ENVIRONMENTAL IMPACT ASSESSMENT
ON

A Parcel of Land presently used by **R.G.D. & CO.**
(previously used by Saha Chemical Works)
Sukanta Nagar, Sahara
P.O. Maikel Nagar, 24 Parganas North

Near Birati, Calcutta, India

Feb 17, 1997

Prepared for:

R.G.D & CO.
251 Nagendranath Road,
Calcutta, INDIA 700028
Phone: (33) 551-4280

LEGAL DESCRIPTION:
A1 Mouza Sahara, J.L. No. 46, Dag No. 139(P), Holding No. 898,
Ward no. 18, Parts A & B, containing about 5,374 sq. ft. in Maikel Nagar,
24 Parganas North, West Bengal

Prepared By:

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Crofton, Maryland, 21114 USA
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SCOPE OF REPORT

This report contains the findings of an environmental impact assessment and subsequent recommendation for pollution prevention and control for R.G.D & Co.'s facility at their new location in Sukanta Nagar, Sahara, P.O. Maikel Nagar, 24 Parganas, North. The facility lies on the northwest side of the main Jessore Road, about 1.5 2.5 Km northeast of the Birati Morh, and contains about 5,374 square ft. (≈7½ Katha).

This investigation report covers the following major items:

1. A complete Environmental Assessment of the study area.
2. Investigation of the presence of any environmental risk from the adjoining properties.
3. Checking presence of toxic and hazardous waste on the property.
4. Certification of findings by a registered professional engineer.

INTRODUCTION

The subject facility has been used in the past by Saha Chemical Works for manufacturing of detergents, talcum powders, and similar other products. Prior to the onset of operation by R.G.D. & Co. in November '96, the buildings were cleared of all the equipment and machinery used by Saha Chemical Works.

An environmental investigation including the hydrogeological condition of the surface and ground water system of the property, and its vicinity has been conducted and compiled in this report. An investigation of the interrelationship of geologic structures and available information on their water-bearing capabilities is also presented. The study area includes the entire property consisting of approximately 5,374 sq ft. The location of the study area and the adjacent area is shown on Figure 1. The adjacent area includes areas within ¼ mile radius of the subject property.

Based upon the available information, the quality and quantity of water in the surface and ground water systems are evaluated and reported in this study. A description of the baseline hydrologic conditions in the study area is furnished in this report. Any expected changes in these conditions due to the presence of industries in and around the subject property have been evaluated and reported in this study. The conclusions arrived at in this report are based upon the available database and field measurements.

The study area is contained in a fenced area of varying widths and lengths as shown on Figure 2. A two-story building of approximately 700 sqft. exist in Part A of the property, and another shed of approximately 400 sqft. is contained in Part B of this property.

As reported by Mr. Shyamal Mukherjee, President of R.G.D. & Co., the subject property was used by Saha Chemical Works from Jan 27, 1986 until June 25, 1996, when the property was sold to R.G.D. & Co. The ownership of the land and buildings were transferred at that time to R.G.D. & Co. After acquiring the property, R.G.D. & Co. moved their plant and machinery for shoe manufacturing operation to this property and started production at this facility on November 6, 1996.

