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INITIAL ENVIRONMENTAL EXAMINATION

of the

PROPOSED INDUSTRIAL ESTATE

at

BUTTALA

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by

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The findings and recommendations contained herein represent the best professional judgement of the study team only.

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BUTTALA PROPOSED INDUSTRIAL ESTATE INITIAL ENVIRONMENTAL EXAMINATION

I. GENERAL SITE DESCRIPTION

This proposed industrial estate is located within the former Gam-Udawa site along the Buttala-Monaragala Road, approximately 1.5 km northeast of Buttala town and in the Buttala Divisional Secretary Division of the Badulla District. The site proposed for the industrial estate is approximately 14 hectares (35 acres) on sloping land below a high rocky ridge to the south and east that forms part of the Rahatankanda Forest Reserve. Katugaha-Galge Forest Reserve is situated to the northwest of the site. The site is already partly developed, and contains an apparel factory and several small Industrial Development Board industries. See Annex A for regional and site maps of the area.

II. PHYSICAL ENVIRONMENT

A. Weather

The site is situated on the border of the Intermediate and Dry Zones of Sri Lanka. Average temperature in the region (based on Tanamalwila data) ranges between 23 and 35°C. Monthly average maximum and minimum temperatures are 33.9 and 24.7°C respectively (Menik Ganga Diversion Project EIA report).

Average annual rainfall based on data from Wellawaya (15 km due southwest of the site), is 1726 mm (1990-1994). Rainfall is characterised by a bimodal pattern with peaks during April (avg. 188 mm) and November (avg. 358 mm). Lowest average monthly rainfall is 23 mm in June. Most rainfall (an avg. of 1130 mm) is during the Maha season. From October to March. Yala season (April to September) receives on avg. 596 mm of rainfall.

Wind analysis carried out for Hambantota climatic station (70 km away) is considered adequate to describe the wind patterns of the site. Wind direction is predominantly SW from May to September and NE from December to February, as summarized below.

B. Topography, Soils, Groundwater

A 1993 perimeter survey to the scale of 1:2000 showed the proposed site to be a near-rectangular tract bordering the Monaragala-Wellawaya (A4) road. The extent of the land is 14.17 ha (35 ac). A contour survey done in 1994 August indicates that the average elevation of the area is approximately 198m above msl, with slopes up to 5%. The site lies in a pass between two rocky mountain ridges to the north and south with peaks above 1500m.

The soils in the site are clayey and gravelly; see Annex B for a detailed soil analysis. The site has a central drainage path which divides the site into two sections. The drainage channels show large cross sections resulting from soil erosion along the banks of the dry streams within the site.

In a drainage path within the proposed site, a dug pit had water at a depth of about 0.5m. In a well in front of the site and at the opposite side of the A4 road, water was present at an approximate depth of 4.5m from the road level; water depth in the well was approximately 1 meter in August. No other site-specific ground water measurements were done during this study.

C. Surface Water Hydrology

On-site surface water drains into two clearly visible drainage paths. Nearly 2/3 of the land drains towards the northeast, while the rest drains to the southwest. Both streams originate from the western or southwestern slopes of the adjacent mountain ridge (see Annex A-II). There are no permanent surface water bodies within the site; a stream on the southwestern edge of the site has a very small quantity of flow amounting to about 1.0m³/day (3 x 10⁻⁵ MCM/month). The principal off-site surface water bodies are Menik Ganga, Kuda Oya, and Kumbukkan Oya.

(1) Menik Ganga, which is approximately 2.8 km from the site along the A4 main road, had a measured flow of 0.35m³/s (0.91 MCM/month) at the Buttala-Wellawaya Road bridge in August during the site visit. River water is extracted for the Buttala town water supply and for Yudaganawa Tank for irrigation; the diversion point is prior to the road bridge; however, water was not being extracted during the team site visit in August. Downstream uses are for agriculture, domestic purposes, and pilgrims at Kataragama. The average annual stream flow of Menik Ganga at Kataragama (located approximately 30 km downstream from the above measuring point) had average annual maximum, minimum and mean flows amounting to 20.91m³/s (54.17 MCM/month), 0.82 m³/s (2.13 MCM/month), and 7.22m³/s (18 MCM/month) respectively. (Water Resources Database, July 1987; data are for the period 1945\1986.)

