



GEMTEC LIMITED
GROUND ENGINEERING
& MATERIALS TECHNOLOGY

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December 5, 2003

File: 3782.04

Mr. Mark Allen
Project Manager
Department of Health and Wellness
P.O. Box 5100
Fredericton, NB E3B 5G8

Dear Mr. Allen:

**RE: ENVIRONMENTAL SOIL INVESTIGATION
BELLEDUNE AREA, NEW BRUNSWICK**

The following is a summary report of the sampling work that was undertaken at several areas of concern in the Belledune region. The work was completed between November 26th and December 3rd, 2003.

Introduction

GEMTEC Limited was retained by the Department of Health and Wellness to undertake environmental sampling in the Belledune area. The purpose of the investigation was to determine the levels of lead, arsenic, and cadmium present in the surface soils in areas of concern. In addition to the soil sampling, wipe samples were also collected to evaluate the concentration of lead, arsenic, and cadmium in dust within the Belledune School. At a planning meeting held on November 26th, 2003, four main areas were targeted for soil sampling. These sites consisted of:

- 1) Belledune School playground,
- 2) School bus pickup site near the Pointe Verte Village sign,
- 3) Roherty Point
- 4) Townsite #2 Ball field.

Site locations are shown on Figure 1, and site photos are appended to this report.

The sites were initially visited by GEMTEC Limited on November 27, 2003, at which time a soil sampling protocol was devised. Field sampling was carried out by a team of four GEMTEC technicians on November 28 and 29, 2003. In addition to carrying out the planned sampling exercise, additional grab samples were obtained at several locations within the target areas. These additional samples were selected based on visual observations by GEMTEC field personnel or on recommendations by local residents. Most of the extra sampling took place along the bus route (Highway 134) and near a dust monitoring station opposite the Townsite #2 ball field. Samples of flaking paint were also collected from tires located in the school's playground, and a sample of metallic debris that was observed on the Roherty Point beach was also collected. The sample areas are shown in detail in the location drawings (Figures 2 – 7).

Site Descriptions

Area 1 Belledune School Playground (refer to Figure 2)

- School is located on the south side of Route 134.
- Property facilities generally consist of school, two paved basketball courts (one on each side of school), playground area (west side), driveways and parking (front of school), and a soccer field (south side or behind the school).
- The land is generally flat, although the soccer field is elevated approximately 1.5 m above the surrounding area.
- Except for paved areas, the site is grass covered.
- The playground area, west of the school, consists of swing sets, slides, teeter-totters, and old tires used as climbing apparatus. The area around the tires has been fenced off with orange snow fence.

- To the east, west and south the adjacent properties are lightly wooded.
- The school well is located near the highway on the northwest corner of the site.

Note: Local testimony (a municipal office worker) indicated that the areas fenced off on the site were the locations where the soils tests by others indicated high levels of lead).

Area 2 *School Bus Stop (Pointe Verte Sign) (refer to Figure 3)*

- Several sites were viewed at the west end of Pointe Verte, including the bus stop located near the Town sign on Route 134.
- The School Board Transportation officer (Mr. Guy Guitard) met with Mr. Ron Cormier, senior technician for GEMTEC, and identified the actual bus stop area.
- Bus stops are simply gravelled areas where widened road shoulders or driveways are present along the highway. No other structures are present

Area 3 *Roherty Point (Little Belledune Point) (refer to Figure 4)*

- Roherty Point is located at the northeast end of Roherty Beach Road, which in turn intersects Route 134 (just west of the Belledune School).
- Large armour stone has been placed at the end of the Roherty Point Road.
- Several narrow and unpaved roads branch off of the Roherty Point Road near the beach.
- Generally the area is flat with a slight grade toward the Bay of Chaleur. On the east side of Roherty Beach road a large bog or swamp area is present. The land to the east of Roherty Point Road is tree covered.
- Several fire pits were observed adjacent to the beach. Some debris and garbage were present.
- Near the water, the beach is very gravelly, becoming sandier near the shoreline. A municipal worker indicated that the beach drops off very quickly at this location and therefore is not a good spot for swimming. The locals fish mackerel in this area.
- The shoreline is lightly vegetated, and exposed soils resemble peat.

Area 4 **Town Site No. 2 (old ball field)** (refer to Figures 5 &6)

- Former recreation site (ball field) is located northeast of the intersection of Hodgson Road and Chaleur Drive.
- The site contains a backstop and outfield fence, but no dugouts or any other structures are present.
- The site is grass covered and has been routinely mowed, although a local maintenance worker indicated that the site is not used anymore, now that the Town has constructed a new recreation facility on Route 134.
- The land is flat, with a slight grade toward the north.
- The lands to the east and the north are tree covered.
- Across the road to the south, an air quality monitoring station is present (Noranda).

Sample Methodology

The objective of the sampling exercise was to determine lead, cadmium, and arsenic levels in the surface soils and determine their geographic distribution on the sites in question. To achieve this objective, the following tasks were undertaken:

- **Composite soil samples** were collected at the Belledune School and the Townsite #2 ball field following the US EPA protocol (Soil Screening Guidance: Technical Background Document EPA 1996). Following this methodology, soil specimens are taken from a systematic grid-sampling scheme covering an exposure area. Thirty-six soil specimens are blended and reduced to six representative soil samples for each exposure area. These samples are meant to provide representative concentrations of chemicals of concern (in this case metals) across the exposure area.
- **Grab samples** were collected at the Roherty Point beach and bus stop locations, because the exposure areas were not well defined. A grab sample is defined as a single sample collected at a particular time and place that represents the composition of the media only at that time and place. Grab samples are typically

collected as part of reconnaissance surveys and target specific areas of interest such as suspected “hot spots”.

- **Dust wipe samples** were also conducted inside the Belledune School from various surfaces such as walls, tables, windowsills and desks. Wipe samples were collected according to NIOSH Method 9100.
- Samples were collected from paint flakes on the tires located on the school property and from dumped or discarded material found on the Roherty beach (metal pieces). This sampling was performed in order to confirm whether these specific materials might be the source of elevated metal concentrations in those particular areas.

A total of 42 samples were sent to RPC Laboratories in Fredericton for analysis of arsenic, cadmium and lead. Thirty-three (33) of these samples consisted of soil samples, fourteen (14) of which were composite samples that were blended based on the EPA 1996 methodology. The other soil samples were discrete grab samples collected at different areas of concern. Five (5) wipe samples were collected from inside the school on walls, desks, window sills and table surfaces. Two (2) paint samples were collected from the tires in the school playground area. A description of the samples is summarized in the three tables which follow.

Analytic Results

Analytical results for the soil samples, the wipe samples and the metal/paint samples are presented in Tables 1 through 3.