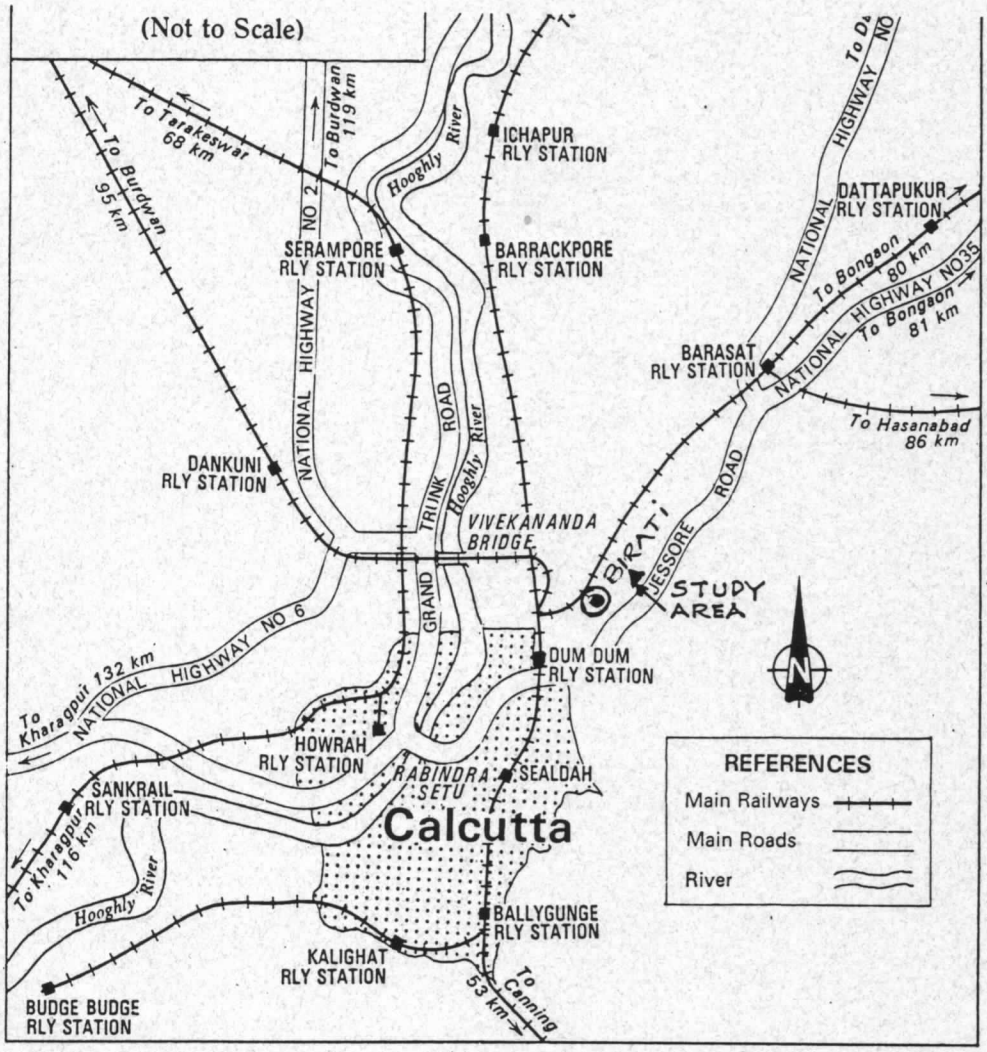


Figure 1. Location of the Study area

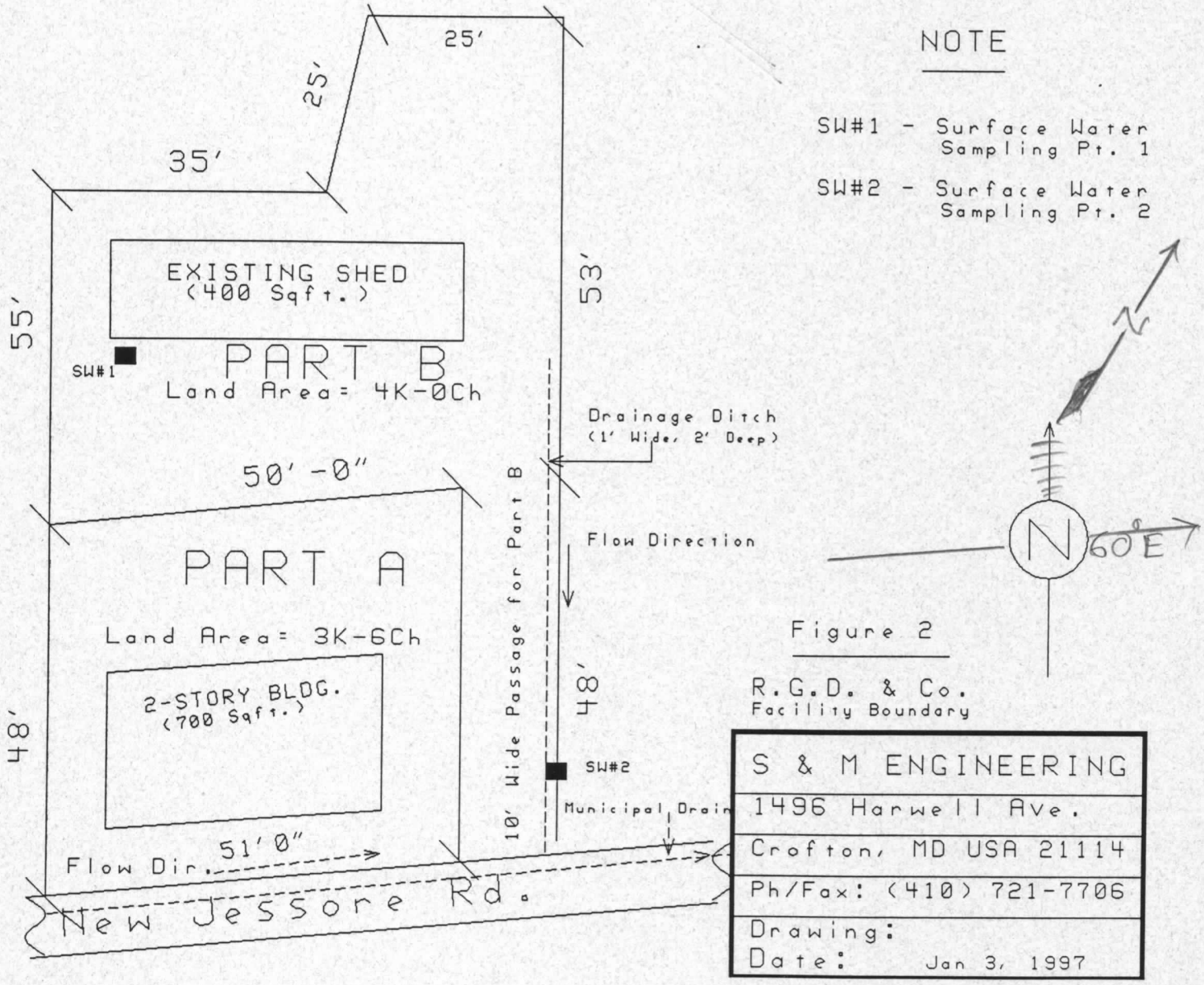


Figure 2. Facility Boundary and Water Sampling Points in the Study Area.

ENVIRONMENTAL ASSESSMENT

The existing climatic, topographic, and hydrogeological conditions prevailing in and around the study area are described below:

CLIMATE:

A humid climate prevails in the study area and its vicinity. Annual precipitation on the study area based on a 10-year average is found to be 146.1 cm (57.5 inches). The monsoon regime of rainy season begins in June and rolls on until September. The monsoon rain accounts for over 80% of the annual precipitation at the site. From December through February minimum precipitation is observed to occur. May is generally the hottest month. Average bi-monthly temperature and precipitation data for the site is furnished in Table 1.

TABLE 1. AVERAGE BI-MONTHLY TEMPERATURE & PRECIPITATION AT THE SITE (Calcutta)

Parameter	January	March	May	July	September	November
Temperature (Max.)	27 °C (80.6 °F)	34 °C (93.2 °F)	36 °C (96.8 °F)	32 °C (89.6 °F)	32 °C (89.6 °F)	29 °C (84.2 °F)
Temperature (Min.)	13 °C (55.4 °F)	21 °C (69.8 °F)	25 °C (77 °F)	26 °C (78.8 °F)	26 °C (78.8 °F)	18 °C (64.4 °F)
Precipitation	1.0 cm (0.39 in.)	3.6 cm (1.42 in.)	14 cm (5.51 in.)	32.5 cm (12.80 in.)	25.2 cm (9.92 in.)	2.0 cm (0.79 in.)

Source: 1997 Guide to India, St. Martin's Press, NY.

The total pan evaporation data was not available for the site. Records on some of the local meteorological parameters having effect on surface runoff, air quality, particulate transport, and intensity of photochemical smog were also unavailable for the site.

Wind velocity varies considerably and can cause adverse effect due to increase in local concentration of dust and other particulates arising from the heavy vehicular traffic on the Jessore road along the south boundary of the site.

The maximum mean monthly temperature is found to be 36 °C (96.8 °F). May is found to be the hottest month in the year when daily high temperatures sometimes go above 40 °C (104 °F). The minimum mean monthly temperature is found to be 13 °C (55.4 °F). January is normally the coldest month in a year. It is not uncommon to see temperatures plunging below 10 °C (50 °F) in the month of January. Drastic variations within a certain month are sometimes observed.

Hydrogeological Investigation:

GEOLOGY:

Geology of the Study Area:

The pivotal area of study is on the North side of Jessore Road. The study area includes the entire property of 5,374 sqft. The adjacent area includes areas within ¼ mile radius of the subject property.

The study area lies in the district of North 24 Parganas of the State of West Bengal. It lies in the eastern part of the vast indo-gangetic plains. It is in the heartland of the coastal plains of Bengal. The Himalaya's deep nesting valleys fashion the watershed of the river Ganges which harbors the site in her vast plain. The site exist in a predominantly alluvial soil setting. The alluvial formation is underlain by a bedrock layer of variable thickness and depth.