(2) A branch of Buttala Kuda Oya is approximately 7.5 km from the site along the A4 road. The flow during the site visit in August was 1m³/s (2.5 MCM/month). Immediate downstream uses are for agriculture, domestic purposes, and the Pelwatta Sugar Factory. This branch and the Pilhiyan Ara combine and flow to Menik Ganga; the river flow at Kataragama consists of all three stream flows.

(3) Kumbukkan Oya flows about 5 km from the site. Access from the site is across a ridge to the east. The river's measured flow at the causeway close to Maligawila was 2m³/s (5.2 MCM/month). The maximum, minimum and average annual stream flows of Kumbukkan Oya (1958-1961) at Kumbukkana ara are 9.37 m³/s (24.MCM/month), 0.10 m³/s (0.3 MCM/month), and 4.82m³/s (12.50 MCM/month) respectively. Kumbukkana is a gauging point upstream from the

causeway where the measurements were done. Primary downstream water uses are domestic and irrigation (Water Resources Database, July 1987).

(4) The stream originating from the southeast edge of the site boundary is called the Nittawela Ara; it crosses the A4 road close to the entrance of the Buttala Affiliated University College (AUC). The flow was approximately $2.8 \times 10^{-3} \text{m}^3/\text{s}$ (0.007 MCM/month) at the road culvert during the site visit. This ara flows through agricultural land towards Menik Ganga.

D. Water Quality

Water quality samples were obtained during the site visit from the following locations, in order to assess the quality of water found in and around this proposed industrial estate site:

- (1) A surface pit within the proposed site (near the area demarcated for the paper recycling factory) that was collecting surface and subsurface drainage;
- (2) Nittwela Ara, a canal collecting water draining from the proposed site (sampled at the culvert point opposite the Buttala AUC);
- (3) Menik Ganga, at the bridge on the Wellawaya-Buttala road;
- (4) Kuda Oya, at the bridge on the Wellawaya-Buttala Road;
- (5) Kumbukkan Oya, at the causeway on the Buttala-Okkampitiya road; and
- (6) A well, found on a mound facing the proposed site, opposite the main road.

Generally, water sampled from the above sources contained a significant level of dissolved salts, with the levels of fluoride being a cause for concern. According to Dissanayake and Weerasooriya, the composition of rocks of the area coupled with climate conditions are the key factors for the abundance of fluoride in the dry zone (Eastern and north-central region) of the country (Dissanayake and Weerasooriya, 1985). A detailed water quality analysis is presented in Annex C.

E. Air Quality and Noise

No site-specific air quality data were available. Some existing anthropogenic emission sources were noted, as follows:

Tri-Star garment factory - solid waste residues are burnt on a daily basis in the backyard of this facility.

Buttala IDB industrial estate - Some gases and noise were emitted from several units working here, (eg., printing press, refrigerator repair unit).

Monaragala paper factory (paper recycling unit) - The factory is under preliminary stages of construction; some construction work noise was noted at this facility.

In general, no significant adverse air quality or noise effects were found from industrial activities at current levels.

III. CURRENT AND PLANNED FACILITIES AND SERVICES

A. Water Supply and Wastewater Disposal Options

Ground water is the water source identified for this proposed industrial estate. Representatives of the paper recycling company informed the team during the site visit, that preliminary pumping tests commissioned by themselves at the proposed site indicated an approximate aquifer yield of 200-1000 l/min; however, these tests were not observed or verified by the study team. The nearby town of Buttala itself obtains part of its municipal water supply from two tube wells, located within the periphery of the town.

Three rivers in the vicinity of the proposed site -- Menik Ganga (2-3 km from the site), Kuda Oya (7-8 km) and Kumbukkan Oya (5-6 km) -- may be considered as surface water source options available to augment the water supply to this proposed site. **Menik Ganga** water is used to supply a part of the Buttala town's water supply, but is known to run dry at the intake point during the dry seasons. **Kumbukkan Oya** is separated from the proposed site by a ridge, which suggests that conveyance of water from the river to the site would require pumping, which could be expensive. **Kuda Oya** serves as the current source of water as well as the effluent disposal location for the Pelwatte Sugar Company. Thus available water quantity and quality from these sources may be limited by existing uses and/or treatment costs.