The soil sample analytical results were compared to the Canadian Environmental Quality Guidelines for soils (residential and parkland use). The US EPA uses a residential soil quality guideline of 400 mg/kg (children play area) and 1200 mg/kg (remaining soil in yard). Wipe samples were compared to the United States Environmental Protection Agency (US EPA) Lead Dust Hazard Standards (2001).

Table 1: Soil analytical results for four sample areas around Belldune (mg/kg)

Sample ID	Sample type	Location	Sample Date	Arsenic	Cadmium	Lead
Area 1 - Belldune School						
GEMBSCXA	Composite	Belldune school playground	11/29/03	11	0.8	42.3
GEMBSCXB	Composite	Belldune school playground	11/29/03	11	2	106
GEMBSCXC	Composite	Belldune school playground	11/29/03	12	1	52.2
GEMBSCXD	Composite	Field duplicate of GEMBSCXC	11/29/03	12	1	55.2
Duplicate	Composite	Laboratory internal QA/QC	11/29/03	12	1	49.6
GEMBSCXE	Composite	Belldune school playground	11/29/03	11	0.9	46.7
GEMBSCXF	Composite	Belldune school playground	11/29/03	12	0.8	44.4
GEMBSCXG	Composite	Belldune school playground	11/29/03	13	1.4	74.7
GEMBSC8S1	Grab	Soil below tires - W (school)	11/29/03	14	1.7	158
GEMBSC7S2	Grab	Soil below tires - W (school)	11/29/03	10	1.6	70.4
GEMBSC9S1	Grab	Sand in sandpit at school	11/29/03	24	1.4	501
Duplicate	Grab	Laboratory internal QA/QC	11/29/03	9	1.3	310
Area 2 - Pointe Verte Bus Stop						
GEMPVBS1	Grab	Pointe Verte bus stop	11/29/03	55	5.1	1760
GEMPVBS2	Grab	Pointe Verte bus stop	11/29/03	45	5.5	2010
GEMPVBS3	Grab	Pointe Verte bus stop	11/29/03	51	3.4	1420
GEMPVBS4	Grab	Pointe Verte bus stop	11/29/03	28	2.1	778
GEMPVBS5	Grab	Pointe Verte bus stop	11/29/03	32	4.7	1230
GEMPVBS6	Grab	Pointe Verte bus stop	11/29/03	38	3.9	1300
Area 3 - Roherty Point						
GEMRBS1	Grab	Roherty Beach (sand E)	11/29/03	4	< 0.1	7.3
GEMRBS2	Grab	Roherty Beach (sand)	11/29/03	5	0.2	20.8
GEMRBS3	Grab	Roherty Beach (sand W)	11/29/03	4	< 0.1	10
GEMRBS4	Grab	Roherty Beach (below vegetation)	11/29/03	6	1.6	92.4
Duplicate	Grab	Laboratory internal QA/QC	11/29/03	5	1.4	85.1
GEMRBS5	Grab	Roherty Beach (below veg. W)	11/29/03	5	1	334
GEMRBS6	Grab	Roherty Beach (black silt/organic)	11/29/03	6	0.2	24
GEMRBS7	Grab	Roherty Beach (black silt/org W)	11/29/03	4	1.5	83.2
Area 4 - Townsite						
GEMTBFXA	Composite	Townsite ball field #2	11/29/03	15	2.2	215
Duplicate	Composite	Laboratory internal QA/QC		14	2	200
GEMTBFXB	Composite	Townsite ball field #2	11/29/03	16	2.6	214
GEMTBFXC	Composite	Townsite ball field #2	11/29/03	14	2.4	153
GEMTBFXD	Composite	Field duplicate of GEMTBFXC	11/29/03	18	2.8	162
GEMTBFXE	Composite	Townsite ball field #2	11/29/03	12	2.1	111
GEMTBFXF	Composite	Townsite ball field #2	11/29/03	14	2.3	160
GEMTBFXG	Composite	Townsite ball field #2	11/29/03	14	2.4	171
GEMDMS1	Grab	Near dust monitoring station	11/29/03	29	3.6	404
GEMDMS2	Grab	East of dust monitoring station	11/29/03	47	7.6	2210
CCME guidelines for residential/parkland (mg/kg)				12	10	140

analysis performed by RPC laboratory

"nd" denotes not detected

Result above guideline are bolded and shaded

Table 2: Wipe samples - Belledune School (ug/100cm²)

Sample ID	Location/type	Sample Date	Arsenic	Cadmium	Lead
QA/QC	Laboratory internal QA/QC		< 0.1	< 0.01	< 0.01
BSS1	Hallway wall	11/29/03	0.1	0.01	0.09
BSS3	Lunchroom table	11/29/03	0.1	< 0.01	0.11
BSS5	Classroom desk 3 to 5	11/29/03	0.1	0.01	0.15
BSS6	Class window sill K to 2	11/29/03	0.1	0.02	0.32
BSS7	Boys washroom blue wall	11/29/03	0.2	< 0.01	0.1
US EPA (residential)	Floors Window Sills (interior)				4 27

no guideline available for arsenic and cadmium

Table 3: Paint and metal analytical results

Sample ID	Location/type	Sample Date	Arsenic mg/kg	Cadmium mg/kg	Lead Concentration
GEMRBS8	Metal pieces on Roherty Beach	11/29/03	< 10	< 1	> 98 %
Duplicate*	Lab internal QA/QC		160	< 1	> 98 %
GEMBSC7S1	Paint from tires - W (school)	11/29/03	4	3.8	195 mg/kg
GEMBSC8S2	Paint from tires - E (school)	11/29/03	4	2.4	313 mg/kg

* The duplicate portions taken differed in physical appearance.

The duplicate sample contained particles of white material in addition to the lead material.

Conclusions

General

- None of the sample results exceeded the applicable criteria for cadmium.

Area 1 *Belledune School Playground*

- Arsenic levels in the soils on the playground property range from 10 to 14 parts per million (ppm), slightly exceeding the CCME guideline of 12 ppm.
- Lead levels in the soils of the playground area range from approximately 42 to 106 ppm. In the soils around the tires and in the sand pit area, however, lead concentrations were found to exceed the CCME guideline of 140 ppm. This is quite likely due to the past use of lead paint on the playground equipment and/or from sand imported to the site (sandbox area). Samples of flaking paint, taken from the tires, contained lead at levels of 195 and 313 ppm. It is important to note that the sand pit area is small compared to the total playground area.
- Lead concentrations in dust wipe samples taken from inside the Belledune School were all below US EPA Guidelines (sample locations shown in Figure 7).

Area 2 *School Bus Stop (Pointe Verte Sign)*

- All of the bus stop samples contained levels of both arsenic and lead in excess of the CCME guidelines for residential/parkland.