Topography & Surface Water Information:

The surface elevation at the site does not significantly vary within the property boundary. However, there is a mild slope of about 1.5% from North to South side along the east property boundary of the site. The drainage ditch on the east side of the property carries runoff from the site and discharges to the municipal drain outside the property at a point near the entrance gate. The overall grading of the site from East to West or North to South does not follow an uniform grading pattern. This non-uniform grading and areas of sporadic low-spots in the property contributes to the drainage problem in the property. Elevation differences from North to South are not significant. On the South side of the existing shed the land seems

to slope very mildly to the south. In the study area the surface slopes east and south and all surface water runoff is drained to the east into an existing drainage ditch, which then drains to the municipal drain outside the property boundary. This municipal drain flows eastward and confluences with the Ganganagar Canal (Khal) at a point about 0.5 Km east of the main gate of the property. During the site inspections in July and August, 1996 this municipal drain was found to carry runoff at a moderately high level.

STRATIGRAPHY AND LITHOLOGY:

The alluvium and terrace deposits are exposed in most of the district and is approximately 150 feet to 375 feet thick in various parts of the district. Typical depth of tubewells around the study area were reported to be around 380 feet.

The study area is contained in an exposed alluvial formation and is underlain by a bedrock of a sedimentary origin. The study area lies in the greater Calcutta area of the State of West Bengal. Erosion has formed a plain and mildly rolling surface in most of the study area.

HYDROLOGY:

AVAILABILITY OF GROUND WATER

Ground water in the greater Calcutta area is derived from precipitation falling directly upon the area. The coastal areas along the Bay of Bengal gets some infusion of the groundwater from the Bay and in areas along the Hooghly river the ground water is recharged from the river. For areas close to the study area however, precipitation accounts for the groundwater recharge. The average annual precipitation is about 57.5 inches. The overall humid climate of the area allows a substantial part of the precipitation to be used for surface runoff and recharge to the groundwater reservoir. During the principal recharge period, from May to November, a part of the rainfall percolates from the land surface downward into the underlying aquifer and becomes ground water. The capacity of the underlying rocks to absorb and transmit water depends upon the number, size, shape, and arrangement of the openings in them.

Water generally moves very slowly through fine-grained rocks such as siltstone and shale because the openings between the rock particles are too small to transmit water freely; thus, yields of wells penetrating the rocks are small. Whereas water moves more freely through medium- to course-grained sandstone and gravel; therefore, yields of wells penetrating the course-grained sandstone are relatively large.

MAJOR AQUIFERS

An aquifer is a geologic unit, a part of a geologic unit, or a group of units that will yield significant amounts of water to wells. For this report, major aquifers are of two types: aquifers in unconsolidated alluvium and terrace deposits, and aquifers in bedrock. Generally, the water-bearing properties of alluvium and of terrace deposits are similar; thus, these two units are combined and counted as a single aquifer along major streams. The units consist of lenticular layers of silt, clay, fine sand, and locally a layer of course sand and gravel at the base. The yields of wells depend largely upon the saturated thickness of the course sand and gravel; highest yields are obtained where the saturated layers are thickest.

In some areas in North 24 Parganas alluvium and terrace deposits are used as the source of water for irrigation, and industrial through installation of shallow wells. As no large-capacity wells are known to have been drilled in the alluvium and terrace deposits, the potential yields of these units in this can only be estimated on the basis of specific geologic information and yields of other similar wells in the alluvium deposits of the location of interest.

Ground-water supplies in alluvium and terrace deposits can be made available for use by the installation of properly constructed wells. Pumping of large amounts of water from these units, however, lowers the water table. Lowering of the water table may cause some water to flow into the alluvium from the nearby stream. Therefore, pumping of large amounts of water from the alluvium can reduce streamflow. In some areas poor-quality water from the stream may cause deterioration of the quality of water in the alluvium.

Mining of water occurs when the amount of water pumped from the aquifer is greater than the amount of recharge. Such mining decreases the amount of water available from the aquifer and is reflected by water levels that continue to decline year after year.

Data are not available to accurately predict the duration, intensity, and areal extent of problems that may result from development and use of large-capacity wells in the alluvium and terrace deposits. Development and use of large-capacity wells in the sandstone aquifers might result in deterioration of water quality, mining of water from the aquifer (which would decrease the amount of water available), and possibly minor amounts of land-surfaced subsidence. The areal extent and duration of such effects have not been determined.