Potential disposal points for the treated effluent generated from this proposed industrial estate site are Udagama Ela (the surface drainage canal) and Menik Ganga. However, lack of adequate dilution water in either the canal or the river during dry periods presents a significant constraint on such discharges. Furthermore, the downstream flow path of Menik Ganga through Yala National Park and the sacred city of Kataragama may raise additional concerns with respect to using Menik Ganga for disposal of effluent from this site.

B. Infrastructure

1. **Power:** An existing 33 kv system serves the site. The IDB industrial facility has one transformer; the garment factory also has its own transformer (250A daily/200 kw) and a diesel generator. The site is located approximately 60 km from the Badulla grid substation; an alternative supply could be provided from the Balangoda grid substation. The approximate estimated cost of providing the site with a 400 KVA supply (i.e. 0.1km of

33KV high tension line, 400 KVA sub and 1km 3 phase low tension line) is Rs. 915,000 using 1993 prices.

2. Telecommunications: The Monaragala Garment Factory (Tri-star) has 2 telephones. Sri Lanka Telecom has agreed to reserve 15 lines to the site at a cost of Rs. 0.6 million.
3. Transportation: The proposed site is by the side of Buttala-Monaragala road. It is located 1.5 km from Buttala, 16 km from Monaragala, and 240 km from Colombo. Public and private bus services are available on this road. There is no nearby railway access; the closest service is the Badulla-Balangoda line, approximately 60 km from the site. From Buttala, the coastline can be reached (at Hambantota) via the A2 (Buttala - Wella Waya - Hambantota) highway.
4. Other public services: The nearby town of Buttala has a police station and a central hospital. Educational institutions in the town include the Buttala Affiliated University College (soon to be a Campus of a National University - Sabaragamuwa NU) and the Buttala Central School (Dutugamunu Jatika Pasala) which has classes through A/L in Commerce and Arts. Other schools in or near Buttala include the Udugama School and the Piyananda Kanishta Vidyalaya (1.3 km from site). The Moneragala town which is 15 km from the site, is to be developed with assistance from the Asian Development Bank. Roadways, housing and other public utilities are to be upgraded. The staff and work force at the industrial estate could benefit from these developments.

C. Existing Structures and Industrial Activities

As mentioned above, the Tri-star garment factory located on the site is fully operational. Basic construction work for the paper recycling factory (a BOI venture) is under way and the factory site has been cleared. The paper recycling unit would produce hazardous sludge from the de-inking process; this aspect has not yet been addressed adequately by the investor.

The IDB industrial estate plant has 17 buildings in various stages of completion; only about 3 of these are functional now. These are small buildings in the style of a house; in fact, most of the completed units are being used temporarily as houses.

At this time the only other known pending industrial application for this site is a proposed poultry farm.

IV. BIOLOGICAL ENVIRONMENT AND RESOURCES

A. Significant Flora

The site contains disturbed grassland, with several scattered trees present, mostly at lower elevations. *Cassia fistula* and *Eupatorium* species are present. This site is bounded by two national Forest Reserves (FR) -- Rahatankanda FR and Katugaha Galge FR (see area map, Annex A). Rahatankanda FR is comparatively undisturbed, and is primarily a dry evergreen forest that has links to Yala National Park Block IV. It serves as a corridor for numerous wild birds and mammals moving in and out of the park. Katugaha Galge FR is primarily a Teak plantation, but also contains areas of mixed dry forest habitat.

B. Significant Fauna

No site-specific research information on local fauna was available. The site is surrounded by a high [YES?] fence which seems to have excluded larger mammals. However, local people have observed quite a number of different wild mammals in the surrounding area, including Samber (*Cervus unicolor*), Spotted Deer (*Axis axis*), Wild Boar (*Sus scorta*), Indian Civet Cat, Grey Mongoose (*Herpestes edwardsi*), Hare (*Lepus nigricollis*), Porcupine (*Hystrix indica*), and Grey Langur (*Semnopithecus entellus*). Many common birds, including the Blue-faced Malkona, Grey Hornbill, and Small Barbet were observed in the surrounding area during the team's field visit.

