

REMEDIAL INVESTIGATION SUMMARY REPORT

**Falls Dump
2731 Forbes Road
Gastonia, Gaston County, NC
ID No. NONCD0000808**

**Task No. 808SUM
State Contract No. N13001S**

Prepared for:

**North Carolina Department of Environment and Natural Resources
Division of Waste Management
Inactive Hazardous Sites Branch
Pre-Regulatory Landfill Unit
1646 Mail Service Center
Raleigh, North Carolina 27699**

Prepared by:

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July 31, 2014



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TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	HISTORICAL OPERATIONS AND DATA.....	2
3.0	SENSITIVE ENVIRONMENTS	2
4.0	WASTE DISPOSAL AREA.....	2
4.1	DELINEATED EDGE OF WASTE.....	2
4.2	SOIL COVER.....	3
4.3	WASTE DESCRIPTION.....	3
4.4	PHYSICAL WASTE HAZARDS	3
5.0	MEDIA CHARACTERIZATION.....	4
5.1	SOIL.....	4
5.2	SEDIMENT	5
5.3	SURFACE WATER	5
5.4	GROUNDWATER	6
5.5	LANDFILL GAS	6
6.0	REFERENCES.....	7

**TABLE OF CONTENTS
(CONTINUED)**

APPENDICES

Appendix A Classification of the Unnamed Tributary

FIGURES

Figure 1	Site Map
Figure 2	Cover Soil Thickness Map
Figure 3	Soil Concentration Map
Figure 4	Sediment Concentration Map
Figure 5	Groundwater and Surface Water Concentration Map
Figure 6	Subsurface Landfill Gas Screening Concentration Map

LIST OF ACRONYMS

µg/l	.....micrograms per liter
bgs	.....below ground surface
ft	.....feet
IHSB	.....Inactive Hazardous Sites Branch
MSL	.....mean sea level
NCAC	.....North Carolina Administrative Code
NCDENR	.....North Carolina Department of Environment and Natural Resources
NCDHHS	.....North Carolina Department of Health and Human Services
ppm	.....parts per million
PSRG	.....Preliminary Soil Remediation Goal
RI	.....Remedial Investigation
SVOC	.....semi-volatile organic compound
TCE	.....trichloroethene
TIC	.....tentatively identified compound
USEPA	.....U.S. Environmental Protection Agency
USGS	.....U.S. Geological Survey
VOC	.....volatile organic compound

1.0 INTRODUCTION

This Remedial Investigation (RI) Summary Report was prepared by ESP Associates, P.A. based upon the reports referenced in Section 6.

The Falls Dump site (the Site) is located at 2731 Forbes Road, Gastonia, Gaston County, North Carolina (see Figure 1). The majority of the waste disposal area is located within an undeveloped wooded (covered with brush, briars, Kudzu vines, and trees) portion of a parcel owned by Jean Falls Parker (Parcel Identification Number [PIN] 3543-43-8083). The waste disposal area extends slightly onto four other parcels: PIN 3543-52-7385 (2803 Forbes Road) owned by Gene Falls; PIN 3543-52-5954 (1165 Safeway Drive) owned by Deborah Lee; PIN 3543-53-4043 (1171 Safeway Drive) owned by Mary Willoughby; and PIN 3543-53-3122 (1175 Safeway Drive) owned by Linda Adams. Mobile homes are located on the three parcels along Safeway Drive, and these parcels have landscaped lawns. Each mobile home property has a septic system believed to be located in the back yard.

The Site can be accessed from a dirt path at the end of Genes Ridge. Genes Ridge intersects with Forbes Road (see Figure 1). The Site and vicinity are located within a residential area of Gaston County.

The Site gently slopes from the southeast to the northwest, generally towards the drainage ditch. Elevations across the Site range from approximately 770 to 745 feet above mean sea level (ft MSL). The drainage ditch is located approximately 330 to 360 ft northwest of the waste disposal area and generally flows in a northerly direction where it intersects the unnamed tributary. The unnamed tributary (located approximately 640 ft northwest of the Site) flows approximately 0.5 mile southwest, intersecting with an unnamed creek just north of Forbes Road. The unnamed creek flows approximately 1.5 miles south before entering Crowders Creek. Crowders Creek is a Class C stream (NCDENR, 2014a).

Within 1,000 ft of the waste disposal area, four mobile homes located on Genes Ridge to the southeast as well as the residences along Greenpack Parkway and Capital Drive to the south and

southwest are served by private drinking water wells. These wells are located topographically upgradient and side-gradient of the waste disposal area. The residences to the northwest, north, northeast, east, and a portion of the southeast within 1,000 ft of the waste disposal area are served by public drinking water wells that are located beyond the 1,000-ft zone.

