is dominant in species composition.

A.(b) Macrophyte

Aquatic species composition of Macrophyte including species largely distributed in landscape of flat as hyacinth *Eichbornia cracipess, Lemma minor, Pistia stratiotes* . These species distribute in ponds and rice-fields

A.(c) Zooplankton

(i) Species composition

There are 44 species of zooplankton belonging *Rotatoria, Cladocera, Copepoda*, and *Ostracoda* in waterbodies of this area. Amount of zooplantonic species as above is not enough to express real species composition in the nature. Among zooplankton, *Rotatoria*, and *Cladocera* occupied a dominance in species composition.

Table 3.2.4.9
Check list of zooplankton in waterbodies of Duc Giang and its surrounding area

No.	Species	Pond	Rice-field	Duong river
	Rotatoria			
1	Filinia longiseta	+	+	
2	F. brachiata	+	+	
3	Brachionus calyciflorus	+	+	+
4	B. budapestinensis	+		
6	B. falcatus	+		
7	B. forficula	+		
8	Diplois daviesiae		+	
9	Euchlanis dilatata	+		
10	Lecane (Lecane) luna	+		
11	L. (L) leotina	+		
12	Trichocerca (Diurella) tigris	+		
13	T. (T) rattus	+	+	
14	Ploesoma truncatum	+		
15	Keratella tropica	+		
16	K. cochlearis	+	+	

No.	Species	Pond	Rice-field	Duong river
17	Polyarthra vulgaris	+		+
18	Tetramastix opoliensis	+		
	Cladocera			
19	Bosmina longirostris	+	+	+
20	Ceriodaphnia rigaudi	+	+	+
21	Diaphnosoma sarsi	+	+	+
22	D. leuchtenbergianum	+	+	
23	Macrothrix spinosa	+	+	
24	Scapholeberis kingi	+		
25	Daphnia carinata	+		
26	Miona dubia	+		
27	Moinodaphnia macleayii	+		
28	Sida crystallina			+
30	Chydorus sphaericus	+		+
31	C. baraoi baraoi	+		
32	Alona rectangula	+	+	
33	A. guttata guttata	+		
	Copepoda			
34	Mongonodiaptomus formosanus	+	+	+
35	Allodiaptomus calcarus	+		
36	Microcyclops varicans	+	+	+
37	Mesocyclops leuckarti	+		+
38	Tropocyclops prasinus			+
39	Thermocyclops hyalinus	+		+
40	T. taihoquensis			+
41	Eucyclops serrulatus	+		
	Ostracoda			
42	Heicocypris anomala	+	+	
	Others			
43	Shrimps (juvenile)	+		
44	Fish (ichthyoplankton)	+		+

(ii) Quantitative distribution

Generally, concentration of zooplankton ranged 1,000 - 100,000 indiv./m3. At ponds, *Cladocera* is abundant in species composition and occupy a considerable proportion in quantity. Cladocerans are dominant in rice- fields.

A.(d) Benthos

Benthic fauna consists of Insectine larvae, shrimps *Macrura*, crabs *Brachyura*, and molluscs. Shrimps and molluscs mainly distribute in ponds, crabs distribute only in rice-fields. These species are common one in waterbodies of flat landscape. Non of the benthic species present are considered locally or nationally rare or are protected

Table 3.2.4.10
List of zoobenthos in waterbodies of Duc Giang and its surrounding area

Species	Pond	river
Diptera		
Fam. Chironomidae	+	+
Fam. Culicidae	+	
Fam. Tipulidae	+	
Lepidoptera	+	
Hemiptera		
Fam. Noctonectidae	+	
Fam. Corixidae		+
Fam. Pleidae	+	
Fam. Belostomatidae	+	
Odonata		
Fam. Macromiidae	+	+
Fam. Coenagrionidae	+	
Coleoptera		
Fam. Hydrophilidae	+	+
Fam. Dytiscidae	+	
Ephemeroptera		
Fam. Baetidae	+	+
Olygochaeta	+	+

Table 3.2.4.11
List of crustaceans, molluses in waterbodies of Duc Giang and its surrounding area

Shrimps *Macrura*	8. Angulyagra boettgeri
1. Macrobrachyum nipponense	9. A. polyzonata
2. Caridina sp.	10. Sinotaia basicarinata
Crabs *Brachyura*	11. S. dispiralis
3. Somanniathelphusa sinensis	12. Allocinna longicornis
Snails *Gastropoda*	Shells *Bivalvia*
4. Melanoides tuberculatus	13. Corbicula baudoni
5. Tarebia granifera	14. C. morelentiana
6. Pila polita	15. Sinanodonta elliptica
7. Cipangopaludina lecythroides	16. S. jourdyi
	17. Noduiaria douglasiae crassidens

A.(e) Fish

By statistic, there are 12 species of natural fish in waterbodies of this area. These fishes are natural species and largely distributed species. Non of the species present are considered locally or nationally rare or are protected

Table 3.2.4.12
A check list of fish in waterbodies of Duc Giang and its surrounding area

1.	Hemiculter leucisculus
2.	Cranoglanis sinensis
3.	Clarias fuscus
4.	Fluta alba
5.	Anabas tetudineus
6.	Ophiocephalus striatus
7.	Carassius auratus
8.	Cirrhina molitonella
9.	Cyprinus carpio
10.	Mylopharyngodon piceus
11.	Macropodus opercularis
12.	Puntius semifascilatus

B. Terrestrial ecosystems

B.(a) Plant

Within the transfer station of waste, beside of derelict lands, there are considerable areas with grass vegetation. The flora in this area is very poor in species composition (214 species). This feature is characterized by the rate between species/genus and genus/family. A genus is often has 1-2 species. Dominant species belong to families as *Poaceae*, *Moraceae*, *Asteraceae* etc. Formation of vegetation here mainly is herbs and shrubs. These communities contribute up to 90% of the vegetation cover of this area. Therefore, this vegetation with poor composition that has not rare species or need to protect.

B.(b) Invertebrates

A total of 49 species of springtails *Collebola*, 22 species of *Acarina* and 20 species of worm *Oligochaeta* are identified in this area. In grass lands, collebolans and acarinans are most abundant in species composition. Parks around houses is the most suitable place for growth of soil worms. By preliminary study, Insectine composition of this area has about 60 species.

Table 3.2.4.13
List of colembolla in biotops of Duc Giang and its surrounding area

species	Biotops			species	Biotops		
	I	II	III		I	II	III
Hypogastruridae				Willowsia bartkei	X		
Ceratophysella denticulata	X		XXX	Willowsia sp.	X		
Xenylla humicola	X	XX		Homidia sauteri f. sinensis	X		
Aherontiellina sabina		X	XXX	Homidia socia			X
Onychiuridae				Pseudosinella immaculata	X		X
Onychiurus sp.		X	XX	Lepidocyrtus (Lepido.) sinsim			X
Protaphorura tamdaona		X	X	L. (Lepido.) lamginosus	X		
Neanuridae				L. (Acrocyrtus) heterolepis	X		
Brachystomella parvulla		XX		L. (Ascocyrtus) cinctus	XX		
Friesea sublimis	XX	X		L. (asc.) filamentosus		X	
Pseudachorutella sp.		XX		L. (asc.) dahlii	XX	XX	X
P. assigilatus			XX	Lepidocyrtus (asc.) sp.	XX	X	X
Vitronura giselae	X	X	X	Lepidosira sp.	X		
Lobella perfusionides	XXX	X		Cyphoderidae			
Isotomidae.				Cyphoderus javanus	X	X	X
Folsomides exiguus	XX	X		Neelidae			

species	Biotops			species	Biotops		
	I	II	III		I	II	III
Proisotoma muscicola	x	xx	x	Megalothrax minimus		x	
Proisotoma submuscicola	x			Sminthurididae			
P. tenella		xxx		Sminthurides aquaticus		x	x
Isotomiella minor		x		Sphaeridia pumilis	x	x	
Cryptopygus thermophylus		xxx	xx	Sphaeridia sp.		xxx	
C. orientalis		xxx	xx	Katiannidae			
Isotomurus palustris	x	x	xxx	Sminthurinus sp.			x
I. cf. prasinus			xx	Sminthuridae			
Entomobryidae				Sphyrotheca macrochaeta			x
Dicranocentrus indicus	xx	x		Dicyrtomidae			
Entomobrya lindbergi			xx	Dicyrtomina antena	x	x	x
E. muscorum			x	Dicyrtomina sp.1		x	
Entomobrya sp.	xx	x		Dicyrtomina sp.2		x	
Sinella coeca		x	x				
Sinella pseudomonoculata	x	x	x	Total : 49 sp.	25	31	25

Table 3.2.4.14
List of Acarina in biotops of Duc Giang and its surrounding area

species	Biotops			species	Biotops		
	I	II	III		I	II	III
Epilohmania cylindrica	x	xx		Ceratozetes sp.		x	
Tectocephens velotus	x	xx	x	Pergaluma sp.		x	
Cryptoppia dendricola		xx	xx	Cosmochthonius lanatus			x
Oppiella nova		x		Arcoppia sp.			x
Oppia clavipectinata	x			Lamellobates ocularis	x		
O. yodai	x			Allogaluma sp.	x		
Oppia sp.			x	Galuma sp.		x	x
Scheloribates laevigatus	x	xx	xx	Paralamellobetes schoutedeni		x	
S. preincisus	x	xx	x	Lohmannia javana			x
S. lapites		x	x				
Xylobates vermiseta	x	x	x				
X. lophotrichus	x	x	x				
X. capucinus	x		x	Total : 22 sp.	11	13	13

Table 3.2.4.15
List of soil worms in biotops of Duc Giang and its surrounding area

species	Biotops			species	Biotops		
	I	II	III		I	II	III
Megascolegidae				Ocnerodrilidae			
Pheretima aspergillum	x			Gordiodrilus elongata	x		x
Ph. brevicapitata	xx			Ocnerodrilus occidentalis	xx	x	x
Ph. elongata	xx	x		Microchaetidae			
Ph. exilis	x	x		Gliphidrilus papillatus			x
Ph. grandipapillata	x			Lumbricidae			
Ph. morrisi	xx	x		Allolobophora parva			x
Ph. posthuma	xx	xx	xxx	Glososcolex corethrurus	x		
Dichogaster bolaui	xx	xx	x	Tubificidae			
D. modigliani		x	x	Limnodrilus hofmeisteri			x
Perionyx sp.	x		x	Branchiura sowerbyi			x
X. lophotrichus	x	x	x				
X. capucinus	x		x	Total : 22 spe.	11	13	13

Note: I: Park around house ; II: Meadow; III: Vegetable field;xxx: very many ; xx: many ; x: few

B.(c) Vertebrates

Vertebrate fauna in this area is poor in species composition. A preliminary total of animals species has been determined in this area, including mammals, birds, reptiles, and amphibians. The number of species recorded for the area is relatively small, with most species present only occurring is low densities. Non of the species present are considered locally or nationally rare or are protected.

3.2.5 Socio- Economic Activities

3.2.5.1 Study Items

+ Number of households using the land and total number of persons of the households who are living within the new access road area.
+ Land Use and Type of Agricultural products currently being produced.
+ The Infrastructure of the Project Area.
+ Number and types of households to be relocated to construct access road.