WATER-LEVEL FLUCTUATIONS

Although most rain falls during the monsoon season, most ground-water recharge takes place during late Summer and early spring. Thus water levels are highest in late summer and early winter months and begin to decline in early spring and continue to decline until the beginning of the monsoon season when they are at their lowest levels. In late summer they begin to rise. During the late summer months, water levels in some of the sandstone formations rise rapidly in response to rainfall.

SURFACE WATER HYDROLOGY

The study area lies in the greater Hooghly River watershed. The study area and its vicinity is drained through a municipal drain to the Ganganagar Canal which finally drains to the Hooghly river at a point about seven (11.2 Km) miles west of the site. Runoff from the site flows through a drainage ditch to the municipal drain just outside the site boundary on the south side. The municipal drain discharges into the Ganganagar canal (Khal) at about 0.5 Km on the east side along Jessore road. This watershed consists of a mixture of industrial, residential, open pasture area, street easement area, and runoff from the nearby runway and open areas of the Dum Dum airport

The surface runoff from the Study area is observed to occur following rainfall events. No established runoff record of this watershed containing the Study Area is available.

WATER QUALITY:

Water quality records for the general area and its vicinity were not available. Chemical analyses performed recently on Surface water samples from the Study area are furnished in Table 1.

TESTING OF SOIL & WATER:

Chemical analyses were carried out on water samples, which were collected from the study area. Location of water sampling points are shown on Figure 2. Chemical testing of the water samples were performed by a registered laboratory of Government of India, Department of Sanitary Engineering. The test results are furnished in APPENDIX I.

The summary of the test results of the surface water samples showing their pH, Conductivity, Total Dissolved Solids, and Chemical Oxygen Demand (COD) are listed below:

TABLE 1 SUMMARY OF ANALYSES FOR SURFACE WATER SAMPLES FROM THE STUDY AREA

PARAMETERS	SAMPLE NO. 1 (Upstream)	SAMPLE NO. 2 (Downstream)
pH (SU)	7.46	7.10
Electrical Conductivity (μmhos/cm at 20°C)	380	2,100
Total Dissolved Solids (mg/l)	247	1,365
Chemical Oxygen Demand (COD) (mg/l)	28	372

The test results showed that the conductivity of surface water at the upstream location is of moderately good quality having low amounts of dissolved solids in it. The water quality of the downstream location, Sample No. 2, has higher conductivity which indicates that some dissolved solids are picked up by the surface water runoff as it flows through the property and the drainage ditch to the east of the property. The COD values were also higher in the downstream sample. However, the pH of the downstream sample didn't change considerably from the upstream sample. This indicates that no acidic discharges are possibly occurring from the facility. The surface water quality of the study area is thus expected to be within the local stream water quality of the Ganganagar Canal watershed. However, periodic monitoring of the downstream water quality would be necessary to check that the effluent quality do not exceed the present conductivity level of the downstream (Sample No. 2) by a large margin (such as 2.5 to 3 times). In general, some industrial wastes have conductivities above 10,000 μmhos/cm which is an indication of high Total Dissolved Solids (TDS), above 6,500 mg/l. In case of such high load of TDS in the wastewater, some pretreatment in a small settling basin or tank is recommended prior to discharge of the wastewater to the surface watercourse. Conductivity instruments could be used in discharging pipelines, flowing streams or channels to check the effluent levels in a useful and handy way.

No groundwater samples could be collected from the property due to absence of groundwater well.

The Lithological investigation of the study area consisted of visual inspection of the soils to a shallow depth inside and around the study area.