A separate and unrelated contaminated site, the Hemphill Road Trichloroethene (TCE) site (ID # NC0 002 374 445), is located to the northeast of the Site along Hemphill Road. The location of the Hemphill Road TCE site is shown on Figure 1. This site is a Superfund site being addressed by the North Carolina Department of Environment and Natural Resources (NCDENR) and the U.S. Environmental Protection Agency (USEPA) Region 4 and consists of a TCE groundwater plume extending from the southeast parcel of the Hemphill Road TCE site downgradient to the northwest parcel and beyond toward the unnamed tributary. Elevated TCE concentrations have been documented to be present in the surface water of the unnamed tributary adjacent to the Hemphill Road TCE site.

2.0 HISTORICAL OPERATIONS AND DATA

From the late 1950s to the late 1970s, the Site was used by grading contractors for disposal of land clearing debris (i.e., trees and stumps). Unauthorized dumping may have also occurred.

3.0 SENSITIVE ENVIRONMENTS

No documented sensitive environments were reported within 500 ft of the waste disposal area.

4.0 WASTE DISPOSAL AREA

4.1 Delineated Edge of Waste

Based on geophysical studies and subsurface soil borings, a single approximately 1.68-acre waste disposal area was identified (see Figure 1).

4.2 Soil Cover

As determined during waste delineation and media characterization drilling activities, the existing soil cover thickness ranges from 0 ft to 7.5 ft (see Figure 2). Soils within the waste disposal area are primarily classified as fine sandy silt; lean clay with silt has also been observed. Very soft soils were noted along the southwestern edge of the waste disposal area during drilling activities.

4.3 Waste Description

Waste types observed during the RIs included wood/wood chips, burnt wood, stumps, shingles, brick, concrete/concrete blocks, asphalt, glass, Styrofoam™, plastic/plastic ribbons, duct tape, fibrous material, fabric, carpet, and metal/sheet metal. At the locations investigated, the waste ranges in thickness from approximately 0 ft (i.e., debris present on the surface only) to approximately 23 ft. The waste/residual soil interface (i.e., bottom of waste depth) ranges from approximately 0 ft bgs to 23.7 ft bgs, with many of the deeper locations occurring at the boundary of the Jean Falls Parker parcel and extending into the three Safeway Drive parcels.

4.4 Physical Waste Hazards

Surface debris within the waste disposal area consists of concrete blocks, bricks, and metal/sheet metal.

Several isolated areas of surface debris beyond the boundary of the waste disposal area were noted on the Jean Falls Parker and Gene Falls properties. These areas are located northwest of the waste disposal area and along the southwestern perimeter of the waste disposal area on the Jean Falls Parker property, and in the central portion and southern corner of the Gene Falls property. The observed debris includes plastic, wood, metal, glass, fabric, concrete blocks, bricks, astro-turf, bubble wrap, plastic sheeting, and Styrofoam. These surface debris locations may represent random dumping activities since waste was not observed below the ground surface in these areas.

5.0 MEDIA CHARACTERIZATION

Soil, sediment, surface water, and groundwater samples were collected from the Site for laboratory analysis of the following parameters: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), 15 selected metals (antimony, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc), ammonia, nitrate and sulfate. Tentatively identified compounds (TICs) for VOCs and SVOCs were also included in the analyses. Additional soil, sediment, and surface water samples were collected for laboratory analysis of limited parameters as discussed in subsequent sections. Landfill gas samples were screened for oxygen, carbon dioxide, methane, mercury, hydrogen sulfide, and Total VOCs using field instrumentation. Sample results for each media were screened against the latest applicable regulatory criteria as indicated in the subsequent sections.

5.1 Soil

Six soil samples from various depths within and around the perimeter of the waste disposal area were collected for laboratory analysis of the full suite of analytes listed above. In addition, 3 soil samples for hexavalent chromium analysis and 15 soil samples for asbestos analysis were collected from various depths within the waste disposal area. Detected concentrations of arsenic, hexavalent chromium, iron, manganese, and thallium in the soil samples that exceed the lower of the NCDENR Inactive Hazardous Sites Branch (IHSB) Preliminary Soil Remediation Goals (PSRGs) for residential health and protection of groundwater are presented on Figure 3. Asbestos was not detected in the analyzed soil samples.

Published regional maximum background levels for arsenic (2.826 milligrams per kilogram [mg/kg]), iron (77,410 mg/kg), and manganese (2,197.64 mg/kg) in Gaston County soils indicate that concentrations of these metals at the Site are likely due to naturally-occurring conditions (U.S. Geological Survey [USGS], 2014).