C. Sensitive Habitat

The presence of numerous wild mammals and birds close to this site is almost certainly due to the relatively large amount of protected habitat contained within the forest reserves and the proximity of these reserves to Yala National Park. Some of the larger mammals typically travel several kilometres per day through such habitat, and are adversely affected by land clearing and other human incursions. Fuel wood collection for domestic purposes is a normal practice in these forests. Some illicit tree-felling has been recorded at Rahatankanda FR, according to the Range Forest Officer who is in charge of this FR. These and other adverse impacts such as air pollution, noise, solid waste disposal, and encroachments by workers and their families, are likely to increase in the forest reserves adjacent to this site if it is developed further as an industrial estate.

V. SOCIAL AND CULTURAL ENVIRONMENT

A. Human Settlements

The proposed site is located in the Pettagamwatte Grama Sevake Division (GSD). It was once a rubber plantation. Approximately 160 families were relocated from the site into a nearby traditional herbal plantation area while preparing the land as a Gam-Udawa demonstration site. Pettagamwatte GSD has a population of 407. There are 172 families

who occupy a total of 161 houses. Roughly half the houses are permanent structures. Only 144 individuals of the population are employed.

Local educational facilities have recently been enhanced with the establishment of the Buttala campus of the Sabaragamuwa National University. Buttala Central College prepares students for higher studies. Health care is available locally at Buttala District Hospital (1.5 km) and Okkampitiya Rural Hospital (within a 2 km radius of the site to the SE).

B. Labour Force

Agricultural employment is predominant in Mahagodayaya, Dikyaya and Udugama whilst in Pettagamwatte and Udugama trading is an important activity. The labour force of the Buttala Divisional Secretariat (DS) is approximately 12,700 of which over 11,231 are employed; The total population of the Buttala DS is 37,882 of which 19,031 are male and 18,85 are female. Of the total population, 26,428 have had an education up to Grade 10, 3904 have G.C.E. OL/AL, and 189 have a higher qualification.

C. Local Economic Activity

The buildings for the proposed BOI approved paper recycling mill at this site are under construction; adjoining the mill is the Tri-star Garment factory, which is currently in full operation. A few other small "cottage" businesses are operating out of the small house-type buildings existing at the site.

D. Religious and Cultural Features

In the immediate vicinity of the site there is a Buddhist meditation center and temple. A Catholic church and a Mosque are situated in Buttala town for respective worshippers. Two archaeological sites of the 1st and 2nd century B.C. are nearby: Udaganawa (6 km) and the Dematamal temple (6 km). These sites are current places of worship as well.

E. Aesthetic and Recreational Features

The verdant forest of Rahatankande with its high rock cliffs forms the backdrop of the industrial estate to the south and east. This protected area is an attractive natural feature of the local landscape as well as habitat for numerous wild plants and animals. If properly maintained, it could serve as a recreational site for trekkers, rock climbers, and ecotourists. At present there are no organized recreational facilities at the proposed site; however, the Pelwatta Sugar Company, 4 km from the site, provides opportunities for regional sports activities, especially cricket.

F. Local Customs, Aspirations, and Attitudes

The local population is predominantly Buddhist; the people in this area are seeking new and expanded opportunities for agriculture, education, industry, and trading to help increase employment and improve their economic status.

VI. MAJOR ENVIRONMENTAL AND REGULATORY ISSUES

A. Sensitivity of the Affected Environment

As noted above, although the site itself has already been extensively altered from its natural state, and appears to contain no significant natural habitat, it is closely bounded by two national Forest Reserves that support a wide variety of indigenous plant and animal life. If this industrial site is intensively developed, however, these reserves could be degraded by noise and air pollution, and would likely be subject to increased disturbance such as illicit tree removals, waste dumping, and other encroachments. The Forest Ordinance already declares that no industries needing timber as a raw material are to be permitted in this site. **Any further industrial development of this site should therefore include strict provisions for the protection of these Forest Reserves, and should establish a local land use plan that provides an appropriate buffer zone to protect these forests from pollution, encroachments, and other threats of degradation.**

B. Regional Water Resource Limitations

Several questions regarding water supply and wastewater discharge need to be answered before industries with significant water requirements are permitted to locate at this site.