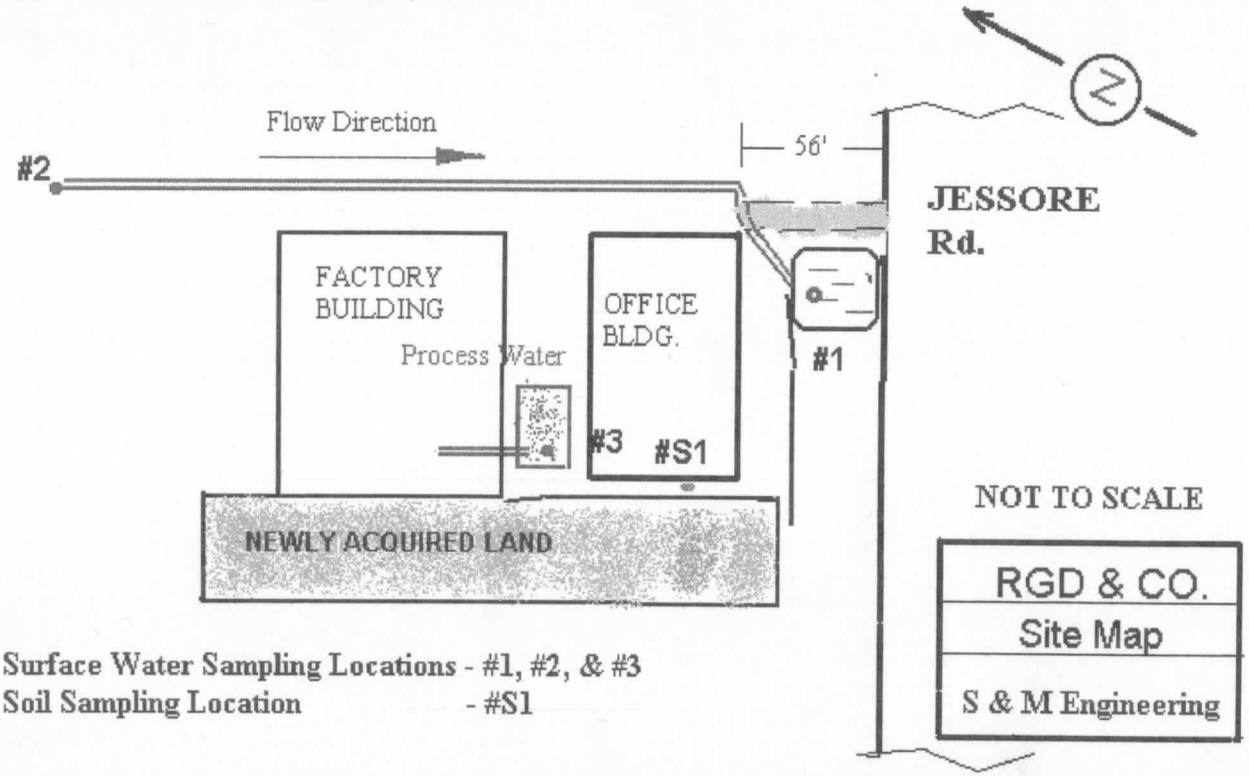
A columnar section of the alluvium deposits from the study area is shown in Figure 3.

ZONE #	DEPTH	LITHOLOGIC DESCRIPTION
A.	0-21"	Yellowish Brown Clay
B.	21-24"	Brown Clayey Sand
	T.D.	

Figure 3 Columnar Section of the Alluvium Deposits from the Study Area

No experiments were performed to calculate the permeability of different strata from the study area. The top stratum of the study area is not expected to have a high permeability because of high clay percentage in the soil. Due to this low permeability of the top stratum in the study area there is very little or no chance

RGD & CO. Site Visit, Dec. 15, 1999



Surface Water Sampling Locations - #1, #2, & #3
Soil Sampling Location - #S1

of vertical migration of any contaminant or spill from the site.

INVESTIGATIONS ON ADJACENT PROPERTIES

A survey of the adjacent properties to the site was conducted in January 1997. A location map identifying the businesses adjacent to the study area are shown on Figure 4.

On the East side of R.G.D & Co. along the Jessore road at about 0.7 Km there is a business named Samson Processing Industries. They are located in Sahara, Ganganagar, of North 24 Parganas District. This business outfit is conducting processing and dyeing of hosiery fabric for the past 15 years. They have two incinerators which have stack heights of about 50 ft. each. On the other (south) side of Jessore road at around the same distance (0.7 Km) east of the study area, is Mechno Paper Machines Ltd. which is in operation for the past five years at this location. Their equipment are mostly housed inside the buildings and the ones outside are presently stored in an orderly manner.

On the West side of the study area, towards Birati, at about 0.8 Km, a Truck stop or 'Dhaba' named Sher E' Punjab is in operation for over ten years. There are residential properties on both sides of the Jessore road between the study area and the Sher E' Punjab restaurant. Also, a small Car & Truck repair shop is continuing its operation for over five years in the vicinity of R.G.D. & Co.

The North side of the property, beyond the boundary of R.G.D. & Co. is bounded by a residential colony named Sukanta nagar.

The South side of the facility borders along the highly travelled Jessore road. Beyond Jessore road, further south of the facility, is the airport runway and a well-fenced open area belonging to the Calcutta Airport Authority.