5.2 Sediment

Six sediment samples were collected from 2 locations (one sample was collected to confirm results) along the unnamed tributary northwest of the Site and 3 locations along the drainage ditch located northwest of the Site for laboratory analysis of the full suite of analytes listed above (see Figure 4). In addition, 5 sediment samples were collected at locations along the unnamed tributary and drainage ditch for hexavalent chromium analysis, and 4 sediment samples were collected at locations along the unnamed tributary and drainage ditch for TCE analysis.

Detected concentrations of arsenic, hexavalent chromium, iron, manganese, and thallium in the sediment samples that exceed the lower of the NCDENR IHSB PSRGs for residential health and protection of groundwater are presented on Figure 4. Comparable results for downstream and upstream (SD-1/SD-1A, which represents background) results suggest that these metals are not site related. Also, published regional background levels for iron and manganese in stream sediments (20,000 mg/kg and 500 mg/kg, respectively) indicate that concentrations at the Site are comparable to the regional estimates and are likely due to naturally-occurring conditions (NCDENR, 2014b).

5.3 Surface Water

Four surface water samples were collected from 2 locations (one sample was collected to confirm results) along the unnamed tributary northwest of the Site and 1 location along the drainage ditch located northwest of the Site for laboratory analysis of the full suite of analytes listed above. In addition, 4 surface water samples were collected at locations along the unnamed tributary and drainage ditch to confirm the presence of TCE. The only contaminant in the surface water samples detected at concentrations exceeding the 15A North Carolina Administrative Code (NCAC) 2B.0211 surface water standards (a.k.a., 2B surface water standards) was iron at one location in the drainage ditch (see Figure 5).

TCE was detected in the surface water of the unnamed tributary. Because the unnamed tributary ultimately flows into Crowders Creek, a Class C stream, the surface water sample results are

compared to the lower of the 2B surface water standards for freshwater aquatic life and human health (NCDENR, 2014a). The TCE concentrations detected in the unnamed tributary are below the applicable 2B surface water standard of 30 micrograms per liter ($\mu\text{g/l}$). The Hemphill Road TCE site is believed to be the source of the TCE contamination in the surface water of the unnamed tributary because the observed range of TCE concentrations upstream of the Site and adjacent to the Hemphill Road TCE site were notably higher (i.e., as high as 17 $\mu\text{g/l}$) (NCDENR, 2012).

5.4 Groundwater

Based on surface topography, the groundwater at the Site is anticipated to generally flow in a northwesterly direction toward the drainage ditch. Static water levels range from approximately 4 ft below ground surface (bgs) at the northwestern extreme of the waste disposal area to approximately 33 ft bgs in the southeastern portion of the waste disposal area.

Five temporary groundwater monitoring wells were installed along the waste disposal area perimeter, and groundwater samples were collected. Arsenic, beryllium, chromium, iron, manganese, selenium, nitrate, and sulfate concentrations that exceeded the 15A NCAC 2L groundwater quality standards (a.k.a., 2L groundwater standards) in one or more wells are presented on Figure 5. Private well test results for Gaston County available from the North Carolina Department of Health and Human Services (NCDHHS) suggest that some of these inorganic constituents are likely due to naturally-occurring conditions. The following maximum concentrations have been measured in private wells elsewhere in Gaston County: arsenic at 232 $\mu\text{g/l}$; chromium at 30 $\mu\text{g/l}$; iron at 98,000 $\mu\text{g/l}$; manganese at 7,040 $\mu\text{g/l}$; selenium at 41 $\mu\text{g/l}$; and nitrate at 116,000 $\mu\text{g/l}$ (NCDHHS, 2014).

5.5 Landfill Gas

Above ground landfill vapor screening over the landfill did not identify any concerns.

Four subsurface landfill gas probes were installed within the waste. Each gas probe was field screened between two and four times, and the detected results for methane, carbon dioxide, mercury, and Total VOCs for each screening event are presented on Figure 6. Hydrogen sulfide was not detected during subsurface landfill gas screening.

Mercury was detected at concentrations above the NCDENR IHSB Residential Vapor Intrusion Screening Limit for soil gas of 0.00209 milligrams per cubic meter (mg/m³) at all three locations screened in July 2013. Mercury was not detected in GP-1 (the only gas probe screened) during the March 2013 screening event, and landfill gases were not screened for mercury during the January 2014 and February 2014 screening events.

Methane was detected in only one of the gas probes (GP-2). The measured methane concentration at this location was low and was not confirmed during subsequent screening events. Carbon dioxide was detected in all four gas probes. Low levels of Total VOCs were detected at all four gas probes; however, Total VOC detections were not confirmed during subsequent screening events.

The nearest structures to the waste disposal area are the three mobile homes, approximately 100 ft to the northeast, which are located on the small Site parcels. The mobile homes are built on crawl spaces, and each has a septic system in its back yard. Additional mobile homes built on crawl spaces and an enclosed shed built on a slab foundation (located to the southeast) are located greater than 100 ft away from the waste disposal area.