Area 3 *Roherty Point (Little Belledune Point)*

- All lead and arsenic levels in samples obtained at Roherty Point were below CCME guidelines, with the exception of one sample (Sample S5) taken below the vegetation mat in an area where scattered debris was observed.
- Metal debris found on the beach (Sample S8) contained 98 percent lead.

Area 4 *Town Site No. 2 (old ball field)*

- Arsenic levels in the soils of the ball field ranged from 12 to 16 ppm.
- Lead levels in the soils ranged from 111 to 215 ppm.
- Samples taken across the road from the ball field, at the site of the Noranda air monitoring station contained higher levels of both arsenic and lead. These samples were taken in areas where local testimony indicated that fill materials were imported or dumped on the site.

This report was prepared by Christina St.Amand, B.Sc., CESA, and reviewed by Mr. Paul McNeil, P.Eng. If you have any questions, please contact the undersigned.

Sincerely,

Paul McNeil, P. Eng.

Enclosure

APPENDIX A
SAMPLING LOCATION FIGURES

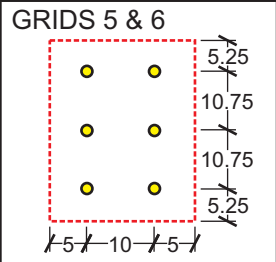
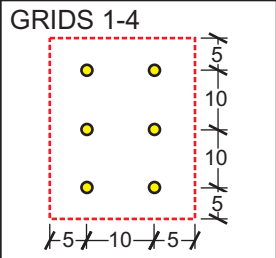
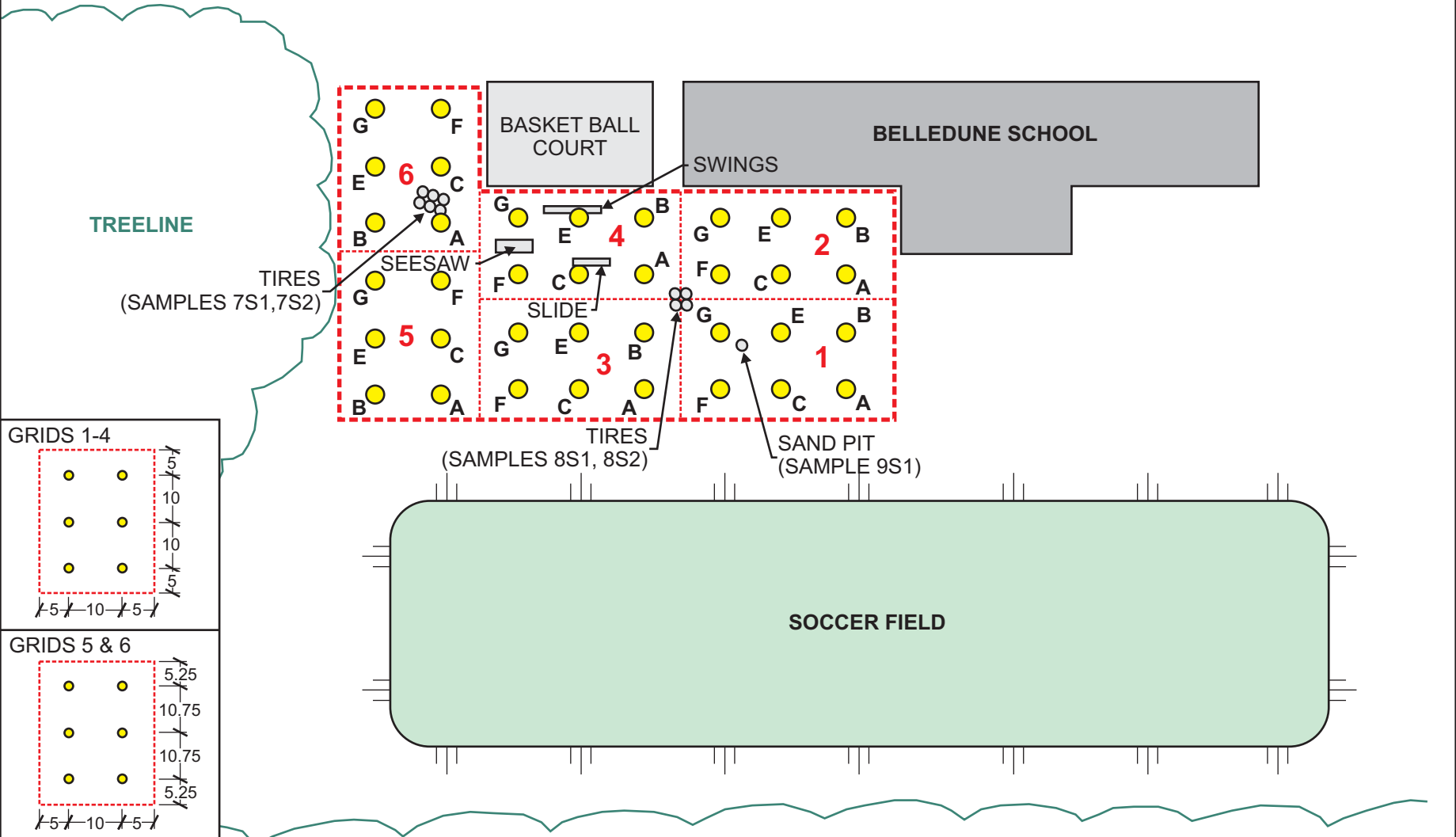


Project		Drawing		
DEPARTMENT OF HEALTH BELLEDUNE, NB		SITE LOCATION PLAN		
Drawn By	Date	File No.	Drawing No.	Revision No.
AGSD	DEC., 2003	37820414	FIGURE 1	0