1. Further analysis is needed to determine the sustainable availability and quality of ground water at this site. Pumping tests done for the paper recycling plant are not adequate for this purpose.
2. The possibility of withdrawing water from nearby surface water bodies needs careful quantitative analysis to determine what potential conflicts with existing local and downstream users might result from such withdrawals.
3. The very low seasonal flows in nearby water bodies means that there may not be sufficient flow in them during dry periods to allow for the required dilution of wastewater discharges. Advanced wastewater treatment (including nutrient removal) might serve to mitigate adverse impacts, but would likely be quite expensive to accomplish.

C. Regulatory Issues

Plans for either surface or ground-water withdrawals to supply water to this site should be based on further analysis, and should be reviewed and approved by the Water Supply and Drainage Board, the C.E.A., the Irrigation Department, and local authorities.

To avoid significant adverse impacts on the forest reserves adjacent to this site, M/ID should place special restrictions on air pollution and noise emissions from industries using this site. M/ID should also involve local and regional authorities in preparing and administering an area land-use plan before allowing additional industries to use this site. This plan should designate approved locations for roads, utilities, housing, commercial development, and cultural/recreational activities, and should also establish a buffer zone to limit commercial and residential development on lands adjacent to the forest reserves.

VII. GENERAL CONCLUSIONS AND RECOMMENDATIONS

This site was rated by the study team as having **medium to low pollution assimilative capacity and medium to high local resource availability**. The site is considered to be generally suitable for a variety of small to medium-scale industries that do not have large water needs and that do not produce significant wastewater discharges, air pollutants, or noise emissions. The site is in a valley and hence prone to air and noise pollution.

The principal environmental constraints on the use of this site by heavier industry (industry with high resource needs and/or pollution potential) are:

- Uncertainty about the sustainable quantity and quality of ground or surface water available to the site;
- Limitations on wastewater discharges due to low seasonal flow in local surface waters;
- Potential for adverse impacts on adjacent forest reserves and therefore limited site expandability.

Establishment of the Buttala Affiliated University College nearby may accentuate some of the above-mentioned environmental concerns (especially those relating to water use, air pollution, and noise); however, it also presents an opportunity to attract industrial research and technical facilities, testing laboratories, etc. to the site that could benefit from formal or informal relationships with such an educational institution. Efforts by M/ID to develop this site could promote the potential for such relationships, as other governments in Asia are doing.

REFERENCES

Dissanayake, C. B. And S.V. R. Weerasooriya, The Hydrogeochemical Atlas of Sri Lanka, Natural Resources Energy and Science Authority (NARESA) of Sri Lanka, 1985.



Location Map of Proposed Industrial Estate - Buttala

Scale Produced using 1:63,360
Topographic Map

- | | |
|------------------------|--|
| A - Archeological | P - Percolation Measurement Point |
| E - Schools | Q - Water Quality Sampling Point |
| H - Important Habitats | R - Religious (Temple, Church, Kovil/Mosque) |
| I - Industries | S - Soil Sampling Point |
| M - ... | W - Wa ... Me ... |

ANNEX A-III: SITE PHOTOGRAPHS - BUTTALA



A. Proposed site for Industrial Estate at Gam-udawa site in Buttala.



B. Approach to the proposed Industrial Estate Site - Tri Star Garment Factory building is in the foreground and Rahatankanda as a silhouetted backdrop.

ANNEX B: DETAILED SOIL ANALYSIS

SOIL AND SURFACE WATER : METHODS OF COMPUTATION

- ◆ Site Elevations in MSL are based on Survey Department Topographic Maps or available contour maps for the respective site.
- ◆ Maximum slope values are based on physical measurements during study.
- ◆ Reservoir capacity estimates other than from irrigation department are based on the average depths observed during site visits.
- ◆ Rainfall values are based on data collected from regional institutions during site visits and the historical data from hydrological annuals and Ceylon Electricity Board Water Resources Data Base (July 1987).
- ◆ Maximum, Minimum and Average river flows are based on the historical flow data. In cases where streamflow data were absent, representative runoff ratios from hydrological annuals were used with rainfall in respective regions and watersheds identified using topographic maps.
- ◆ Hydraulic Conductivity Data and Sorptivity data are based on Infiltrometer Tests done at each site fitted to infiltration curve by Philip (1957).
- ◆ Soil moisture contents and the organic matter contents by Gravimetry.
- ◆ Soil quality by liquid (water) extraction and relevant water quality methods.
- ◆ Wind and temperature estimates are based on the information in the National Atlas of Sri Lanka.
- ◆ Soil classification is according to the unified system.