6.0 REFERENCES

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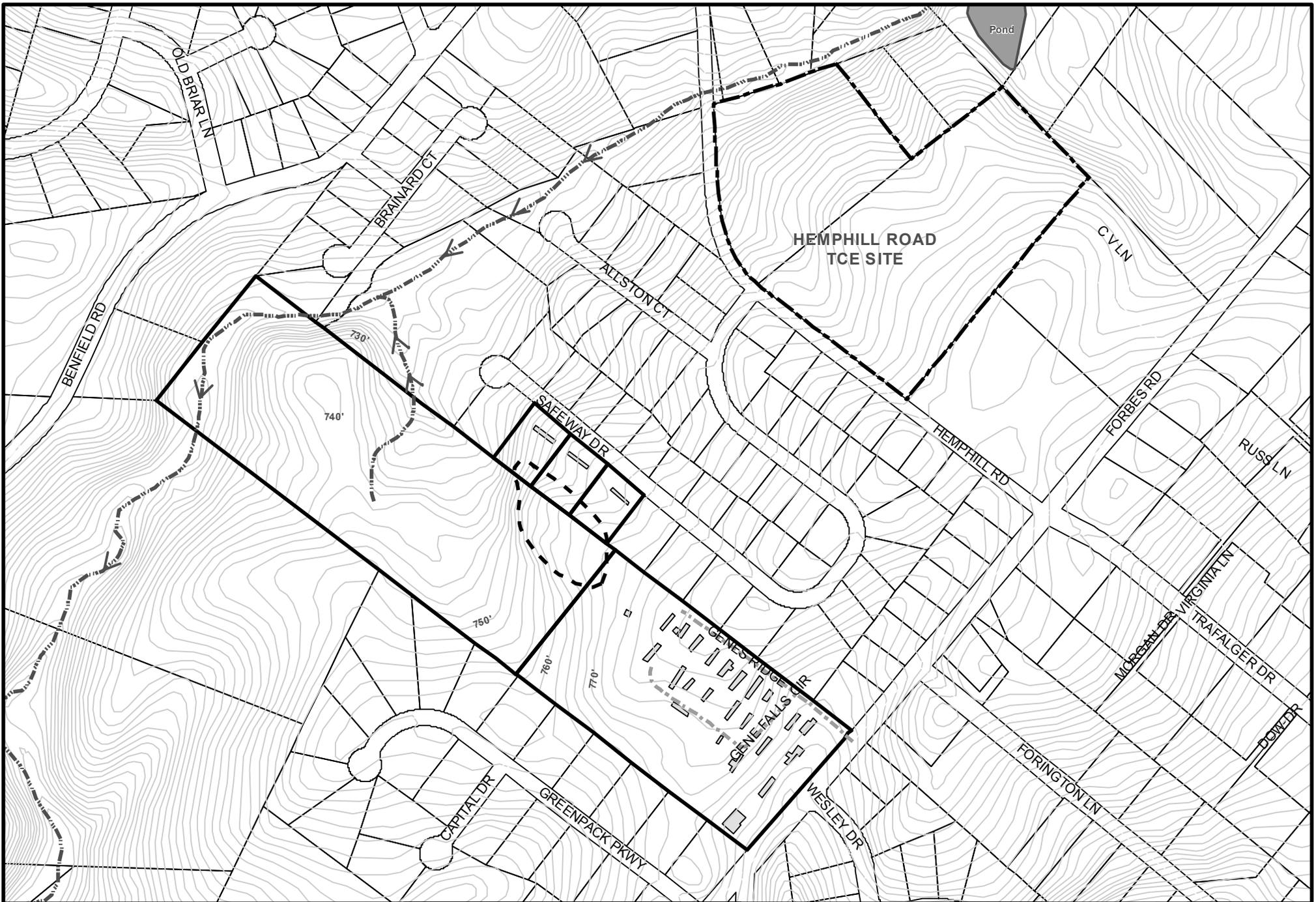
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FIGURES



Legend	
	Minor Roads
	Property Line
	Estimated Waste Disposal Area Perimeter
	Hemphill Road TCE Site
	Perennial Stream
	Topographic Contour (2ft)
	Parcel Line
	Existing Buildings On Site

SHEET TITLE

Figure 1
Site Map

Falls Dump
NONCD0000808
Gastonia, Gaston County, NC

0 95 190 380 570
Feet

* Source: Parcel and topographic information provided by Gaston County, NC GIS.