3.2.5.2 Study Duration

From July 15th, 1999 to August 31th, 1999.

3.2.5.3 Study Methods

A. Interview

+ The people within project areas
+ Authorities of communes
+ Others.

B. Data collection

+ The data are provided by the Hanoi People's Committee
+ The maps on future plan development are provided by the Chief Architect Office of Hanoi

C. Data analysis and reporting

3.2.5.4 Study Results

A. Dong Ngac Area

Based on the typical activity of related areas along the access road, the following areas have been chosen for collecting of economic activity data:

- Dong Ngac Commune
- Thuy Phuong Commune
- Xuan Dinh Commune

A.(a) General Conditions at Dong Ngac Area

Dong Ngac site is located at the West side of the Southern access road for the Thang Long bridge. The surroundings are the small shops, houses, and agricultural fields. An existing road with the length of 1,100 m and width of 5.0 – 7.5 m is very crowded because it is used a by-pass road to Thang Long bridge. Distance between the site and a residential area located north of the site is long enough that waste odor problems would not be serious. But a road facing the site, is very crowded now because it is used as an access/bypass road to Thang Long bridge.

(i) Population, Employment and Land Use

The population and employment status of the project area is shown in Table 3.2.5.1.

Table 3.2.5.1
Population and Employment Status in Dong Ngac Area

N°	Villages	Population Status					Employment Status					
		Total (persons)	Household Numbers	Family Size	Male (Pers.)	Female (Pers.)	Govern. Sector (Pers.)	Private Sector (Pers.)	Peasants (Pers.)	Students (Pers.)	Pupils (Pers.)	Retired (Pers.)
01	Dong Ngac	15,800	3,400	3,98	7,916	7,884	2,401	1,643	632	2,844	3,460	3,210
02	Thuy Phuong	6,800	1,118	3,55	3,380	3,420	1,516	650	1,224	714	1,292	1,404

Total Population: 15, 800 persons **Number of Households: 4.0**

Where: Government Sector: 2,821 persons Occupied 17.85 %
Average Family Size: 4 persons/household
Private Sector: 1,643 persons Occupied 10.40 %
Peasants: 1,822 persons Occupied 11.53 %
University Students: 2,844 persons Occupied 18.00 %
School Pupils: 3,460 persons Occupied 21.90 %
Retired Persons: 3,210 persons Occupied 20.32 %

The residential distribution in Dong Ngac area is shown in map No 5, scale 1:10,000 (Appendix I.4).

As same as with other commune of Tu Liem District, Dong Ngac is an agricultural district, providing food, foodstuff and green vegetables for the whole capital city. In the recent years the average food grain production in the whole district has reached 8.5 tones per hectare equivalent to 32,000 tones of paddy/year. Green vegetables and fruits have mounted to 2,000-3,000 tones/year. In general, one hectare of cultivated land values up to 30 million VND. A long with the agricultural development, many traditional handicrafts and small industries have been restored and developed such as flower and side bon - growing, fish - pet raising etc. The Table 3.2.5.2 shows the technical criteria for using of agricultural land at the proposed site. Table 3.2.5.3. shows the productivity annual value of the products produced in the project area. Average income per capita is 513,000 VND/capita among which the agricultural labor is 250,000 VND/person. The land use in Dong Ngac area is shown in map No 2, scale 1:10,000 (Appendix I.4).

The project will cover an area of 5 ha land for transfer station.

Table 3.2.5.2
Existing Land Use in Dong Ngac Area

N°	Villages	Total Area (ha)	Land Use Status					
			Housing Land (ha)	Industrial Land (ha)	Agricultural Land (ha)	Institutions/ Offices (ha)	Public Utilities (ha)	Others (ha)
01	Dong Ngac	370.00	107.0	0	81.0	-	3.02	179
02	Thuy Phuong	256.17	94.0	5.0	97.0	-	2.17	58.0
Total		626.17	201.0	5.0	178.0	-	5.19	237.0

Total Land Area of Dong Ngac: 370.0 ha

Where: Housing Land: 107 ha Occupied 28.90 %

Industrial Land: 0 ha Occupied 0 %

Agricultural Land: 81.0 ha Occupied 21.89 %

Institutional/Office Land: 0 ha Occupied 0 %

Piblic Utilities Land: 3.02 ha Occupied 0.8 %

Other Land: 179 ha Occupied 48.41%

Table 3.2.5.3
Economic Efficiency of Land Using in Project Area, Tu Liem District (Dong Ngac Transfer Station)

N°	Villages	Agricultural Land (ha)	Land Use Status				Economic Efficiency		
			Paddy Fields (ha)	Cultivated land (ha)	Lakes/ Ponds (ha)	Open Canals (ha)	Rice (100kg/ha-year)	Agricultural Products (100kg/ha-year)	Fish (100kg/ ha-year)
01	Dong Ngac	81.0	39.69	30.78	6.48	4.05	51	88	51
02	Thuy Phuong	97.0	47.52	39.21	7.00	3.27	54	82	55
Total									

Total Land Area of Dong Ngac : 370 ha

Agricultural land: 81 ha

Where: Paddy Land: 39.69 ha Occupied 49.0 %

Cultivated Land: 30.78 ha Occupied 38.0 %

Lakes/ponds for fishing 6.48 ha Occupied 8.0 %

Open canals: 4.05 ha Occupied 5.0 %

(ii) Cultural and Historical Properties

There are several cultural and historical vestiges that were approved by the government in the area. Annual national festivals closely connect with those vestiges.

Some villages in the area have their own cultural houses, for example:

- Xuan Dinh village has one cultural house with area of 250.
- Dong Ngac village has one cultural house.
- Thuy Phuong village has two

Most of village-cultural houses are of small scale. Their activities are improving intellectual life for people. The list of cultural houses, temples in project area is shown in Table 3.2.5.4

Table 3.2.5.4
Public Utilities and Cultural Properties in Dong Ngac Area

N°	Villages	Concrete - Asphalt Roads (km)	Public Utilities					Cultural Properties	
			Schools			Medical Centre	Markets	Temples	Cultural House
			Kindergarten	Secondary	Primary				
01	Dong Ngac	2.75	4	1	1	1	1	4	1
02	Thuy Phuong	1.85	2	1	2	0	0	3	2
03	Xuan Dinh	1.10	2	1	2	1	1	5	1
		5.60	8	3	5	2	2	12	4

(Extracted from the book named "Xa Dong Ngac", Publishing House of Hanoi, 1994)

(a) History and tradition

Present Dong Ngac commune is a famous village of Hanoi City. The history of Dong Ngac is linked with the history of Hanoi City. From the very ancient Hanoi City, perhaps from its establishment under Ly Cong Uan King who decided moving the ancient capital from Ninh Binh province to Hanoi because of the its terrain position.

The present Dong Ngac is unified from three ancient villages: Dong Ngac, Lien Ngac and Nhat Tao. Standing among the ancient villages of Thang Long - the ancient name of capital city- these three villages had the very an ancient Chinese-transcribed Vietnamese names: Ke Ve (Dong Ngac), Bai Hoa (Lien Ngac), and Nha Kieu (Nhat Tao).

Ke Ve has 3 ancient graves that were excavated at Cau Gieng area. These 3 graves were determined its age of about 200 years before BC, may be at the An Duong Vuong dynasty. Restored memorial stella of the communal house of Ke Ve village was set up in 1719 under the Le Du Tong dynasty showed

the establishment of this communal house was the 7th century in the Chinese Duong colonial time. The two bells of the temple of Dong Ngac on which were engraved the Chinese name of village, were made of 1315 and 1332 under Tran dynasty.

Under different feudalism dynasties, even under the most prosperous and peaceful dynasties, the rural people rarely had a stable live and comfortable and could go to school. That is a characteristic of ancient Vietnam society. But at ancient Dong Ngac village, there were many people who had got the successful candidates in feudal per-court and court competition exams. The first director of Van Mieu University of Vietnam was of the Dong Ngac village. Apart from these licensed from official exam there were many others with high education without participating the exams and they were as the village teachers. The ancient sad that " Land by Gian village, but government officer by Ve village" in order to say that the Gian village was famous of rich by land, the Ve village was famous of graduated people. Or another ancient saying was: "Poem by Mo village, rich by Cach village but diploma by Ve village."

From the 17th century of Tran dynasty to Nguyen dynasty in about 500 years, the Dong Ngac village had 25 persons with doctor degree and 400 persons with bachelor degree.

Formerly, Dong Ngac people had lived by agriculture cultivation. By not so much of land possession, the Dong Ngac people had developed other handicraft occupations such as ceramic, bonsai, textile etc. The market of Ve village was famous in the ancient age by the its terrain because it stood nearby Red River and Capital City. After the development of Thang Long Capital and mostly under French colony, the Dong Ngac people had developed moving their occupations into the Capital City. At present, Dong Ngac people established many stores and buildings inside Hanoi City.

Morever, Dong Ngac people has a beautiful tradition in the war against to French and American to liberate the Vietnamese nation. Here, there were the confidential addresses of Communist Party Members before 1945 and during the war against the French after 1945. And here there was the battlefield to defend the Hanoi Capital during the war against American in 1965-1973 period. Like Hanoi Capital and other villages of Hanoi City, Dong Ngac people had intensively participated in the war to protect the country. That was reason of the HO CHI MINH visit on 1992. This occasion was the New Year of Tiger Year; the president HO CHI MINH visited the Dong Ngac People on the first day of New Year.

(b) Culture and remains

Besides of the heritages of literature, history, sociological that makes the culture of Dong Ngac Village, the Dong Ngac has also the architectural and sculptural heritages.

(c) Communal House

The Dong Ngac communal house was ranked as government historical and cultural remains. Pham family being one of 4 large families in Dong Ngac built up this communal house in 1635. After the 3 time of restore the communal house is still remaining the Post of Le dynasty architectural characteristics of 17th century. At present, a set comprising of 48 pictures of wood sculpture from the Post Le dynasty are still at the communal house. The symbol of Dong Ngac communal house is interesting by two hands of which the first the hand to hold a fire spiral expressing the military art and the second is the hand to hold the big pen brush expressing the literature art. Like a communal house of North Vietnam, the Dong Ngac communal house adores three saints (icons) those are: Heaven, Earth, and Man. The Man saint here was Royal Highest Le Khoi who was a nephew of Le Loi King.

A strange story under North Vietnam war (1965-1973) happened to the Dong Ngac temple. On that day 19 November 1967, American Air-force Army with 100 planes bombarded Dong Ngac commune. In this battle, 2 American planes were dropped with 2 pilots. Total bomb number dropped on Dong Ngac was 60 with weight of 250 pounds of each. One of them dropped at the yard - just on the front of Dong Ngac Communal House. The pressure of the bomb had inclined the 4 columns of communal house leading the house to be inclined. A magic thing had happed. After pulling out the bomb detonator and after then the bomb was risen and brought away the 4 house columns automatically came back at their positions without any damage.