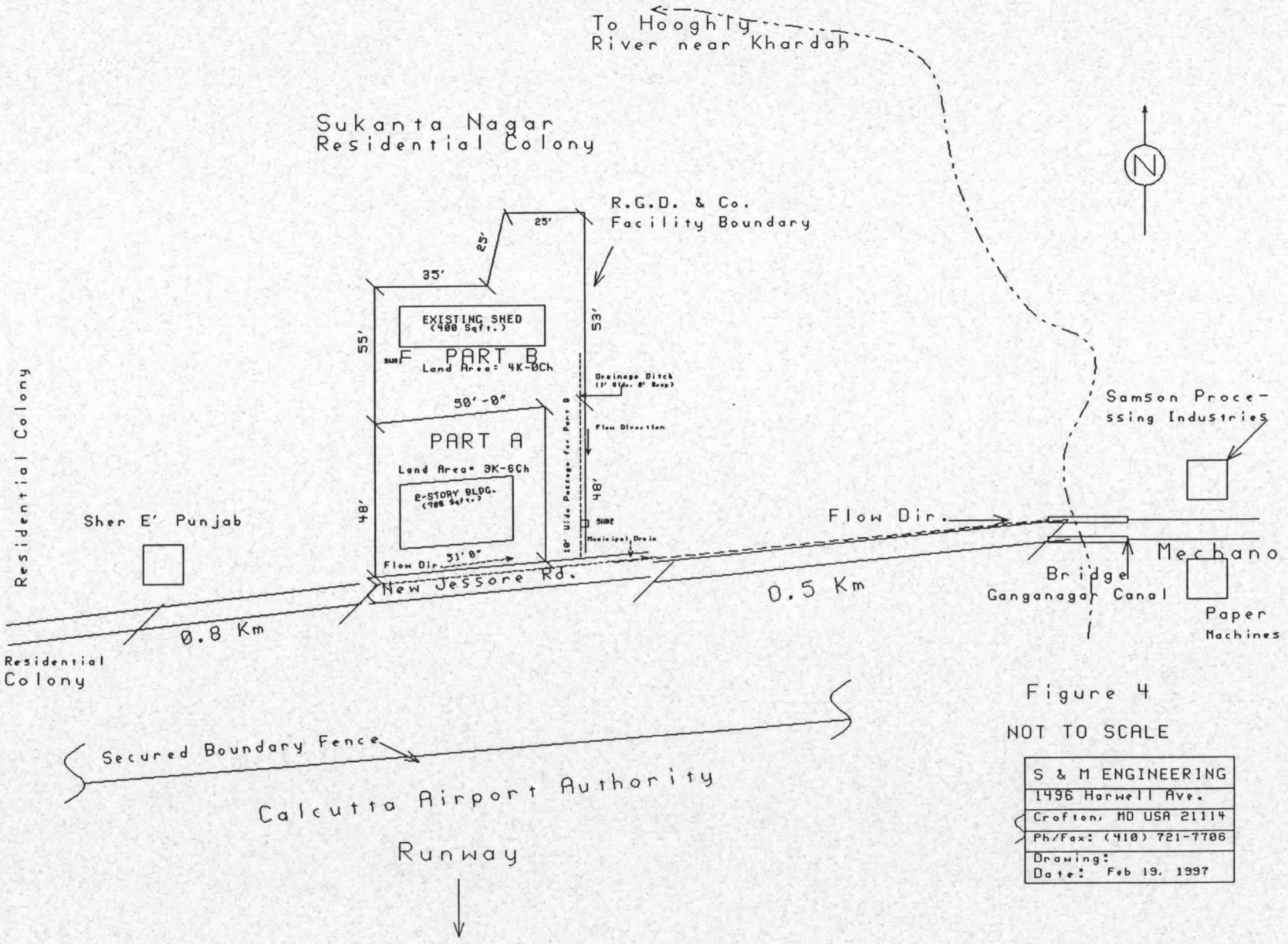


Figure 4. Location of businesses/industries within a ½ mile radius of the study area.

The adjoining properties were checked for any reported hazardous or toxic leaks or spills. As far back as 1987 and no reports of any leaks or spills were found when verbally enquired with the people working in the adjoining businesses. Verbal enquiries have also been made with the former owner of the subject facility, namely Saha Chemical Works, who has indicated to have no major leaks or spills during their occupation of the facility from Jan 27, 1986 until June 25, 1996, when the property was sold to R.G.D. & Co. Saha Chemicals used to manufacture detergent/chemicals using soap stone etc. raw materials.