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DATE
July 30, 2014

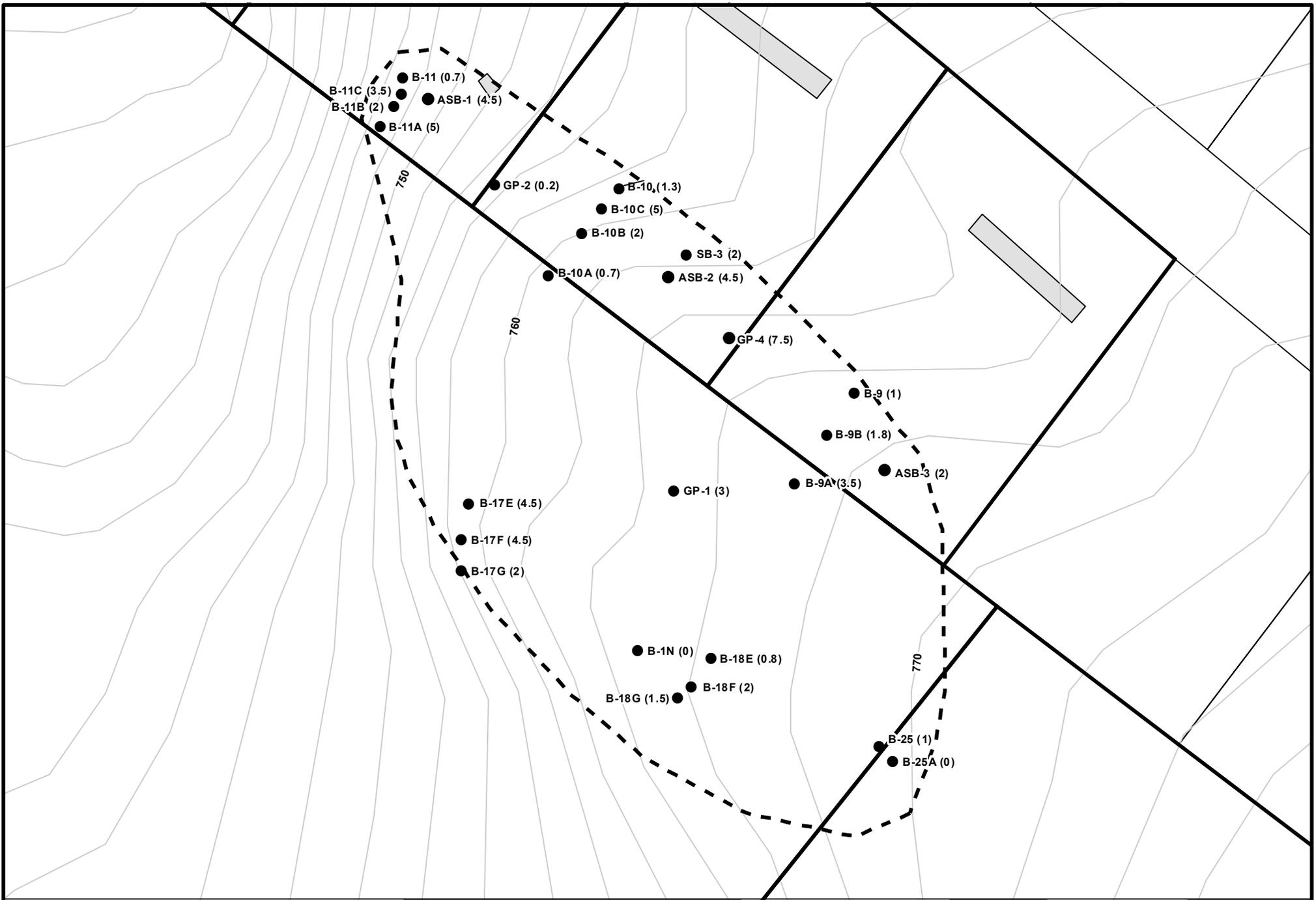
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Phone: 803-802-2440



Legend

- Property Line
- ▬▬▬ Estimated Waste Disposal Area Perimeter
- Topographic Contour (2ft)
- ▭ Parcel Line
- ▭ Existing Buildings On Site
- Boring with Observed Cover Soil Thickness (Feet)

SHEET TITLE
Figure 2
 Cover Soil Thickness Map
 Falls Dump
 NONCD0000808
 Gastonia, Gaston County, NC

0 15 30 60 90
 Feet
 * Source: Parcel and topographic information provided by Gaston County, NC GIS.