Besides of this communal house, at present Dong Ngac commune has other two communal houses those are Nhat Tao and Lien Ngac communal houses. The adored Man saint of Nhat Tao communal house is the Royal highest and General Cung Tinh who was the son the Tran Minh Tong King.

(d) Temple

Dong Ngac has two temples namely Dien Khanh Temple and Tu Khanh Temple. The Dien Khanh also named the Small Temple was built up from very long time. Books said that this temple had 2 (two) very big copper bell founded from 1332 under Tran Hien Tong King. One said that this copper bell was so heavy that 30 healthy mans could move it to Tu Khanh Temple. Later, this Small Temple was left.

The Tu Khanh Temple also named Eldest Temple was built up in Mac dynasty (1527-1529) by Nguyen Family. The temple is influential and ancient although it was passed many time to restore. At the present, the temple has many ancient statues especially two sets of eight diamonds very beautiful.

The Public utilities, cultural properties in Dong Ngac area is shown in map No 3, scale 1:10,000 (Appendix I.4).

In each village, there are small and old cemeteries, located among communes and fields. The list of major cemeteries is shown in Table 3.2.5.5

Table 3.2.5.5
The List of Major Cemeteries

N°	Name of villages	Amount of cemetery	Amount of monument
1	Xuan Dinh	2	1
2	Thuy Phuong	1	1
3	Dong Ngac	4	1

(iii) Educational System

Most of villages in the area have their own primary schools. Those schools are still small, material bases are very poor. It is due to the shortage of investment fund. The List of the Schools in project areas is shown in Table 3.2.5.6

Table 3.2.5.6
The List of the Schools in Proposed Areas

N°	Name	1st level			2nd level		
		Classes	Teachers	Pupils	Classes	Teachers	Pupils
1	Xuan Dinh village	34	34	1.578	28	46	890
2	Thuy Phuong village	21	21	748	10	17	398
3	Dong Ngac village	37	37	1.584	26	44	1.015

There are not enough kindergartens in villages, communes. Due to poor condition, most of kindergartens were rebuilt from rooms, warehouses, so there are not any yards for children to play.

(iv) Medical System

All villages have their own clinics to serve local people and to do the family planning activities. The list of major local clinic is shown in Table 3.2.5.4.

A.(b) Infrastructure of the Project Area:

(i) Existing road access conditions

** Thang Long Highway:

Width: ranging from 23.5 m to 30.0 m Height: 9.5 m

** Thang Long railways (old):

Width: ranging from 21.5 m to 26.0 m Height: 9.5 m

According to the future plan by Institute of Urban Planning of Hanoi- Chief Architect Office of Hanoi: Up to the year 2020, the roads in this area will be expanded . The Thang Long high way will also be expanded:

The future width of Thang Long High way will be: 68.0 m - 73.0 m.

** By-pass Road (the old roads in parallel with railway):

Length: 1,100 m Width: 5 – 7.5 m

** The access from trunk road

Length: 500 m Width: 5 – 6 m Pave: Crude

The distance from City Centre to Dong Ngac : 13.8 km

The distance from Dong Ngac to Nam Son : 37.6 km

The distance from City Centre to Nam Son (Thang Long High way): 51.4 km

The distance from City Centre to Nam Son (Chuong Duong): 0.5 km

The distance from URENCO to Dong Ngac: 12.0 km

Driving time: 15 minutes

The distance from Dong Ngac to Nam Son: 37.6 km

Driving time: 74 minutes

The transportation condition of the project area is shown in the Map No 1, scale 1:10,000 (Appendix I.4).

There is no restricted construction area near the bridge bents, but future access road should have certain distance from the bents so as not to narrow drivers' view. There is one small bridge (Vanh Khuyen bridge) in an access road that crosses the main drainage canal. Dimension of the bridge is 4.5 m x 6.2 m. The water way runs from West to East.

The project area is a convergence place of inter-provincial routes, main transportation roads of the city in the South Thang Long part as well as: railway, waterway (river) and airway...

It can be seen that the project area is in paralleling the North - South axle namely the South Thang Long route (from the site Mai Dich crossing the National Road N° 32 stretching 5.9 km to the Thang Long bridge). This route reaches northwards and goes through the Thang Long bridge before connecting to the North Thang Long - Noi Bai Highway (built in 1993 and conformed to the international standards). This is the "gate" route linking the Noi Bai International Airport to Hanoi urban area. Through this route, land transportation can also meet the National Road N°2 to Tuyen Quang or the National Road N°3 to Thai Nguyen.

A railway route was established in 1990, the rail route is an enclosed oval with total length of 84 km (Yen Vien - Bac Hong - Thang Long - Van Dien - Giap Bat - Hang Co - Long Bien - Yen Vien).

The current railway, which run through the project area is about 1200 m. There is an old track of 1000mm which can afford only 33 doubletrips/day. The total doubletrips going through the Thang long bridge is 68/day.

In fact, the net figure is: n = 68 x 07 = 50 doubletrips/day (the factor of 0.7 is calculated with various links).

(ii) Electricity and telephone

Preliminary planned access road goes under:

- Telephone line 5.2 m above the ground
- Electric line 8.0 m and 6.7 m above the ground

(iii) Water supply and sanitation

Total household of Dong Ngac is 3,400. Number of households use Municipal Water Supply (MWS) is 316 (Occupied 9.30 %). There is no household use Shallow Wells (SW), and number of house holds use Deep Wells (DW) is 2,901(Occupied 85.33 %). Number of household's use other sources is 183 (Occupied 5.37 %). The situation of water supply and sanitation in Dong Ngac Area is shown in Table 3.2.5.7

Table 3.2.5.7
Water supply and Sanitary Conditions in Dong Ngac Area

N°	Villages	Sanitary Conditions						
		Water Supply			Sanitation			
		MWS (%)	SW (%)	DW (%)	Others (%)	Double-vault (%)	Septic Tank (%)	Others (%)
01	Dong Ngac	9.30	0	85.33	5.37	16.00	58.66	25.34
02	Xuan Dinh	0	0	100	0	0	97.05	2.95
03	Thuy Phuong	0	0	100	0	0	73.33	26.67
Total								

A.(c) Housing conditions

(i) Living style

The living style of the community in proposed area is formulated as follows:

Village inhabitant areas: Village families have the country styled houses: 5 rooms under a tiled roof, kitchen and agricultural products store attached to the front wing of the house, water tank and fruit - flower garden located in front of the house yard etc. Each dwelling covers a total area of 200 - 500 m^2 of which the house occupies 20% - 30%.

Village houses are in the model of cultivation land, hereditary from generation to generation and located one next to another in a close relative link.

Inhabitant areas in edgeways of villages: From 2 to 4 generations live in a house is an effect of fast population growth rate. Over the last decades, with a view to solve the problem of lack of inhabitant area and resettle villagers, communal authorities have granted part of cultivation area in the edgeways of village on "overloaded"houses.

The houses are of 2 story buildings with plane roof with total area of 100 - 200m^2. 50 - 100m^2 of which is housing area and the rest is garden for vegetable, flower and fruit plantation or probably a small shop.

Owners of new style buildings: Urban high - income groups based on their prediction of the city's development have bought land from local people to build 2 - 3 story buildings.

The surveyed data showed that there are 12 % of the buildings is concrete structure; 36 % is made of brick and 52 % are other structural style.

(ii) Number of households using the land and total number of persons of the households who are living within the new access road area

According to the proposal of JICA Study Team, the access roads to the proposed transfer station site. The surveying has been conducted along the proposed access road area. 124 households have been interviewed for getting information in which 75 households belong to Dong Ngac commune; 34 belong to Xuan Dinh (the right side of the existing road to the proposed site) and 15 belong to Thuy Phuong Commune where representative for the vicinity area to the transfer station.

Total households:	124 households
The number of people	543 persons
Total land for housing	12,648 m^2
Average land used for living	23 m^2/person
Average income	513,000 VND/pers.month
Average family's member	4 persons/family

In addition, there are several small vendors and shops which are located along the candidate access roads. Those shops are removable.

B. Duc Giang Area

B.(a) General Conditions at Duc Giang Area

Duc Giang site is located between the Southern bank of Duong river and the Road No1. The surroundings are the factories, houses, rail way and agricultural fields.

The access road from the Road No1 crosses the railway. The structure of this road is not in good condition. The width of the roads is of 4 – 6 m.

The site is located in the area of three villages: Thanh Am, Duc Hoa and Xom Lo. Those villages belong to Thuong Thanh commune, Gia Lam District. There is no house within the area of the site. The site is 650 m far from the Road N°1; 400 m far from Duong River dyke.

(i) Population, Employment and Land Use

The population and employment status of the project area is shown in Table 3.2.5.8.

Table 3.2.5.8
Population and Employment Status in Duc Giang Area

N°	Villages	Population Status					Employment Status					
		Total (persons)	Household Numbers	Family Size	Male (Pers.)	Female (Pers.)	Govern. Sector (Pers.)	Private Sector (Pers.)	Peasants (Pers.)	Students (Pers.)	Pupils (Pers.)	Retired (Pers.)
01	Thanh Am	2,150	551	3.90	1,062	1,088	422	354	244	195	580	355
12	Xom Lo	581	138	4.21	271	310	114	98	65	50	156	98
13	Duc Hoa	1,176	307	3.83	546	630	231	190	121	117	317	200
14	Thuy Van	629	161	3.91	298	331	124	130	-	94	175	106
15	Thuong Cat	3,362	902	3.73	1,624	1,738	695	556	350	334	913	550
06	Gia Quat	2,338	548	4.27	1,264	1,074	461	270	152	616	462	377
Total		10,236	2,607	3,94	5,064	5,172	2,011	1,598	932	1,406	2,603	1,686

Total Population: 10,236 persons, **Number of Households:** 2,607

Where:

Government Sector:	2,011 persons	Occupied 20 %
Average Family Size:	4 persons./household	
Private Sector:	1,598 persons	Occupied 16 %
Peasants:	932 persons	Occupied 9 %
University Students:	1,406 persons	Occupied 14 %
School Pupils:	2,603 persons	Occupied 25 %
Retired Persons:	1,686 persons	Occupied 16 %

The residential distribution in Duc Giang area is shown in map No 5, scale 1:10,000 (Appendix 1.4).

As same as with Dong Ngac Site, Duc Giang is an agricultural community. Land use at the proposed site is vegetable fields. Surroundings are paddy field-Vegetable farms. There is a chemical plant (Duc Giang Chemical Plant) is located not far from the site. The Table 3.2.5.9 shows the technical criteria for

using of agricultural land at the proposed site. Table 3.2.5.10 shows the productivity annual value of the products produced in the project area. Available area is 50 ha.

Highest income per capita: 550,000 VND/capita

Lowest income per capita : 200,000 VND/capita

In the recent years the average food grain production in the whole area has reached 4,9 tones of paddy/year. The agricultural products are 8,0 tones/year. In general, one hectare of cultivated land values up to 30 million VND. A long with the agricultural development, many traditional handicrafts and small industries have been restored and developed such as flower and side bon - growing, fish - pet raising etc. The land use in Duc Giang area is shown in map No 2, scale 1:10,000 (Appendix I.4).