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ROUTE 134

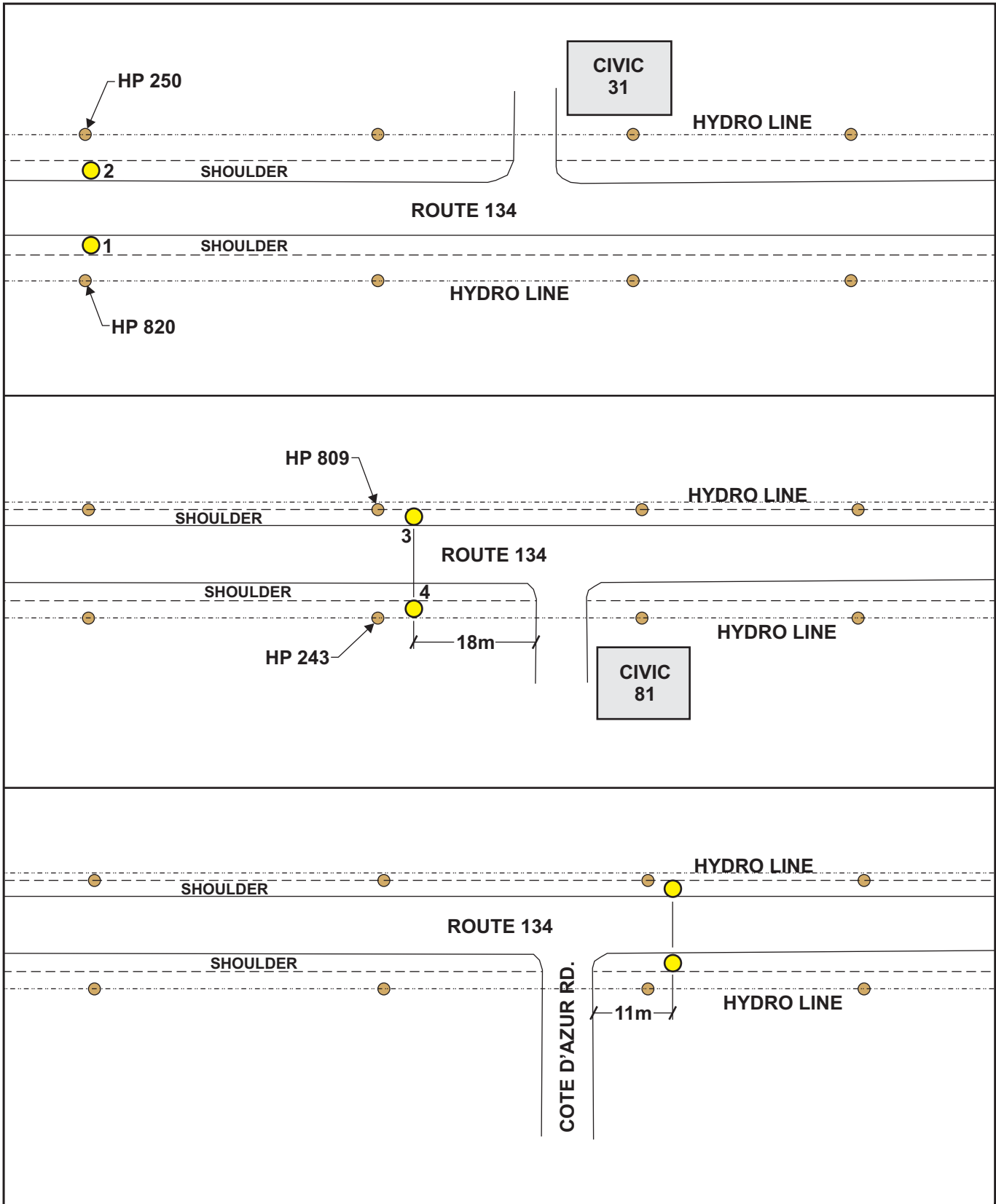



Project
 DEPARTMENT OF HEALTH
 BELLEDUNE, NB

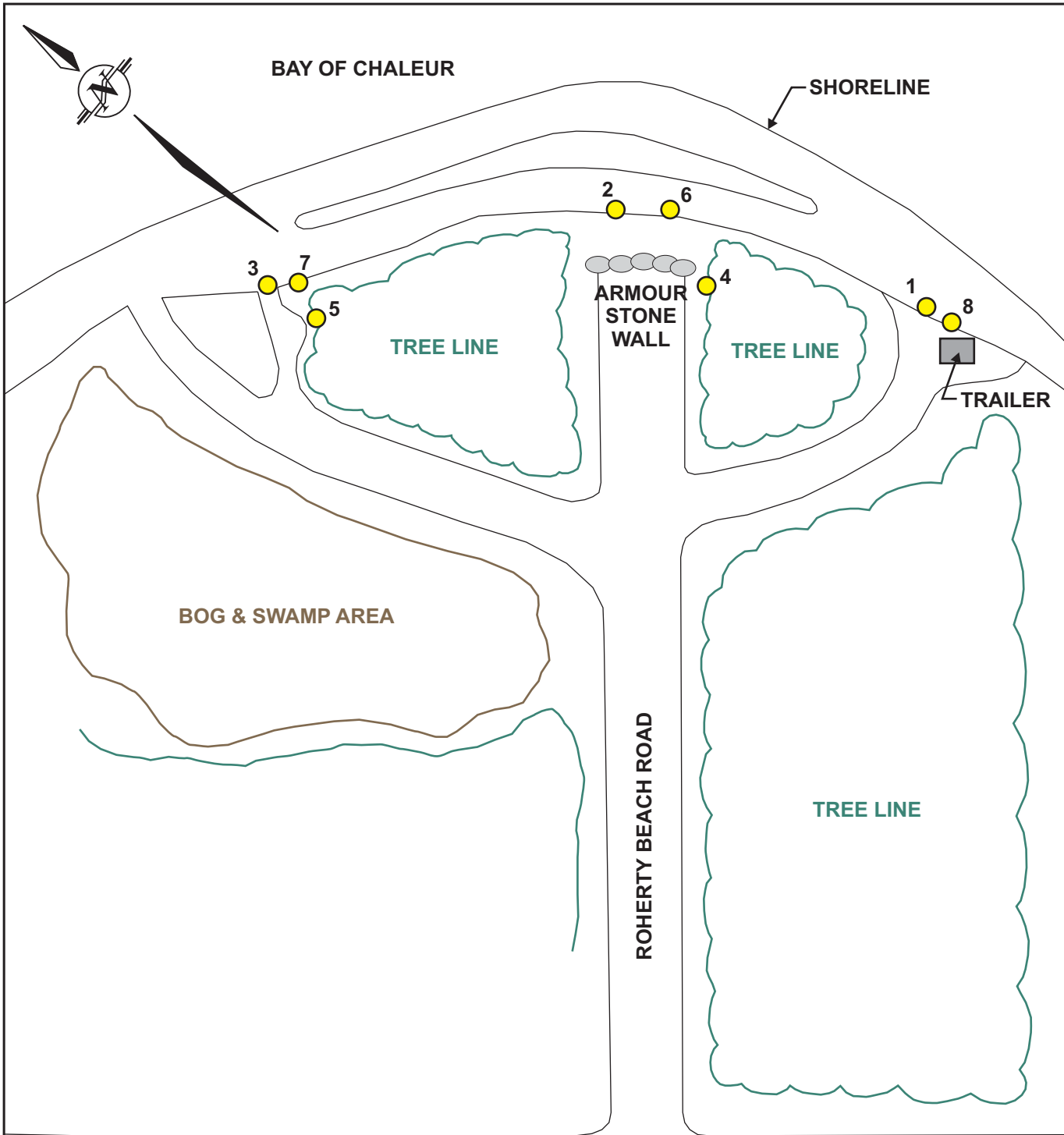
Drawing
 BELLEDUNE SCHOOL




Drawn By AGSD	Date DEC., 2003	File No. 37820404	Drawing No. FIGURE 2	Revision No. 0
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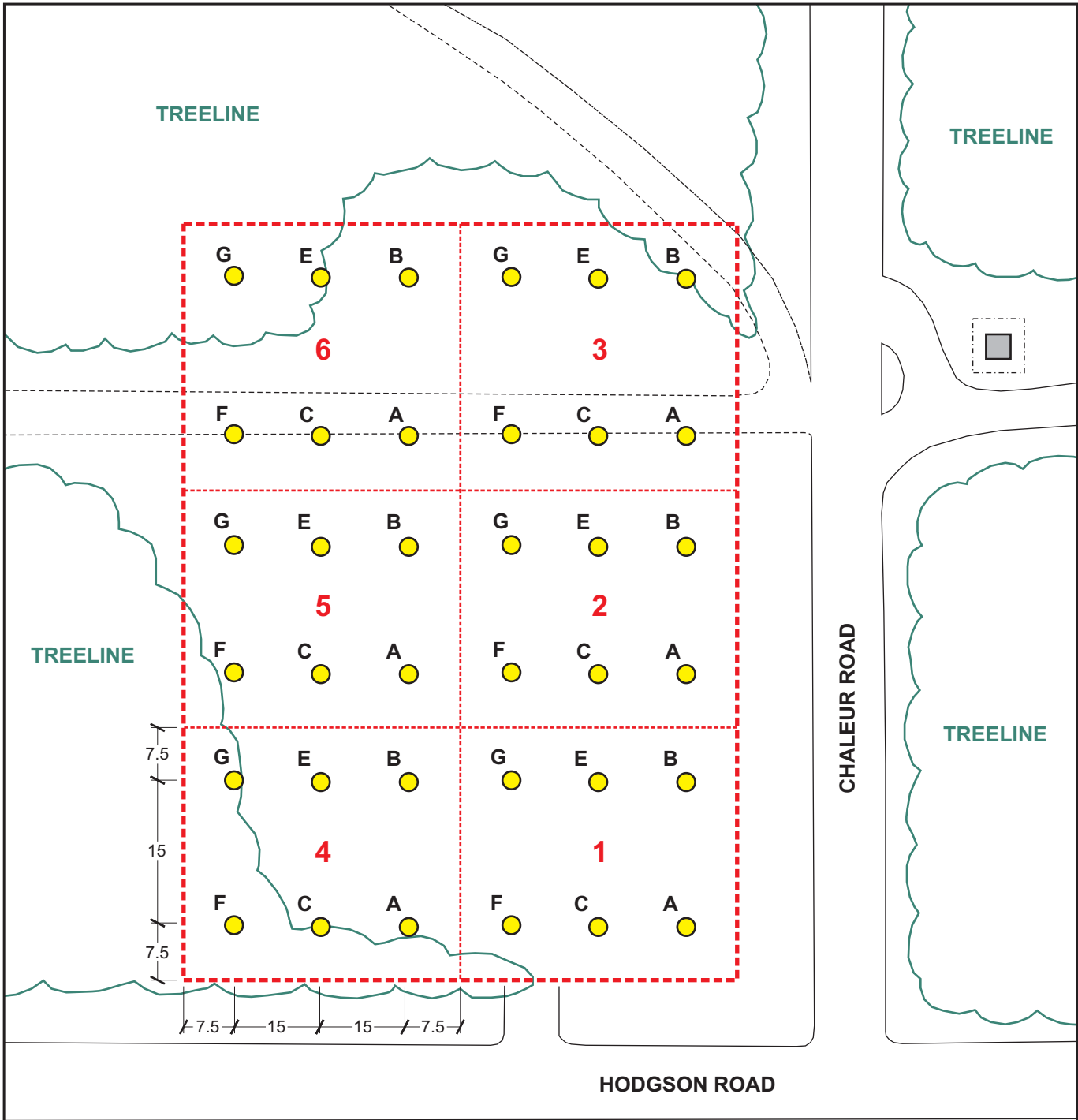


Project DEPARTMENT OF HEALTH BELLEDUNE, NB		Drawing BUS STOP			 GEMTEC LIMITED <small>GROUND ENGINEERING & MATERIALS TECHNOLOGY</small>
Drawn By AGSD	Date DEC., 2003	File No. 37820405	Drawing No. FIGURE 3	Revision No. 0	



ROUTE 134

Project		Drawing			 GEMTEC LIMITED <small>GROUND ENGINEERING & MATERIALS TECHNOLOGY</small>
DEPARTMENT OF HEALTH BELLEDUNE, NB		ROHERTY POINT			
Drawn By	Date	File No.	Drawing No.	Revision No.	
AGSD	DEC., 2003	37820401	FIGURE 4	0	