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Preliminary Soil Remediation Goals (mg/kg)		
Constituent	Residential Health	Protection of Groundwater
Arsenic	0.61	5.8
Hexavalent Chromium	0.29	3.8
Iron	11,000	150
Manganese	360	65
Thallium	0.16	0.28

SB-1 (3.5-5) mg/kg	
Arsenic	1.7
Iron	13,000
Manganese	170
Thallium	0.27

SB-3 (14-15) mg/kg	
Arsenic	1.8
Iron	30,000
Manganese	320
Thallium	0.56

SB-4 (14-15) mg/kg	
Arsenic	1.7
Iron	47,000
Manganese	500
Thallium	0.87

SB-1/Cr-1B (3-5) mg/kg	
Hexavalent Chromium	0.32 J

B-9A (14-15) mg/kg	
Arsenic	0.91
Iron	5,300 B
Manganese	240 B

SB-2 (14-15) mg/kg	
Arsenic	2.6
Iron	13,000
Manganese	530
Thallium	0.47

SB-5 (14-15) mg/kg	
Arsenic	1.0
Iron	51,000
Manganese	5,000 E
Thallium	2.4

Notes:
 - Only constituents that exceed PSRGs are shown.
 - Arsenic, iron, and manganese are likely due to naturally-occurring conditions.

Legend

- Minor Roads
- Property Line
- Estimated Waste Disposal Area Perimeter
- Soil Boring
- Topographic Contour (2ft)
- Parcel Line
- Existing Buildings On Site

SHEET TITLE
Figure 3
 Soil Concentration Map
 Falls Dump
 NONCD0000808
 Gastonia, Gaston County, NC

0 25 50 100 150 Feet

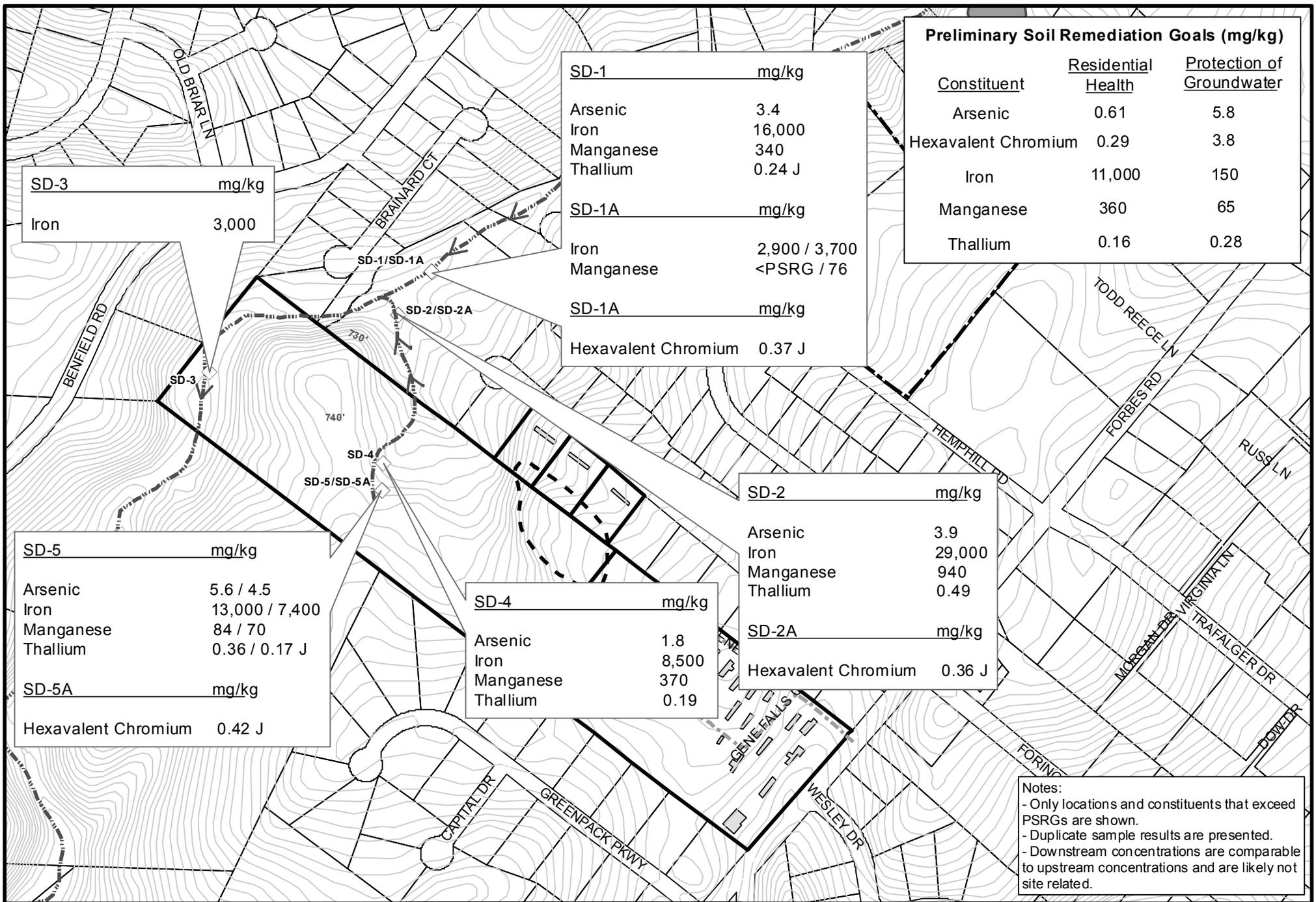
* Source: Parcel and topographic information provided by Gaston County, NC GIS.