Total areas to be used by the Project: 6.4 ha

Table 3.2.5.9
Existing Land Use in Duc Giang Area

N°	Villages	Total Area (ha)	Land Use Status					
			Housing Land (ha)	Industrial Land (ha)	Agricultural Land (ha)	Institutions/ Offices (ha)	Public Utilities (ha)	Others (ha)
01	Thanh Am	129.08	14.17	26.05	64.93	0	0.25	23.66
12	Xom Lo	42.83	5.04	15.0	20.82	0	0	2.96
13	Duc Hoa	90.12	7.48	15.0	32.47	0	0.16	25.00
14	Thuy Van	48.89	9.65	15.0	2.60	0	0	21.64
15	Thuong Cat	127.57	18.91	30.0	68.73	4.82	0.64	4.47
06	Gia Quat	64.93	11.27	20.0	29.03	1.50	0.05	3.08
Total		484.38	66.52	121.05	218.58	6.32	1.10	80.81

Total Land Area: 484.38 ha

Where:			
	Original Land:	66.52 ha	Occupied 13.7 %
	Industrial Land:	121.05 ha	Occupied 25.0 %
	Agricultural Land:	218.58 ha	Occupied 45.1 %
	Institutional/Office Land:	6.32 ha	Occupied 1.3 %
	Piblic Utilities Land:	1.13 ha	Occupied 0.23 %
	Other Land:	80.81ha	Occupied 14.67 %

Table 3.2.5.10
Economic Efficiency of Land Using in Duc Giang Area

N°	Villages	Agricultural Land (ha)	Land Use Status				Economic Efficiency		
			Paddy Fields (ha)	Cultivated Land (ha)	Lakes/ Ponds (ha)	Open Canals (ha)	Rice (100kg/ha-year)	Agricultural Products (100kg/ha-year)	Fish (100kg/ ha-year)
01	Thanh Am	129.08	29.16	27.972	4.3	3.5	49	80	65
02	Xom Lo	32.83	9.396	4.224	4.2	3.0	51	80	65
03	Duc Hoa	80.12	8.6208	15.9480	4.4	3.5	50	80	65
04	Thuy Van	48.89	0	0	2.1	0.5	0	0	65
05	Thuong Cat	127.57	34.8864	19.6968	8.6482	5.5	47	80	65
06	Gia Quat	64.93	20.9520	1.980	4.1	2.0	53	80	65
Total		484.44	103.0152	69.8208	27.7482	18.0	50	80	65

Total Land Area: 484.38 ha

Where:			
	Original Land:	66.52 ha	Occupied 13.7 %
	Industrial Land:	121.05 ha	Occupied 25.0 %
	Agricultural Land:	218.58 ha	Occupied 45.1 %
	Institutional/Office Land:	6.32 ha	Occupied 1.3 %
	Piblic Utilities Land:	1.13 ha	Occupied 0.23 %
	Other Land:	80.81ha	Occupied 14.67 %

(ii) Cultural and Historical Properties

There are several cultural and historical vestiges that were approved by the government in the area. Annual national festivals closely connect with those vestiges. The total number of the temple and cultural houses in surveyed area is 8 in which Thanh Am village has one temple and one cultural house.

Most of village-cultural houses are of small scale. Their activities are improving intellectual life for people. The list of cultural houses, temples in project area is shown in Table 3.2.5.11

Table 3.2.5.11
Public Utilities and Cultural Properties in Duc Giang Area

N°	Villages	Concrete - Asphalt Roads (km)	Public Utilities					Cultural Properties	
			Schools			Medical Centre	Markets	Temples	Cultural House
			Kindergarten	Secondary	Primary				
01	Thanh Am	20	1	-	2	1	-	1	1
02	Xom Lo	10	1	-	1	1	-	0	1
03	Duc Hoa	15	1	-	2	1	1	0	2
04	Thuy Van	10	1	-	1	1	-	-	-
05	Thuong Cat	33	1	1	1	2	1	1	-
06	Gia Quat	15	1	-	2	1		1	1
Total		103	6	1	850	7	2	3	5

The Public Utilities in Duc Giang area is shown in map No 3, scale 1:10,000 (Appendix I.4).

In each village, there is a cemetery, located next to the transfer station site. There also are 15 graves which should be removed when the project to be implemented.

Estimated cost for compensation:

Land using and Resettlement:	57.2 billions VND
Moving of graves:	75 millions VND
Compensate the damage of rice paddy:	342 millions VND
Compensate the damage of agricultural products:	546 millions VND
Total estimated compensation cost:	58,163 billions VND

(iii) Educational System

Most of villages in the area have their own primary schools. Those schools are still small, material bases are very poor. It is due to the shortage of investment fund. The List of the Schools in project areas is shown in Table 3.2.5.11

There are not enough kindergartens in villages, communes. Due to poor condition, most of kindergartens were rebuilt from rooms, warehouses, so there are not any yards for children to play.

There are not enough kindergartens in villages, communes. Due to poor condition, most of kindergartens were rebuilt from rooms, warehouses, so there are not any yards for children to play.

(iv) Medical System

All villages have their own clinics to serve local people and to do the family planning activities. The total of medical centres in surveyed area is 7 in which Thanh Am has one. The list of major local clinic is shown in Table 3.2.5.11

B.(b) Infrastructure of the Project Area

(i) Existing road access conditions

It is natural that Cau Duong Bridge and Route N°.3 will be used to transport waste from Duc Giang transfer station. There are a few bridges including one located a few kilometers from Nam Son landfill. HPC should strengthen these bridges so that the secondary transport vehicles can pass the bridge if Route N° 3 is to be used. The existing conditions of the roads in Duc Giang area is as follows:

The National Highway N°1.:

Width: ranging from 20.0 m

The access from National Highway N°1 to the site:

Width: 7.5 m ; Length: 60 m

The railways, which runs through Thanh Am:

Width: 5 m - 7.0 m; Length: 750 m

The access road from railway to the site:

Width: 5 m - 7.0 m; Length: 750 m

The access road from Duong River dyke to the site:

Width: 5 m: Length: 300 m

According to the Master plan of Hanoi City (approved by the Prime Minister Decision No 108/ QD-TTg dated 20/6/1998 This site is located next to the cross sections between Xom Lo; Thanh Am and Duong river dyke- Road N°1. In this area, a regulation pond will be constructed with surface area of 3.5 ha. This pond is 100 m far from the candidate transfer station – Duc Giang.

The distance from City Centre to Duc Giang: 16.7 km

The distance from Duc Giang to Nam Son: 44.0 km

The distance from City Centre to Nam Son (Chuong Duong): 60.5 km

The distance from URENCO to Duc Giang: 10.7 km

driving time of 15 minutes.

The distance from Duc Giang to Nam Son 44.0 km

with driving time of 75 minutes

The transportation condition of the project area is shown in the Map No 1, scale 1: 10,000 (Appendix I.4).

(ii) Electricity and telephone

The access road runs under:

- High- voltage electric line 13.95 m above the ground
- Telephone line 4.0 m above the ground
- Electric line 5.5 m above the ground

(iii) Water supply and sanitation

The sanitary conditions of the Project area is in Table 3.2.5.12

Total household of Duc Giang is 2,607. Number of households use Municipal Water Supply (MWS) is 211(Occupied 8 %). Number of Households use Shallow Wells (SW) is 401(Occupied 15 %), and number of households use Deep Wells (DW) is 1,840 (Occupied 71 %). Number of household's use other sources are 155 (Occupied 6 %). The situation of water supply and sanitation in Duc Giang Area is shown in Table 3.2.5.12

Table 3.2.5.12
Water supply and Sanitary Conditions in Duc Giang Area

N°	Villages	Sanitary Conditions						
		Water Supply			Sanitation			
		MWS (%)	SW (%)	DW (%)	Others (%)	Double-vault (%)	Septic Tank (%)	Others (%)
01	Thanh Am	-	11.47	26.35	12.9	27.24	12.82	7.47
02	Xom Lo	-	-	6.84	7.74	3.79	8.26	5.14
03	Duc Hoa	38.40	-	12.28	-	12.95	11.09	5.60
04	Thuy Van	14.20	-	6.52	7.09	2.77	10.23	16.35
05	Thuong Cat	-	75.30	28.64	47.09	34.19	35.02	35.98
06	Gia Quat	47.40	13.23	19.37	25.18	19.06	22.58	35.06
Total		100	100	100	100	100	100	100

B.(c) Housing conditions

(i) Living style

The living style of the community in proposed area is formulated as follows:

Village inhabitant areas: Village families have the country styled houses: 5 rooms under a tiled roof, kitchen and agricultural products store attached to the

front wing of the house, water tank and fruit - flower garden located in front of the house yard...Each dwelling covers a total area of 200 - 500 m^2 of which the house occupies 35 %.

Village houses are in the model of cultivation land, hereditary from generation to generation and located one next to another in a close relative link.

Inhabitant areas in edgeways of villages: From 2 to 4 generations live in a house is an effect of fast population growth rate. Over the last decades, with a view to solve the problem of lack of inhabitant area and resettle villagers, communal authorities have granted part of cultivation area in the edgeways of village on "overloaded"houses.

The houses are of 2 story buildings with plane roof with total area of 100 - 200m^2, 50 - 100m^2 of which is housing area and the rest is garden for vegetable, flower and fruit plantation or probably a small shop.

Owners of new style buildings: Urban high - income groups based on their prediction of the city's development have bought land from local people to build 2 - 3 story buildings.

The surveyed data showed that there are 41 % of the buildings is concrete structure; 30 % is made of brick and 29 % are other structural style.

(ii) Number of households using the land and total number of persons of the households who are living within the new access road area

According to the proposal of JICA Study Team, the access roads to the proposed transfer station site. The surveying has been conducted along the proposed access road area. 99 households have been interviewed for getting information in which households belong to Thanh Am village where the transfer stations to be located.

Total households:	551 households
The number of people:	2,150 persons
Total land for housing:	14,17 ha
Average land used for living:	65,9 m^2/person
Average income:	650,000 VND/month
Average family's member:	4 persons/family

L. Survey for the Current Social and Environmental Conditions of Candidate Solid Waste Transfer Stations

II. DETAIL RESULTS OF SURVEYS ON ENVIRONMENTAL, SOCIAL CONDITIONS AND ACCESSIBILITY

II.1 THE PROPOSED LAM DU TRANSFER STATION

1.1 NATURAL GEOGRAPHIC CHARACTERISTICS AND ENVIRONMENTAL STATUS

1.1.1 LOCATION

The proposed Lam Du transfer station is located outside the Red river dike, in Lam Du village, Bo De commune, Gia Lam district, Ha Noi within the coordinate:

21° 01' 52" - 21°02'14" North latitude

105°52'11" - 105°52'33" East longititute

- In the North and North-East :it's bounded with the Red river dike
- In the west is the dump site of domestic waste of Bo De commune. Cemetery of Bo De commune is located a little bit further
- In the South and South- West: it's bounded with a brick kiln , residential group N°4 and Phu Vien Fishery living quarter.
- In the West is earthen road leading to Bo De pagoda and a military living quarter

The proposed site is in the South of the Red river dike, on the dike road leading to Tu Dinh, 600m South-East of Chuong Duong bridge and 5,2 km East of City center

1.1.2 TOPOGRAPHY

The proposed transfer station is a large lake covering 21.1 ha outside the Red river dike with elevation of 9.0-10.3m. This lake is currently divided into 3 small lakes with average depth of 1.3-2.4m. The first, the second and the third lake is in the North-West , the Center and the South-East of the site respectively.