Project
 DEPARTMENT OF HEALTH
 BELLEDUNE, NB

Drawing
 TOWN SITE #2
 BALLFIELD



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 & MATERIALS TECHNOLOGY

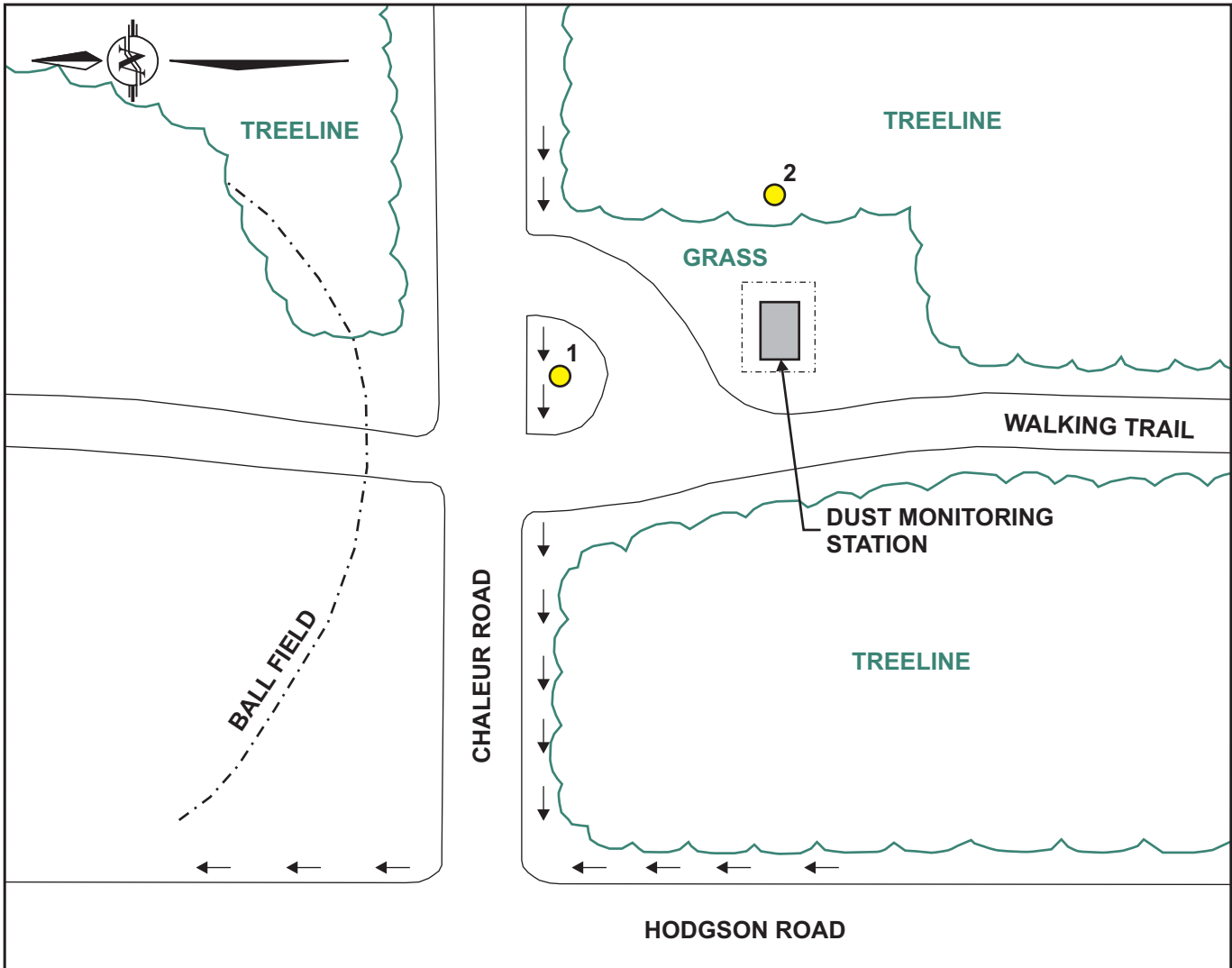
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 AGSD

Date
 DEC., 2003

File No.
 37820402


Drawing No.
 FIGURE 5

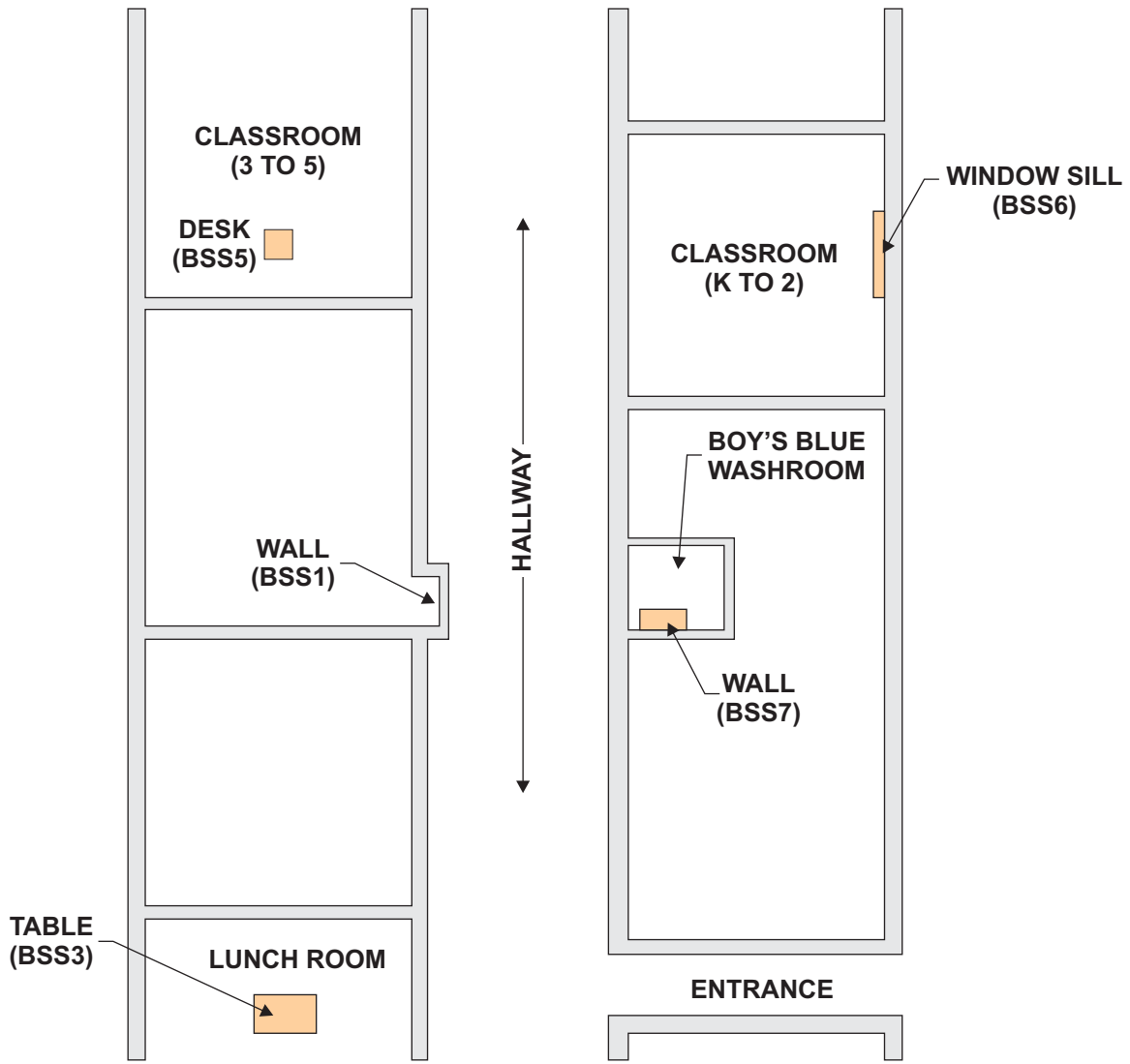
Revision No.
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NOTE:

SAMPLE 1 OBTAINED 4m SOUTH OF DITCH LOCATED ON CHALEUR ROAD.
 SAMPLE 2 OBTAINED 25m EAST OF DUST MONITORING STATION.