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DATE August 11, 2014

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Notes:
 - Only locations and constituents that exceed PSRGs are shown.
 - Duplicate sample results are presented.
 - Downstream concentrations are comparable to upstream concentrations and are likely not site related.

Legend

- Minor Roads
- Perennial Stream
- Estimated Waste Disposal Area Perimeter
- Property Line
- Hemphill Road TCE Site
- ◇ Sediment Sample
- Parcel Line
- Existing Buildings On Site
- Topographic Contour (2ft)

SHEET TITLE
Figure 4
 Sediment Concentration Map
 Falls Dump
 NONCD0000808
 Gastonia, Gaston County, NC

0 95 190 380 570 Feet

* Source: Parcel and topographic information provided by Gaston County, NC GIS.

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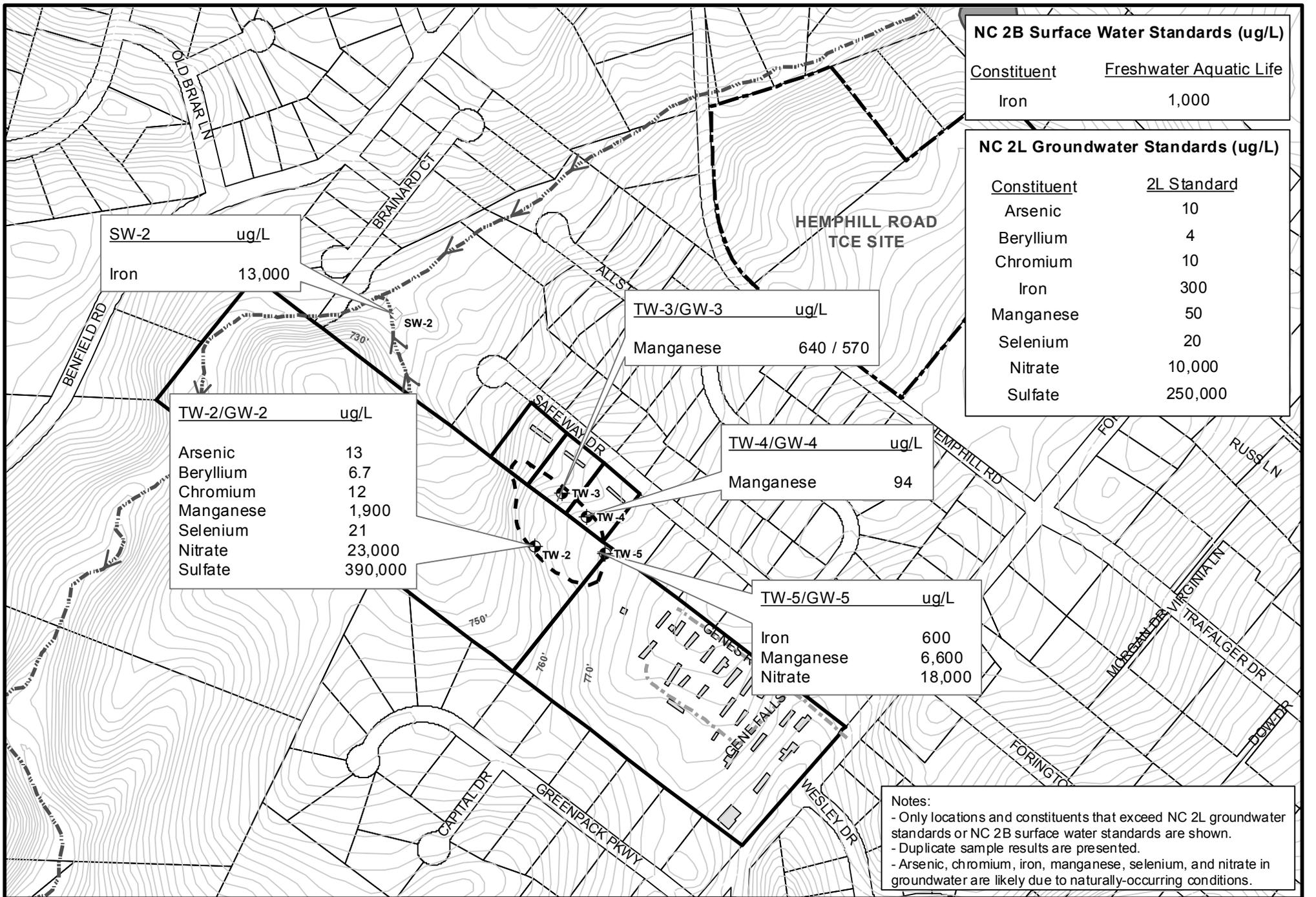
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NC 2B Surface Water Standards (ug/L)	
Constituent	Freshwater Aquatic Life
Iron	1,000