All the first and the second lake are being used for fish breeding. About 25% of the third lake is being used as dump site of construction waste (broken bricks...).

The proposed site is 2.3m lower than the dike. Water in these lakes is almost stagnant and only drains to nearby small lakes, ponds and low-lying stretch when there is heavy rain, raising the water level in the lake.

1.1.3 CLIMATIC AND ATMOSPHERIC CHARACTERISTICS

* *Climatic characteristics*

The proposed Lam Du transfer station is located in Gia Lam district, West of Ha Noi city. Therefore, the proposed site bear the common climatic characteristics of Ha Noi, which has the hot and humid tropical climate with monsoon and heavy rainfall. Statistics of Lang- Ha Noi meteorological station show that:

**As regard sunny hours*

Mean sunny hour is very high, about 1,700 hours on average and 1,200 at the lowest level

**Atmospheric temperature*

- Long-term mean temperature: 23.4° C
- Mean temperature in 3 hot months (June-august):28.6o C
- Mean temperature in 3 cold months (december-february):17.2° C
- The absolute minimum temperature: 3 .1° C
- The mean maximum temperature in hot season: 32.3° C
- The mean minimum temperature in cold season:14.5° C

* *Humidity*

- Annual mean air humidity: 83%
- Mean air humidity in hot season: 83.6%
- Mean air humidity in dry season: 81.7%

* *Wind*

- The predominant wind direction is South- Easterly
- Annual mean wind velocity : 2.4 m/s
- Mean wind velocity in hot season: 2.4m/s
- Mean wind velocity in cold season : 2.5m/s
- The maximum wind velocity in 50 years reoccurence: 4.3m/s

* *Rainfall*

- The mean annual rainfall: 1661mm
- The mean rainfall in 3 hot season: 282mm
- The mean rainfall in 3 cold season: 21mm

* *Air environment*

Survey and measurement were carried out in 4 typical location within the transfer station by the Center for Consultation on Environmental Technology (CCET) on August, 01 1999 (see picture N°2) with analysis results shown in Table 1.1 below:

Table 1.1: *Results of air analysis in Lam Du transfer station*

No	Indicator	Sample marks				TCVN 5937 - 1995
		LD1	LD2	LD3	LD4	
1	NO_x (mg/m^3)	0.02	0.036	0.035	0.030	0.4
2	NH_3 (mg/m^3)	0.06	0.09	0.07	0.08	-
3	CH_4 (mg/m^3)	0.39	0.47	0.45	0.44	-
4	CO (mg/m^3)	< 0.1	< 0.1	0.10	0.10	40
5	CO_2 (mg/m^3)	132	176	164	154	-
6	SO_2 (mg/m^3)	0.01	<0.01	0.012	0.01	0.5
7	H_2S (mg/m^3)	0.03	0.03	0.02	0.03	0.008 *
.8	Dust (mg/m^3)	0.018	0.175	0.18	0.178	0.3
9	Noise (dB)	45 - 55	47 - 50	51 - 57	48 - 51	70 **
10	RH (%)	65	60	60	60	-
11	Temperature (°C)	38	40	39	39	-
12	P (mmHg)	715	710	715	710	-
13	Wind direction	ES	ES	ES	ES	-
14	Wind velocity (m/s)	0.3 - 0.5	0.3 - 0.5	0.2 - 0.4	0.2 - 0.4	-

* *Taken from Vietnamese Standard TCVN 5938 -1995*

** *Taken from Vietnamese Standard TCVN 5949-1995*

Remarks: The analysis results show that the Hydrosulfua content is 2.5-3.75 times higher than the permissible level, Metan content is relatively high. Other indicator is below the standard limit.

1.1.4 HYDROLOGY

* *General characteristics.*

The proposed site is 350m away from the Red river bank, so it bears the influence of flow regime of Red river (water level, silt, erosion..)

According to long-term monitoring, the total flow of Red river reach 887,109m^3.The flow regime is clearly divided into two seasons: flood and dry season. The flood season (from June to October) focus 74% of the total volume of the whole year, of which total flow in June, July, August account for 60% of the whole year

The flow rate also change greatly in the two seasons. In low water period, the flow rate is 750-1,000m^3 whereas in flood season, it reach 1,200-

10,000m^3. The average water level in Hanoi is 5m. In flood season, the water level is 11.3m and may reach to the highest level of 14.3m. In dry season, the mean water level is 2m and the lowest level is 1.7m. The highest and lowest water level fluctuate between12.3m

Water in the Red river is muddy all the year round, muddy level in the dry season is 100-400g/m^3, in the flood season 500-1,500g/m^3. Results of analysis of chemical composition show that water here is quite clean with pH value being approximately 7.9-8.3. Other indicators show no sign of pollution

* *In the proposed transfer station .*

The proposed transfer station is a large lake, divided into 3 parts by two patches of land. Water in the lake is almost stagnant. Only when there is long-lasting heavy rain, raising water level in the lake, water drains to the low-lying land in the South and then flows towards the Red river. For environmental surveys, the CCET collected 03 surface water samples on July, 31 1999 in the transfer station (see picture N°4). The analysis results are presented below:

Table 1.2: ***Results of surface water analysis in Lam Du transfer station***

No	Indicator	Sample marks			TCVN 5942 - 1995 (Column B)
		LD01	LD03	LD04	
1	COD (mg/l)	16.8	12.8	16.0	< 35
2	BOD_5 (mg/l)	5.65	4.6	5.2	< 25
3	Phenol (mg/l)	0.005	0.001	0.003	0.02
4	Cyanua (mg/l)	0.001	<0.001	<0.001	0.05
5	As (mg/l)	0.00021	0.0005	0.00526	0.1
6	Pb (mg/l)	0.0108	0,005	0.0014	0.1
7	Cu (mg/l)	0.0015	0.0007	<0.0001	1
8	Zn (mg/l)	0.003	0.0016	0.001	1
9	Cd (mg/l)	0.0004	0.0005	0.0002	0.02
10	Hg (mg/l)	0.00069	0.00085	0.00019	0.002
11	Mn (mg/l)	0.045	0.055	0.025	0.8
12	Ni (mg/l)	0.04	0.032	0.045	1.0
13	Cr (VI) (mg/l)	0.003	0.001	0.003	0.05
14	F (mg/l)	0.65	0.58	0.50	1.5
15	Ca (mg/l)	40.0	50.0	54.0	-
16	Mg (mg/l)	7.8	13.2	7.8	-

No	Indicator	Sample marks			TCVN 5942 - 1995 (Column B)
		LD01	LD03	LD04	
17	Coliform (MPN/100ml)	248	48	Negative	10000
18	Sulphat (mg/l)	8.0	16.0	40.0	-
19	PH	7.5	7.5	7.0	5.5 - 9.0
20	Fe (mg/l)	0.56	0.42	0.7	-
21	NO_2 (mg/l)	0.00	0.03	1.5	0.05
22	NH^+_4 (mg/l)	0.40	0.01	0.20	1
23	NO_3^- (mg/l)	1.38	1.72	13.07	15
24	Clorua (mg/l)	21.27	85.09	55.31	-

- *LD 01 : Taken from a small lake in the South of the site*
- *LD 03 : Taken from fish-breeding lake in the North-West of the site*
- *LD04 : Taken from construction waste disposal site*

Remarks: According to the analysis results, all indicators of water samples are below the standard limits in TCVN 5942-1995.

1.1.5 HYDROGEOLOGY.

According to the hydrogeological investigation data, in the area of the intended transfer station occur the following hydrogeological units:

1. Cover layer

This layer is composed mainly of alluvium deposited by the Red river. This layer has moderate to low permeability. The thickness of this cover layer is small, 0.6 - 1 m.

2. Holocene aquifer.

This aquifer occurs all over the area (the area between the Red river and the Duong river), extending to the depth of 2.0 - 25 m. Lithologically it is composed of sand, silty fine grained sand in the upper part and medium grained sand of brown to white Grey color, intercalated with silty clay layer. The water bearing capacity is moderate. The groundwater is of bicarbonate-chloride type. The pH value is 7.3, the TDS is M= 0.39 g/l. At the bottom of this aquifer in some places exist non water bearing clay lenses.

3. Pleistocene aquifer:

This aquifer occurs all over the area, at the depth of 22 -65 m. This is the main source of groundwater exploitation in the area. Lithologically it is composed of medium to coarse grained sand mixed with quartz gravel in the upper part and cobble, gravel mixed with some quartz sand in the lower part,

with high water bearing capacity. Due to the activities of the Red river, in this area the clay layer separating the Holocene and the Pleistocene aquifers is nearly completely eroded away, making the groundwater in these two aquifer communicate with each other. The pH value is 7.5, the total dissolved solid (TDS) is M = 0.29 g/l. The groundwater is of bicarbonate-chloride type.

The water level regime of this aquifer is under the influence of the flow of the Red river, varying strongly in seasons.

According to the water supply source survey data, 90 % of the local people exploit groundwater for their domestic water supply. The survey shows that the wells are drilled to the depth of 24 - 31 m. The water is clear, with low iron content, can be used directly without filtering. The results of analyzing two groundwater samples, one from the residential area south of the transfer station (on the river side of the dike, sample LD-02) and one from Lam Du village (LD05) show that the manganese content 1.5 - 2 times higher than the permissible level, the Hg content is slightly higher than the permissible level (LD05). The amount of coliforms in the groundwater is 8 - 9 times higher than the permissible level for domestic water supply. The water level in the drilled wells varies in seasons. In the flood season the water level is approximately the same as the ground level. During high flood the water level is above the ground surface.