Soil Data for Proposed Industrial Estate at Buttala

Description	Unit	Site 1
Sampling Depth	mm	250
Moisture Content	%	12.27
Organic Matter	%	3.215
Classification		SP
Chloride Cl ⁻	mg/gr	0.30
Nitrates No ₃ ⁻ -N	mg/gr	0.00
Fluoride F ⁻	mg/gr	0.04
Phospate PO ₄ ³⁻ - P	mg/gr	N/D
pH		6.25
Hydraulic Conductivity (saturated)	cm/hr	N/A
Sorptivity	cm/(hr ^{1/2})	N/A

N/D = Not detected

N/A = Not available

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ANNEX C: DETAILED WATER QUALITY ANALYSIS

INDUSTRIAL ESTATES SITING STUDY, 1995

SUMMARY OF ANALYTICAL METHODS

PARAMETER	UNITS	METHOD	DETECTION LEVEL
TSS	mg/l	Gravimetry	-
TDS	mg/l	Gravimetry	-
DO	mg/l	Titrimetry	-
BOD	mg/l	Titrimetry	-
COD	mg/l	Open - Reflux, Titrimetry	-
pH	-log H ⁺	Selective ion electrode	0.01
Cl ⁻	mg/l	Titrimetry	-
SO ₄ ²⁻	mg/l	Gravimetry	-
F ⁻	mg/l	Colorimetry	0.1
NH ₄ ⁺ - N	mg/l	Colourization/Spectrophotometer	0.01
NO ₃ ⁻ - N	mg/l	Colourization/Spectrophotometer	0.01
PO ₄ ³⁻ - P	mg/l	Colorimetry	2.0
Alkalinity	mg CaCO ₃ /l	Titrimetry	-
Hardness	mg CaCO ₃ /l	Titrimetry	-

WATER QUALITY ANALYSIS :

PROPOSED SITE AT BUTTALA

MONERAGALA DISTRICT

Location	Date of Sample	TSS	TDS	DO	BOD ₅	COD	<u>BOD</u> COD	pH	Temp.	Cl ⁻	SO ₄ ²⁻	F ⁻	NH ₃ -N	NO ₃ ⁻ -N	PO ₄ ³⁻ -P	Carb. Alk.	Bicarb. Alk.	Carb. Hard.	Non-Carb. Hard.	Flow rate
Site drainage pit	Aug 28 1995	10.0	310	4.2	0.4	28	0.02	7.5	27	16	29.62	3.2	0.14	0.05	ND	Nil	280	230	Nil	-
Udagama Ela	-do-	5.0	120	7.5	1.2	39	0.03	7.0	28	8.6	33.74	1.6	0.1	0.04	ND	Nil	80	60	Nil	0.1 ft ³ /S
Menik Ganga	-do-	12.0	100	9.1	1.2	36	0.04	7.2	26	8.5	24.69	2.4	0.1	0.05	ND	Nil	140	140	Nil	1.0 m ³ /S
Kuda Oya	-do-	4.0	150	8.6	1.2	32	0.04	7.8	27	8.6	20.57	2.0	0.1	0.03	ND	Nil	180	160	Nil	0.35 m ³ /S
Kumbukkan Oya	-do-	4.0	130	8.5	1.6	36	0.05	8.0	28	10.0	49.38	3.2	0.1	0.15	ND	Nil	120	90	Nil	2.0 m ³ /S
Well	-do-	27.0	120	7.2	1.2	36	0.03	6.0	27	9.5	14.00	0.8	0.08	0.04	ND	Nil	70	70	20	-
Proposed Minimum Ambient Quality	-do-	-	-	3.0	4.0	-	-	5-8.5	-	1200	400	1.5	4.0	5.0	0.7	-	-	600		

ND = Not Detected