R.G.D & CO.'S SHOE MANUFACTURING OPERATION

R.G.D and Co. has started manufacturing shoes at this facility as of November 1996. The process involves a vertical injection moulding machine which uses hydraulic oil. A well secured tank of about 150 litres capacity contains this oil. Small granules of PVC are fed through a hopper at 65 °C (149 °F) where it is molded to form the shoe components. A detail emission test of the granules at 65 °C by an Ion trap Gas Chromatograph/Mass Spectrophotometer (GC/MS) system has been conducted by Teledyne Electronic technologies, 3644 Oxford Court, Erlanger, KY USA 41018. The test result showed No Volatile Organic Compound (VOC) emissions from processing of the granules at 65 °C. It may be noted that until the pyrolysis temperature (around 400 °C) is reached the PVC granules used at this facility are not expected to break down its carbon chains to volatilize as other toxic organic compounds.

Waste generated from the injection moulding machines are recycled and reused at this facility.

CERTIFICATION OF FINDINGS

I, Subijoy Dutta, Registered Professional Engineer, do hereby certify that the subject property containing the land in both Part A & B, 2-story Building in Part A, and existing shed in Part B, located at A1 Mouza Sahara, J.L. No. 46, R.S. No. 3, C.S. Dag No. 139 (P), P.S. Airport, Dist. N. 24 Parganas of West Bengal, has been personally inspected by me on the 17th of June, 1996 for presence of any hazardous waste or pollutants in the improvements and on the site. The property has also been revisited in August, September, and November by other technical persons under my guidance and advice. Water samples from the subject property, located on the North side of Jessore Road, containing 5,374 square feet, and its vicinity have been collected under my guidance and advice and analyzed by a Registered Laboratory. Findings of the inspection and conclusions from the physical and chemical analyses of samples are furnished below:

- No hazardous waste or pollutants were known to be present or observed in the improvements and on the site of the subject property.
- No observable or known environmental risk from the adjoining or immediate properties were qualitatively found to exist.
- Only one facility, Samson Processing Industries, having two on-site incinerators has been located within a ½ mile radius, on the downstream side of the subject property. This facility conducts hosiery fabric dyeing and processing. However, being located on the downstream side of the subject property this industry is not expected to have any adverse environmental impact on R.G.D. & Co.'s operation.
- The lay out of machinery and equipment at this facility (R.G.D. & Co.) seems to be well thought out and organized. However, surface drainage from the property will have to be improved either by increasing/deepening the drainage ditch for easy drainage from the property.
- Although the effluent levels of TDS were not very high at the downstream sample location, it is recommended that the discharges from the facility be periodically monitored for conductivity or TDS. Conductivity meters could be used in discharging pipelines, flowing streams or channels as a useful and handy way to check the effluent levels.

Subijoy Dutta

SUBIJOY DUTTA, PE #19127

REFERENCES

1. Personal Communication with Mr. Shekhar Bagchi, Retd. Chief Engineer, Public Health Engineering Department, Rtd. Adviser, P.H.E.D. Govt. of West Bengal, in June, 1996.

2. American Public Health Association, "Standard Methods for the Examination of Water and Wastewater, 16th Edition, 1985.

3. McKee, Derek, "Let's Go - Guide to India & Nepal, St. Martin's Press, NY. 1997.

4. Dutta, Subijoy, "Hydrogeological Investigation Report on 901 N. Morgan Road", March, 1990.

APPENDICES

APPENDIX I

(Water Quality Analysis)

Govt. of India
Department of Sanitay Engineering
All India Institute of Hygiene & Public Health
110, C. R. Avenue, Calcutta - 73

Our Ref. No. : 95(P)

Dated the 22nd August'96

Report of chemical analysis of water samples received from Mr. Sekhar Bagchi, Rtd. Chief Engineer, Rtd. Adviser, P. H.E. D. Govt. of West Bengal.

No. of Samples : 3 (Three)

Parameters	Sample No. 1	Sample No. 2	Sample No. 3
	(US)	(DS)	TUBE WELL
1. pH	7.46	7.10	-
2. Electrical Conductivity (umhos/cm at 20°C)	380	2.100	-
3. Total Dissolved Solid (mg/l)	247	1.365	-
4. COD (mg/l)	28	372	-
5. Arsenic (mg/l as As)	-	-	*BDL

* Below Detection Limit

(A. K. Adhya)
Prof. & Head