Currently, GiaLam water plant is exploiting water from this aquifer. The designed capacity of this water plant is 30,000m^3/ capital. At the present, 11 drilled wells have been constructed, ***the nearest 1,000-1,500m away from the well field.*** According to results of hydrogeological survey, ***there is no clay layer between Pleistocene and Holocene aquifer.*** As the result, water from Red river and Holocene aquifer may percolates into Pleistocene aquifer. Calculations of hydrogeologists reveal that if the transfer station is constructed here, dirty water may easily percolates and moves to drilled wells in the well field in 2-5 years. Therefore, the City People's Committee doesn't allow further dumping of waste in Lam Du dump site

Analysis results of 03 water samples are presented below:

Table 1.3: ***Results of groundwater analysis in Lamdu transfer station***

No	Indicator	Sample marks		TCVN
		LD02	LD05	5944 - 1995
1	COD (mg/l)	4.8	4.8	-
2	BOD_5 (mg/l)	1.4	1.6	-
3	Phenol (mg/l)	<0.001	0.001	0.001
4	Cyanua (mg/l)	<0.001	<0.001	0.01
5	As (mg/l)	0.00185	0.000274	0.05

No	Indicator	Sample marks		TCVN
		LD02	LD05	5944 - 1995
6	Pb (mg/l)	0.0039	0.0022	0.05
7	Cu (mg/l)	<0.0001	0.0011	1.0
8	Zn (mg/l)	0.0021	0.0074	5.0
9	Cd (mg/l)	0.0008	<0.0001	0.01
10	Hg (mg/l)	0.00026	0.0016	0.001
11	Mn (mg/l)	0.67	1.07	0.1 - 0.5
12	Ni (mg/l)	0.02	0.075	-
13	Cr (VI) (mg/l)	0.0024	0.001	0.05
14	F (mg/l)	0.50	0.34	1.0
15	Ca (mg/l)	70.0	17.0	-
16	Mg (mg/l)	14.4	28.2	-
17	Coliform (MPN/100ml)	24	26	3
18	Sulphat (mg/l)	4.0	4.0	200-400
19	PH	7.5	7.0	6.5 - 8.0
20	Fe (mg/l)	0.21	0.21	1 - 5
21	NO_2 (mg/l)	0.0	0.0	-
22	NH^+_4 (mg/l)	0.20	0.0	-
23	NO_3^- (mg/l)	2.75	1.38	45
24	Clorua (mg/l)	83.32	70.91	200-600

1.2 SOCIO- ECONOMIC CHARACTERISTICS

1.2.1 SOCIAL- ECONOMIC CHARACTERISTICS OF BO DE COMMUNE.

a. Population

According to statistics provided by Bo De commune , the commune has a population of 8428 inhabitants living in 2155 households. The annual growth rate is 1.5%. The natural acreage is about 309.02 ha .The commune has 4 villages: Phu Vien, Lam Du, Ai Mo, Ngoc Lam and two newly established residential groups No4 and No5. The communal office is in Phu Vien commune. Telephone number is 048.271616. Deputy charman is Nguyen Manh Hoai.

b. Infrastructure.

Within Bo De commune, no big factories or enterprises is found except some small establishments such as Song Long plastic-producing workshop, asphalt-mixing station....

The commune has 02 basic secondary school (level II),03 primary school (level I) with a total of 2416 pupils (including pupils of Gia Lam town). There isn't any hospital except a clinic with 06 beds.

The roads in the commune is mostly concrete and asphalt roads, only a small part is eastern road. 100% of population have access to electricity. Main sources of domestic water are ground water and rainwater. According to statistic, the whole commune has 800 drilled well, 24- 40m deep on average and over 1,000 dug well (4- 10m deep on arrearage). 15% of the household use rain water tank with mean volume of $6m^3$. 60% of population use toilet with septic tank, 60% use two compartments latrine and 5% use others.

c. Main occupation

Farming, handicraft and employees in factories or enterprises within the commune are major occupation of local people. A small portion involve in commercial activities (mainly along National road N° 1).

1.2.2 SOCIAL- ECONOMIC CHARACTERISTICS OF THE TRANSFER STATION AND ITS VICINITY (WITHIN DISTANCE OF 200M FROM THE SITE BOUDARY)

a.In the transfer station.

No households or establishments are found living within the proposed transfer station. The SE part is being used as dump site of demolition waste (see description in the 3.4 below).

b. In the vicinity.

Within the distance of 200m from the site boudary, there are 160 households with total of 652 people living in Phu Vien Fishery living quarter, living quarter of Road Managament company in the south and residential area of Lam Du village in the north. In the East is uncultivated land and brick kiln of Bo De commune. A high voltage power line is near the site. Construction of the transfer station and the access road doesn't necessite any land relocation or compensation.

1.2.3 RESULT OF ENVIRONMENTAL AND SOCIAL SURVEY

During the survey, we have cooperated with communal People's committee, worked with leaders of the commune, statistical department and collected such information as land use status in the transfer station site and the vicinity and socio-economic conditions of the locality. We have interviewed 31 households living in Lam Du, Group4, Ai Mo and residential area along the waste transportation route about current dumping of construction waste in Lam Du transfer station

The results of surveys and interviews of show that:

+ As regards pollution of the surrounding environment :

- Severely polluted: 29 %,
- Not severely polluted: 58.1 %
- Not polluted: 12.9 %

+ Evaluation of the interviewees on the degree of pollution (in %):

Degree / Aspect	Severely polluted	Not severely polluted	Not polluted
Waste	12.9%	67.7%	19.4%
Water resource	3.2 %	12.9 %	83.9 %
Odor	22.6%	41.9 %	35.5%
Gas, dust	9.7 %	35.5 %	54.8 %
Noise	19.4 %	51.6 %	29.0 %
Vibration	6.4 %	16.1 %	77.4 %

+ *As regards the degree of pollution caused by the surrounding solid wastes:*

16.1 % - Polluted, 74.4 % - Not very clean, 6.5%: Clean

+ *Point of view of the population about the construction of the transfer station:*
49.1% of them agree with the construction of the transfer station

51.8 % not agree.

1.3 ACCESSIBILITY OF THE PROPOSED TRANSFER STATION

1.3.1 DISTANCE OF WASTE TRANSPORTATION

The distance and time of truck travel from URENCO office to the transfer station are 5.2 km and 12-15minutes respectively.

The distance and time of truck travel from the transfer station to Nam Son landfill are 44.2 km and 1-1.10 hour respectively.

1.3.2 TRAFFIC FLOW IN THE MAIN ROAD .

The traffic density in the road to the transfer station is quite low. The average number of vehicles passing the access road is 50/ hour of which:

Kinds of vehicles	Number of vehicles	Ratio (%)
Small struck (under 4.5 tones)	30	60
Big struck (over 4.5 tones)	13	26
Small car under 16 seats	10	20
Passenger car over 24 seats	7	14

1.3.3 ACCESS ROAD TO THE TRANSFER STATION.

a. Access road to the transfer station

The proposed transfer station is 5.2km way from the City center. To access the transfer station, waste trucks must go over Chuong Duong bridge. Since this is an important bridge on the traffic route from Hanoi to northern provinces, the traffic density in this bridge is very high so waste trucks must avoid rush hour

Road section from Chuong Duong bridge to the transfer station is Red river

dike road, 600m long. The road has been asphalted, 7m wide and 2.1-2.3m higher than the project site. The road side is narrow (1.2-1.5m on each side). The URENCO built a 850m long access road running parallel with the dike (see the outline of Lam Du Transfer station) This access road has following characteristics:

- Kind of road: Asphalt road of level III, constructed in the flood plain outside the Red river dike
- Length: 850m
- Width: 5m with large road side which is the safety corridor of the dike
- Quality: Medium, sufficient for only small capacity trucks

b. Waste transportation route to Nam Son landfill

Distance from Lam Du transfer station to Nam Son landfill is 44.2 km. Waste transport route follows Red river dike- under Chuong Duong bridge- Gia Lam town- National road N°1- Duong bridge- National road N°3 - Nam Son landfill

This transport route is in good condition comprising mainly of asphalt roads, 7-10m wide. Road improvement is not necessary.

However, travel of big capacity waste trucks to Nam Son landfill has some disadvantages: Red river dike road is not sufficient for travel of big capacity trucks in flood season, Chuong Duong bridge has maximum height of 3.5m which is not suitable for trucks of over 3.5m high and the Duong bridge is old and weak, catering for only small capacity trucks.

Upgrade of the access road

Because the access road to the transfer station is narrow and not sufficient for over 15 tons capacity trucks to travel and by-passt, the road must be upgraded. Upgrading work includes reinforcement of road foundation, expansion of 2m more and asphalt the road. As no residents is found living within the access road, there is no need for land acquisition and compensation.

1.3.4 CURRENT STATUS OF THE TRANSFER STATION

**Land use status in the transfer station*

Most of the proposed site is occupied by water and divided into 3 small lakes (as described above). 70% of the area of the transfer station (in the central and North-Western part) are used for fish breeding (by local people) and one-forth of the third lake in the South-West are used as dump site of construction waste of the City (about 21.600 ha). About 60 trucks/ day (mostly small capacity trucks of 2-3.5 tons) enter the site for dumping of construction waste (100-150m^3/day)

The analysis results of 02 soil samples collected at the site (in the South-West) and the vicinity (in the South) by the CCET on July, 31 are presented in the table below:

Table 1.4: *Soil analysis result in the transfer station*

No	Indicator	Sample mark	
		LD01	LD02
1	Hg (mg/kg dry soil)	0.00005	0.000025
2	As (mg/kg dry soil)	0.000183	0.000208
3	Pb (mg/kg dry soil)	0.004	0.0047
4	Cu (mg/kg dry soil)	0.0189	0.0197
5	Fe (mg/kg dry soil)	3.0	3.35
6	Al (mg/kg dry soil)	2.29	7.69
7	CaO (mg/kg dry soil)	1.82	1.12
8	MgO (mg/kg dry soil)	1.65	1.50
9	Mn (mg/kg dry soil)	0.07	0.056
10	Clo (mg/kg dry soil)	0.000497	0.0088
11	pH value	7.0	6.8

Remarks: Analysis results show that content of iron in soil sample is fairly high, other indicators is below the stadard limits.

* *Existing structures within the site*

Within the site, there are two structures: a electric weighting station and a resting house of site guardians. The area of the two structures is $14m^2$ and $24m^2$ respectively.

1.3.5 ISSUES TO BE NOTED.

- Transportation of waste from City center to Lam Du transfer station may meet certain difficulty because waste trucks have to go over Chuong Duong bridge raising the traffic flow in the road and bridge (> 200 vehicles/day)
- According to the Authority of Dike Management and Flood Control, no structure is permitted to be constructed outside and near the dike. Since the proposed Lam Du transfer station is located within the dike system, construction of the transfer station will not be allowed
- The transfer station to be constructed is a sanitation project but it's located within the sanitary protection zone of the wellfield which supply water for Gia Lam town. Consequently, according to regulations on sanitary protection zone of major water project of the City, construction of the transfer station will also not be allowed.

- The proposed site has open hydrogeological structure so it may contaminates groundwater
- The main road passing the transfer station is the dike which is not sufficient for travel of big capacity trucks.
- Construction of the transfer station in the flood plain of the Red river will have certain impacts, blocking the water flow, particularly in rainy season. Therefore, attention must be paid to this point when considering.