Project		Drawing			 GEMTEC LIMITED <small>GROUND ENGINEERING & MATERIALS TECHNOLOGY</small>
DEPARTMENT OF HEALTH BELLEDUNE, NB		DUST MONITOR			
Drawn By	Date	File No.	Drawing No.	Revision No.	
AGSD	DEC., 2003	37820403	FIGURE 6	0	



Project
 DEPARTMENT OF HEALTH
 BELLEDUNE, NB

Drawing
 BELLEDUNE SCHOOL



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Drawn By
 AGSD

Date
 DEC., 2003

File No.
 37820406

Drawing No.
 FIGURE 7

Revision No.
 0

APPENDIX B
ANALYTICAL RESULTS

Analysis of Swab Samples

RPC ID	Client ID	Arsenic	Cadmium	Lead
		Concentration ($\mu\text{g}/\text{swab}$)		
35520 RB	QA/QC	< 0.1	< 0.01	< 0.01
35520-36	Belledune School S1 (Swab) Nov. 29/03	0.1	0.01	0.09
35520-37	Belledune School S2 (Swab) Nov. 29/03	0.1	< 0.01	0.06
35520-38	Belledune School S3 (Swab) Nov. 29/03	0.1	< 0.01	0.11
35520-39	Belledune School S4 (Swab) Nov. 29/03	0.1	< 0.01	0.07
35520-40	Belledune School S5 (Swab) Nov. 29/03	0.1	0.01	0.15
35520-41	Belledune School S6 (Swab) Nov. 29/03	0.1	0.02	0.32
35520-42	Belledune School S7 (Swab) Nov. 29/03	0.2	< 0.01	0.10

The swabs were digested with nitric acid. The resulting solutions were diluted to volume for analysis of Arsenic, Cadmium and Lead by ICP-MS.

Analysis of Soil Samples

RPC ID	Client ID	Arsenic	Cadmium	Lead
Concentration (mg/Kg)				
35520 RB1	QA/QC	< 1	< 0.1	0.2
35520 RB2	QA/QC	< 1	< 0.1	0.2
35520 RB3	QA/QC	< 1	< 0.1	0.1
NIST 2709	CRM	15	0.4	12.8
NIST 2711A	CRM	95	43.5	1230
NIST 2711B	CRM	85	42.5	1240
35520-01A	GEMTBFXA Nov. 29/03	15	2.2	215
35520-01B	Duplicate	14	2.0	200
35520-02	GEMTBFXB Nov. 29/03	16	2.6	214
35520-03	GEMTBFXC Nov. 29/03	14	2.4	153
35520-04	GEMTBFXD Nov. 29/03	18	2.8	162
35520-05	GEMTBFXE Nov. 29/03	12	2.1	111
35520-06	GEMTBFXF Nov. 29/03	14	2.3	160
35520-07	GEMTBFXG Nov. 29/03	14	2.4	171
35520-08	GEMBSCXA Nov. 29/03	11	0.8	42.3
35520-09	GEMBSCXB Nov. 29/03	11	2.0	106
35520-10	GEMBSCXC Nov. 29/03	12	1.0	52.2
35520-11A	GEMBSCXD Nov. 29/03	12	1.0	55.2
35520-11B	Duplicate	12	1.0	49.6
35520-12	GEMBSCXE Nov. 29/03	11	0.9	46.7
35520-13	GEMBSCXF Nov. 29/03	12	0.8	44.4

Samples were air dried and sieved at 1mm. Portions were digested according to EPA Method 3050. The resulting solutions were diluted to volume for analysis of Arsenic, Cadmium and Lead by ICP-MS and ICP-ES.

Analysis of Soil Samples

RPC ID	Client ID	Arsenic	Cadmium	Lead
		Concentration (mg/Kg)		
35520-14	GEMBSCXG Nov. 29/03	13	1.4	74.7
35520-15	GEMBSC7S1 Nov. 29/03	4	3.8	195
35520-16	GEMBSC7S2 Nov. 29/03	10	1.6	70.4
35520-17	GEMBSC8S1 Nov. 29/03	14	1.7	158
35520-18	GEMBSC8S2 Nov. 29/03	4	2.4	313
35520-19	GEMDMS1 Nov. 29/03	29	3.6	404
35520-20	GEMDMS2 Nov. 29/03	47	7.6	2210
35520-21A	GEMBSC9S1 Nov. 29/03	24	1.4	501
35520-21B	Duplicate	9	1.3	310
35520-22	GEMPVBS1 Nov. 29/03	55	5.1	1760
35520-23	GEMPVBS2 Nov. 29/03	45	5.5	2010
35520-24	GEMPVBS3 Nov. 29/03	51	3.4	1420
35520-25	GEMPVBS4 Nov. 29/03	28	2.1	778
35520-26	GEMPVBS5 Nov. 29/03	32	4.7	1230
35520-27	GEMPVBS6 Nov. 29/03	38	3.9	1300
35520-28	GEMRBS1 Nov. 29/03	4	< 0.1	7.3
35520-29	GEMRBS2 Nov. 29/03	5	0.2	20.8
35520-30	GEMRBS3 Nov. 29/03	4	< 0.1	10.0
35520-31A	GEMRBS4 Nov. 29/03	6	1.6	92.4
35520-31B	Duplicate	5	1.4	85.1
35520-32	GEMRBS5 Nov. 29/03	5	1.0	334
35520-33	GEMRBS6 Nov. 29/03	6	0.2	24.0
35520-34	GEMRBS7 Nov. 29/03	4	1.5	83.2

Analysis of Metal Sample

RPC ID	Client ID	Arsenic	Cadmium	Lead
		Concentration (mg/Kg)		Concentration (%)
35520-35A	GEMRBS8 Nov. 29/03	< 10	< 1	> 98
35520-35B	Duplicate	160	< 1	> 98

Portions of the sample were digested in nitric acid. The resulting solutions were analysed for Arsenic, Cadmium and Lead by ICP-ES.