1.4 COMMENTS OF THE SURVEY TEAM

- *Area: The proposed cover an area of 21.2 ha , meeting the requirement*
- *Distance of waste transportation : The proposed transfer station is located near waste generating area (5.2km from the city center) thus decreasing the cost of waste transportation. However, the distance from the transfer station to Nam Son landfill is quite great (44.2km) raising the cost for waste transportation. Waste transportation over Chuong Duong bridge and on the dike road is a disadvantage, increasing the traffic density, blocking the traffic flow and affecting the dike especially in the rainy season.*
- *Access road: The access road is available, but it has to be upgraded to be sufficient for travel of 20 tons capacity trucks. Furthermore, transportation route to Nam Son must pass under Chuong Duong bridge with the maximum height of 3.5m making it inaccessible for trucks of over 3.5m high.*
- *Topography: The proposed site is occupied by large lake, requiring lot of filling which is very costly for construction so it's unfavorable*
- *Geological setting: The proposed transfer station is located outside the dike, so it's easy to be submerged, the site foundation is weak , not ensuring the construction of the transfer station*
- *Surface water: The project area is located in the flood plains of red river. Therefore, when the flow of Red river changes, the site is easy to be eroded. It's difficult to estimate the long-term changes. Moreover, the transfer station will block the water flow particularly in rainy season*
- *Ground water: At the proposed site, the clay in the upper layer is thin . The lower layer consist of sand, water-bearing sitlty fine grained sand. Thus, allowing percolation of contaminated water to groundwater. Another disadvantage of the site is that it's located in the sanitary protection zone of the wellfield supplying water for Gia Lam (1,000m to the South-East)*
- *Air environment:The project area is located just 50m away from the nearest residential area, so bad smell may influences this nearby*

residential area

- *Land use status: the transfer station is not in the area intended for development of the City and in agriculture development area so it's favorable for land acquisition*
- *Cultural aspect: The project area is near cultural and historical relics of the city such as Bo De pagoda, Duc Thanh Linh Lam temple (150m to the South of the site). Therefore, it's will have some spiritual influences on prayers*
- *Public opinion: The number of local people who oppose to the construction of the transfer station is higher than those agree (according the results of survey, 58.1% of population oppose)*
- *Land compensation: The project area is under management of City People's Committee, so compensation is very low or almost not necessary*
- *Distance to residential area: The proposed transfer station is very close to residential area (50m away) so it's not favorable for construction.*

II.2 CO NHUE TRANSFER STATION

2.1 NATURAL GEOGRAPHIC CHARACTERISTICS AND ENVIRONMENTAL STATUS

2.1.1 LOCATION

The site of Co Nhue waste transfer station is located in a paddy field of Co Nhue commune, at the coordinates 21° 03.788' North latitude and 105° 45.009' East longitude. Co Nhue commune is located at the NW of Hanoi, bounded in the North with Thuy Phuong commune, in the South with Phu Dien, Mai Dich communes, in the East with Xuan La, Xuan Dinh communes, in the West with Tay Tuu, Minh Khai communes.

The study area is mainly occupied by the paddy fields of Hoang village (Hamlet No 6) and Dong village (Hamlet No 7) of Co Nhue commune, Tu Lime district, Hanoi and a part of the residential quarter of Transport Construction Company No 118 (4,000 m^2).

- In the North and the East the study area it is bounded by an irrigation canal which serves as the boundary between Co Nhue and Xuan Dinh communes.
- In the South it is bounded with the paddy field of the commune, 150 m from the population.
- In the West it is bounded by the Thang Long expressway.

2.1.2 TOPOGRAPHY

The project site is located in the North of Tu Liem district, suburb of Hanoi. The land surface is rather flat. The mean elevation is 5.9 - 6.1 m. This area is occupied mainly by wet paddy field, with very little dry crop area.

The study area is occupied mainly by the paddy field of Co Nhue commune. The land surface is flat, with two small ponds and a canal.

2.1.3 CLIMATIC ENVIRONMENT

General characteristics

Since the project site is located in the north suburb of Hanoi, so it bears the general climatic characteristics of Hanoi area, which is of hot and humid tropical monsoon climate (see item I.1.3)

Air environment in the project site

The study site has fairly clean environment, except some dust and waste gases caused by the vehicles along the Thang Long expressway. The average traffic flow of the vehicles travelling across the area on 01 August 1999 in the peak hour is 576 vehicles and in non peak hour is 463 vehicles. During the surveys, the CCET have collected and analyzed 4 air samples taken from the

study area with the results shown in the following Table :

Table 2.1: Results of air analysis in Co Nhue transfer station

N°	Indicator	Sample marks				TCVN 5937 - 1995
		CN 01	CN 02	CN 03	CN 04	
1	NO_x (mg/m^3)	0.02	0.016	0.02	0.018	0.4
2	NH_3 (mg/m^3)	<0.01	<0.01	<0.01	<0.01	-
3	CH_4 (mg/m^3)	0.25	0.47	0.45	0.37	-
4	CO (mg/m^3)	0.12	0.4	0.13	0.32	40
5	CO_2 (mg/m^3)	88	88	110	90	-
6	SO_2 (mg/m^3)	0.01	0.015	<0.01	<0.01	0.5
7	H_2S (mg/m^3)	<0.01	<0.01	<0.01	<0.01	0.008 *
8	Dust (mg/m^3)	0.095	0.091	0.099	0.1	0.3
9	Noise (dB)	55-60	47-50	53-58	50-55	70 **
10	RH (%)	65	60	60	62	-
11	Temperature (°C)	38	40	40	40	-
12	P (mmHg)	715	710	710	710	-
13	Wind direction	ĐN	ĐN	ĐN	ĐN	-
14	Wind velocity (m/s)	0.5-0.7	0.3-0.5	0.3-0.5	0.5-0.7	-

Sample CN01: Taken from paddy field of Xuan Dinh commune

Sample CN02: Taken from land plot of Transport Construction Company No 118

Sample CN03: Taken next to Thang Long-Noi Bai express way

Sample CN04: Taken from paddy field of Co Nhue commune where the proposed transfer station is located

Remarks:The analysis results show that content of all indicator is below the permissible level

2.1.4 HYDROLOGY.

The study area comprises part of the living quarter of the Transport Construction Company No 118 (400m^2) and paddy field of Co Nhue commune. The study area is surrounded by paddy field with flat topography and two small ponds of 200m width and 0.6-0.8m depth on average. These

ponds have no influence on the hydrological characteristics if the area.The site is 2,000 m South of the Red river and 1,600 m East of Nhue river.

Water environment in the study area:

Around the study area, there are no pollution sources which might severely affect the water environment in the area. For environmental survey of the site the CCET collected 2 groundwater samples (see picture 2.4) 1 water sample from the canal, 1 sample from a pond and . The results of sample analysis are presented in table 2.2

Table 2.2: Results of surface water analysis in Conhue transfer station

N°	Indicator	Sample Marks		TCVN 5942 - 1995 (column B)
		CN 03	CN04	
1	COD (mg/l)	16.0	12.8	< 35
2	BOD_5 (mg/l)	5.2	4.0	< 25
3	Phenol (mg/l)	0.004	0.005	0.02
4	Cyan (mg/l)	<0.001	<0.001	0.05
5	As (mg/l)	0.00041	0.00093	0.1
6	Pb (mg/l)	0.0023	0.0038	0.1
7	Cu (mg/l)	0.0077	0.01	1
8	Zn (mg/l)	0.01	0.0077	1
9	Cd (mg/l)	0.0008	0.0007	0.02
10	Hg (mg/l)	0.00041	0.00039	0.002
11	Mn (mg/l)	0.09	0.055	0.8
12	Ni (mg/l)	0.05	<0.01	1.0
13	Cr (VI) (mg/l)	0.001	0.0028	0.05
14	F^- (mg/l)	0.45	0.19	1.5
15	Ca (mg/l)	32.5	20	-
16	Mg (mg/l)	8.7	4.8	-
17	Coliform (MPN/100ml)	Negative	248	10,000
18	Sulfate (mg/l)	8.0	1.0	-
19	PH	7.2	7.0	5.5 - 9.0
20	Fe (mg/l)	0.98	1.67	-
21	NO_2 (mg/l)	1.5	0.0	0.05
22	NH^+_4 (mg/l)	0.2	0.6	1
23	NO_3^- (mg/l)	8.26	0.69	15
24	Clorua (mg/l)	31.91	7.09	-

Sample CN03: Taken from irrigation canals

Sample CN 04: Taken from pond in the paddy field

Remarks: Comparing the analysis results with TCVN 5942-1995, we see that the indicators are below the permissible level except NO_2 in sample CN03 which is 30 times higher than the permissible level. This may be attributed to the use of cattle manure by farmers of Co Nhue commune

2.1.5 HYDROGEOLOGY.

Based on the lithological composition, sediment facies and hydrogeological characteristics such as groundwater yield, permeability, water bearing properties, the Quaternary sediments in the study area are divided into 2 main aquifers, between which is an aquiclude.

1) Unconfined porous aquifer in Holocene sediments (qh)

This aquifer is distributed in a narrow band along the Red river with a width of some tens meters to over 100 m, expanding eastwards. It is mainly composed of sand, with grain size varying from fine to medium and coarse, in the lower part mixed with gravel, of river bed and flood plain facies. The thickness of this aquifer is small, around 11 m. The groundwater level in dry season is 4.6 m deep. In flood season, the groundwater level of this aquifer is directly influenced by the water level of the Red river.

The main source of discharge is the rain water and river water infiltration. The groundwater discharges mainly to the river.

2) Porous aquifer in Upper Pleistocene alluvial and alluvial - marine sediments (qp)

This aquifer is distributed all over the study area. It is composed mainly of fine to coarse grain sand in the upper part and gravel in the lower part. Its thickness is 20 - 40 m.

The groundwater level of this aquifer varies depending on the water level of the Red river and groundwater exploitation rate. The groundwater is recharged by rain water, river water, and discharged through evaporation, percolation to the underlying aquifer and groundwater exploitation in dug wells and shallow boreholes.

This is the main productive aquifer for large scale domestic water supply for Hanoi city.

The aquifer is very productive, occurs at shallow depth, easy for exploitation and has permanent recharge sources, easy to establish sanitary protection zone. As the result, Cao Dinh wellfield with 10 well have been designed to supply water for Cao Dinh water plant with total flow of 30,000m^3/day

The wellfield is 1,100m North-East of the study area.

To survey the quality of groundwater, the CCET has taken 03 groundwater sample with the analysis results presented in the table below:

Table 2.3: Results of groundwater analysis Co Nhue transfer station

N°	Indicator	Sample marks			TCVN 5944 - 1995
		CN01	CN02	CN05	
1	COD (mg/l)	8.0	16.0	5.6	-
2	BOD_5 (mg/l)	3.6	5.2	1.4	-
3	Phenol (mg/l)	0.006	0.004	0.001	0.001
4	Cyan (mg/l)	<0.001	<0.001	<0.001	0.01
5	As (mg/l)	0.0008	0.00053	0.00028	0.05
6	Pb (mg/l)	0.0104	0.0047	0.0019	0.05
7	Cu (mg/l)	0.0026	0.0011	0.0023	1.0
8	Zn (mg/l)	0.151	0.0183	0.0026	5.0
9	Cd (mg/l)	0.001	0.0012	0.001	0.01
10	Hg (mg/l)	0.0002	0.0023	0.00029	0.001
11	Mn (mg/l)	0.08	0.15	0.05	0.1 - 0.5
12	Ni (mg/l)	0.015	<0.01	<0.01	-
13	Cr (VI) (mg/l)	0.003	0.001	0.0058	0.05
14	F^- (mg/l)	0.28	0.52	0.09	1.0
15	Ca (mg/l)	2.0	40	5.0	-
16	Mg (mg/l)	2.1	6.0	3.0	-
17	Coliform (MPN/100ml)	2	400	Negative	3
18	Sulfate (mg/l)	1.0	4.0	1.0	200-400
19	pH	7.0	7.2	7.0	6.5 - 8.0
20	Fe (mg/l)	0.3	0.45	0.14	1 - 5
21	NO_2 (mg/l)	0.0	0.0	0.05	-
22	NH^+_4 (mg/l)	0.0	0.2	0.0	-
23	NO_3^- (mg/l)	3.44	1.03	4.13	45
24	Clorua (mg/l)	7.09	8.86	12.41	200-600

Sample CN01: Taken from drilled well
Sample CN02: Taken from dug well of a household in the living quarter of Transport Construction Company N^0 118
Sample CN05: Taken from drilled well of household in hamlet N^0 6 of Co Nhue commune

Remarks: most of the indicator is below the standard limits except for Phenol content in sample CN01 and CN02 which is 4-6 times higher than the

permissible. The Coliform content in the sample CN02 is 130 times higher than the permissible level

2.2 SOCIO-ECONOMIC CHARACTERISTICS

2.2.1 SOCIAL- ECONOMIC CHARACTERISTICS OF CO NHUE COMMUNE.

a. Population.

Area of the commune: 615.9 ha. The population of the whole commune: 21,628 inhabitants living in 5,748 households, population growth rate is 1.4%.

The commune has 4 villages: Hoang village, Dong village, Tru village and Vien village.

Chairman: Mr. Nguyen Thi Bac

Deputy Chairman: Mr. Nguyen Thi Hai

Tel: 8 386550

b. Infrastructure

The commune has an area of 615.9 ha of which the residential land is 276.9 ha, agricultural land is 339 ha (248.5 ha for rice cultivation, 27.7 ha for dry crops and the remaining 155.8 ha for other kinds of trees)

The commune has 1 clinic with 14 beds, 2 primary schools with 1,345 pupils, 1 basic secondary school with 1,325 pupils, 1 nursery school with 380 pupils and 2 pagodas.

Besides, in the territory of the commune there are also the Police University, Tourist Higher School, Military Institute, Military Foreign Languages University, Tanks and Armor vehicles army commanding staff, E Hospital, Northern hydrogeological and engineering geological Division, INTERGEO Division.

The commune is crossed by the Hanoi - Phuc Yen railway and Thang Long - Noi Bai expressway which is an important road from the Noi Bai airport to Hanoi. The roads in the commune are mainly asphalt and concrete roads.

c. Main occupation

Agriculture is the main occupation in the commune. Besides there are some other occupations such as tailoring and small trade.

2.2.2 SOCIAL- ECONOMIC CHARACTERISTICS OF THE TRANSFER STATION AND ITS VICINITY.

a. In the transfer station.

Within the site, there are 3 households, 2 serial houses and 2 graves. The site is crossed by a high voltage power line (for futher detail, see description in the 3.4 below).

b. In the vicinity (within distance of 200m from the site boundary).

The transfer station is surounded mainly by paddy field. 120-150m to the South and SW fo the site, there are 80 households living in residential area of Co Nhue commune.

2.2.3 RESULTS OF ENVIRONMENTAL AND SOCIAL SURVEY

During the surveys, we cooperated with communal People's committee, worked with communal leaders, statistical department and collected information on land use status around the project area, socio-economic conditions of the commune. We also interviewed 40 households in the area

intended for the transfer station and the vicinity. The results of the survey and interview show that:

+ *As regards the surrounding environment :*

- Severely polluted: 7.5 %,
- Not severely polluted: 57.5 %
- Not polluted: 35 %

+ *Evaluation of the interviewees on the degree of pollution (in %):*

Degree / Aspect	Severely polluted	Not severely polluted	Not polluted
Waste	0 %	27.5 %	72.5 %
Water resource	27.5 %	15 %	57.5 %
Odor	22.5 %	22.5 %	55 %
Gas, dust	20 %	17.5 %	62.5 %
Noise	12.5 %	12.5 %	75 %
Vibration	10 %	10 %	80 %

+ *As regards the degree of pollution caused by the surrounding solid wastes:*

5 % - Polluted, 42.5 % - Not very clean, 52.5 %: Clean

+ *Point of view of the population about the construction of the transfer station:*
80% of them agree with the construction of the transfer station

0 % not agree and

20 % give no idea.

2.3 ACCESSIBILITY OF THE INTENDED TRANSFER STATION

2.3.1 DISTANCE OF WASTES TRANSPORTATION.

The distance and time of truck travel from URENCO office to the transfer station are 9.4 km and 20 minutes respectively.

The distance and time of truck travel from the transfer station to Nam Son

landfill are 37.2 km and 1 h respectively.

2.3.2 TRUCK TRAFFIC FLOW ON THE ACCESS ROAD TO THE TRANSFER STATION

Access road to the transfer station is directly connected with Thang Long-Noi Bai express way. This is an important road connecting Noi Bai airport with Hanoi city so during peak hours, there are 187 big trucks and 322 small trucks and beyond peak hours, there are 215 big trucks and 318 small trucks.

2.3.3 ACCESS ROAD TO THE TRANSFER STATION

The station is adjacent to Thang Long - Noi Bai expressway, access road to the transfer station is favorable . Thang Long-Noi Bai express way is the main road with high traffic. If the transfer station is constructed here, there will be an additional number of 400 waste trucks going in and out of the transfer station of which 100 trucks are of 25 tons capacity, thus increasing the traffic density in this road. If the waste trucks access and go out directly from the express way, this will affect the traffic of the area, therefore a fly-over must be built over the expressway which is very costly and has low feasibility. However, it's not necessary to build a flyover if the waste trucks from Nam Son landfill go straight to cross road of Thang Long-Noi Bai and Road No32 then turn round. In dong so, each waste truck have to cover an additional distance of 3.2km for entering the transfer station

2.3.4 CURRENT STATUS OF THE TRANSFER STATION

+ Land use status at the station

The transfer station is located in the land area of the Transport Construction Company No 118 covering 4,000 m^2. In this area there are two serial houses. One consists of 19 rooms with the size of 7x4 m, one 7 rooms with size of 7x3.5 m. Now only 3 households are living here. ***The company has built surrounding walls and installed electricity system. The land here was bought by 53 households in 1995 with the following prices:***

- 90,000,000 VND per plot for 20 plots adjacent to the road.
- 80,000,000 VND per plot for 20 plots further away.
- 70,000,000 VND per plot for 13 remaining plots.

As this area is not wide enough, another 4.6 ha of paddy fields of Co Nhue commune adjacent to it has been surveyed. Here, paddy is grown in 2 crops per year with the productivity of 150 kg/360 m^2. In this area, there is a high voltage power line running across and 2 tombs

Table 2.4: Results of soil analysis in Conhue transfer station (taken and analyzed by the CCET on August 2 1999)

N°	Indicator	Sample Mark	
		CN01	CN02
1	Hg (mg/kg dry soil)	$4,0x10^{-5}$	$1,8x10^{-5}$

N°	Indicator	Sample Mark	
		CN01	CN02
2	As (mg/kg dry soil)	$2,17x10^{-4}$	$2,88x10^{-4}$
3	Pb (mg/kg dry soil)	0.0085	0.0056
4	Cu (mg/kg dry soil)	0.0415	0.058
5	Fe (mg/kg dry soil)	2.1	2.9
6	Al (mg/kg dry soil)	5.93	5.93
7	CaO (mg/kg dry soil)	1.12	1.26
8	MgO (mg/kg dry soil)	1.4	1.5
9	Mn (mg/kg dry soil)	0.038	0.048
10	Clo (mg/kg dry soil)	0.0085	0.0055
11	pH	6.8	7.1

2.3.5 ISSUES TO BE NOTED

- The transfer station is adjacent to Thang Long-Noi Bai express way. This is the main road from Noi Bai airport to the City so it's often traveled by many foreign delegation. If the transfer station is constructed here, it will influence the esthetics of the area. Therefore, mitigative measures need to be taken.
- The transfer station is located in the development area of the city. Moreover, it's close to the area intended for the construction of Foreign Diplomatic Compound
- The project area which has open hydrogeological condition is 1,100m away from the nearest wells of Cao Dinh wellfield . If the transfer station is built here, it will have certain impacts to Cao Dinh wellfield if no measure against leachate form waste, insects and unpleasant smell is taken
- The transfer station site belongs to the construction company No118. Currently, the company has granted ownership of the land to households and has plan to develop this area. Therefore, related agencies need to be contacted and worked with in case the proposed site is selected.
- Within the transfer station, there are 3 households and 2 graves. There is a high voltage power line running across the site. Within distance of 200m from the site boundary, there are 80 households.

2.4 COMMENTS OF THE SURVEY TEAM

- *As regards the area of the site: The area of the site is too small as compared with the requirements, therefore another area of 4.6 ha from*

the paddy field of Co Nhue commune should be added.

- ***As regards distance:*** *The transfer station is located adjacent to the Thang Long - Noi Bai express way, near waste generating area (9.4m away) and near Nam Son landfill (37.2km away). The site is adjacent to waste transportation route so cost for waste transportation is low. This bring about high economic efficiency and benefit*
- ***Access road:*** *The transfer station is located adjacent to Thang Long - Noi Bai expressway, therefore it can be accessed directly from this way. This is an expressway, the turning of trucks when going in and out the station will affect the traffic of the area, therefore a fly-over must be built over the expressway which is very costly.*
- ***Topography of the site:*** *The topography of the site is flat, 0.8 m lower than the surface of the main road. Before the construction of the transfer station, the ground at the site must be raised up by adding more earth materialto the height of 1-1.5m to avoid flood when there is heavy rain.*
- ***Geological setting.*** *The geological setting of the site ensure good conditions for the construction of the transfer station.*
- ***Surface water:*** *Within the the transfer station, no major water course is found. Water courses and bodies have very little influence on the site (possibly no influence)*
- ***Groundwater.*** *The proposed site has open hydrogeological structure. Therefore, waste water may infilt to aquifer polluting the groundwater if it is not properly collected and treated*
- ***Location:*** *the intended transfer station is located in the area planned for development of the Hanoi city, near the area intended for construction of the Diplomatic corps area. It is adjacent to express way thus favorable for waste transportation*
- ***Distance to residential area:*** *the transfer station is 200 m North and 180 m West of population areas of Co Nhue commune. Therefore, if no measures against unpleasant odor, waste gases and insects is taken when constructing the transfer station, the environment of the surrounding community will be seriously affected*
- ***Environment:*** *The environment of the area has no sign of pollution, there are no polluting factories and enterprises around the site.*
- ***Public opinion*** *: The majority of interviewee (80%) support the construction of the transfer station. The local authority is waiting and readily act as decision of City People committee*
- ***Esthetics:*** *the station is between the expressway and the railway which are the main communication lines traveled by many foreign delegations. If a transfer station is constructed here, it will affect the esthetics of the area if there is no measure against environmental pollution and visible*

nuisance

- ***Site clearance:*** *the site is located mainly in the paddy field so compensation and site clearance will be favorable. 4000 m^2 of land of Transport Construction Company No 118 sold to the workers for construction of houses and 26 houses need to be compensated*
- ***Others:*** *the site is 1,000 m away from the nearest wells of Cao Dinh wellfield. The site has open hydrogeological condition so construction of the transfer station here is a very sensitive issue requiring careful consideration.*