Note: The duplicate portions taken differed in physical appearance. 35520-35B contained particles of white material in addition to the Lead metal

APPENDIX C
SITE PHOTOS





VIEWOF LABTECHNICIANS PREPARING THE SAMPLES

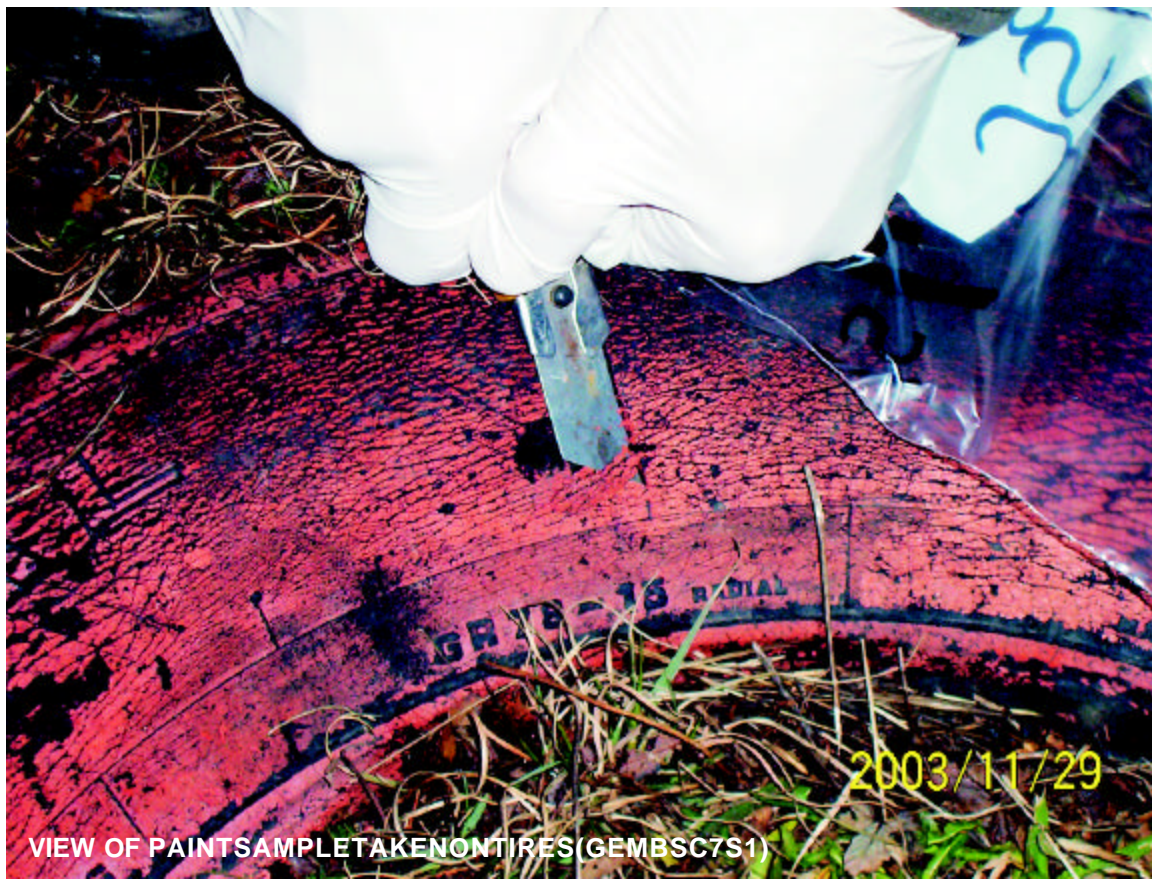


VIEWOF SAMPLEPREPARATION BEFORECOMPOSITING





VIEW OF GRID SYSTEM USED FOR SAMPLING



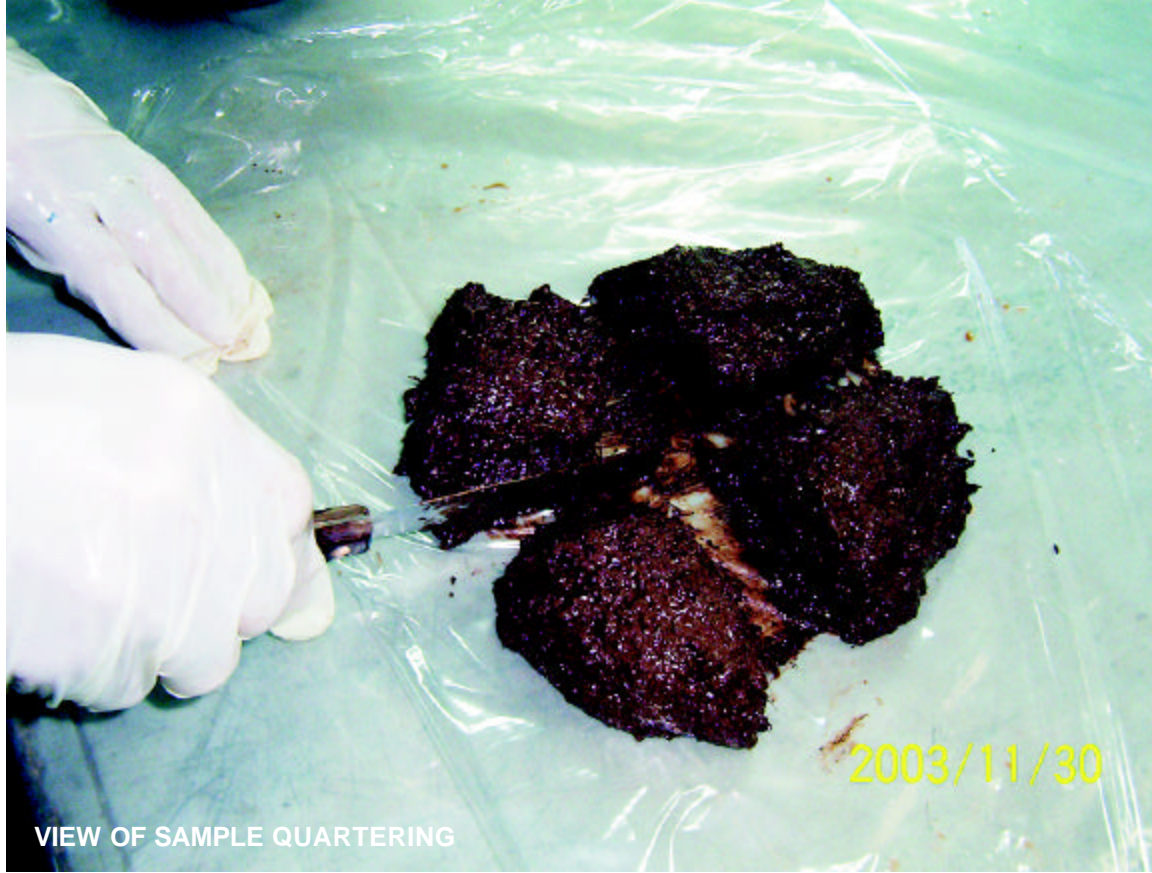
VIEW OF PAINT SAMPLE TAKEN ON TIRES (GEMBSC7S1)



VIEW OF EXPOSED LEAD PIECES AND
EROSION AT ROBERTY BEACH (GEMRBS8S2)



VIEW OF ENCLOSED AREA IN SCHOOL PLAYGROUND



VIEW OF SAMPLE QUARTERING



VIEW OF CLEANING AND DECONTAMINATION OF UTENSILS AFTER EACH SAMPLING PREPARATION



View of composited samples ready to be sent to RPC for analysis