NC 2L Groundwater Standards (ug/L)	
Constituent	2L Standard
Arsenic	10
Beryllium	4
Chromium	10
Iron	300
Manganese	50
Selenium	20
Nitrate	10,000
Sulfate	250,000



SW-2 ug/L
Iron 13,000

TW-2/GW-2 ug/L
Arsenic 13
Beryllium 6.7
Chromium 12
Manganese 1,900
Selenium 21
Nitrate 23,000
Sulfate 390,000

TW-3/GW-3 ug/L
Manganese 640 / 570

TW-4/GW-4 ug/L
Manganese 94

TW-5/GW-5 ug/L
Iron 600
Manganese 6,600
Nitrate 18,000

Notes:
- Only locations and constituents that exceed NC 2L groundwater standards or NC 2B surface water standards are shown.
- Duplicate sample results are presented.
- Arsenic, chromium, iron, manganese, selenium, and nitrate in groundwater are likely due to naturally-occurring conditions.

Legend	
— Minor Roads	◆ Temporary Monitoring Well
--- Estimated Waste Disposal Area Perimeter	◇ Surface Water Sample
— Property Line	□ Parcel Line
— Perennial Stream	■ Existing Buildings On Site
— Hemphill Road TCE Site	— Topographic Contour (2ft)

SHEET TITLE
Figure 5
Groundwater and Surface Water Concentration Map

Falls Dump
NONCD0000808
Gastonia, Gaston County, NC

0 95 190 380 570 Feet
* Source: Parcel and topographic information provided by Gaston County, NC GIS.

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Residential Vapor Intrusion Screening Limits

Constituent	Soil Gas
Methane (Lower Explosive Limit)	5%
Mercury	0.00209 mg/m ³

GP-2

July 2013:	
Methane	0.6% / 0.3%
Carbon Dioxide	9.1% / 19.2%
Mercury	0.022 mg/m ³ / 0.122 mg/m ³
Total VOCs	2.2 ppm / ND
January 2014:	
Carbon Dioxide	8.6% / ND
February 2014:	
No exceedances	

GP-4

January 2014:	
Carbon Dioxide	6.2% / 2.8%
Total VOCs	2.8 ppm / 1.2 ppm
February 2014:	
Carbon Dioxide	3.4% / 0.1%

GP-1

March 2013:	
Carbon Dioxide	12.2% / 11.8%
Total VOCs	1.0 ppm / 0.8 ppm
July 2013:	
Carbon Dioxide	16.6%
Mercury	0.037 mg/m ³
January 2014:	
Carbon Dioxide	8.7% / 0.3%
February 2014:	
Carbon Dioxide	9.2% / 5.1%

GP-3

July 2013:	
Carbon Dioxide	4.8%
Mercury	0.006 mg/m ³
Total VOCs	2.2 ppm
January 2014:	
Carbon Dioxide	0.2% / 4.6%
February 2014:	
No exceedances	

Notes:

- Only detected constituents are shown.
- Second reading results are presented.
- Mercury screening was not conducted in January 2014 or February 2014.

- Legend**
- Minor Roads
 - Estimated Waste Disposal Area Perimeter
 - Property Line
 - Hemphill Road TCE Site
 - Subsurface Gas Probe
 - Perennial Stream
 - Parcel Line
 - Existing Buildings On Site
 - Topographic Contour (2ft)

SHEET TITLE

Figure 6

Subsurface Landfill Gas Screening Concentration Map

Falls Dump
NONCD0000808
Gastonia, Gaston County, NC

0 95 190 380 570 Feet

* Source: Parcel and topographic information provided by Gaston County, NC GIS.

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July 30, 2014

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APPENDIX A
CLASSIFICATION OF THE UNNAMED TRIBUTARY

Nora Zirps

From: Brower, Connie <connie.brower@ncdenr.gov>
Sent: Friday, July 11, 2014 2:42 PM
To: Nora Zirps
Cc: Kountis, Elizabeth
Subject: RE: surface water classification and criteria selection

Nora -

Thanks to Betsy Kountis – she has provided to me that the site is discharging to an unnamed tributary to Crowder Crk. Crowder Crk is a Class C water. The applicable standards would be the lower of either the human health column or the aquatic life column in the link provided on Thursday. If you have questions, please feel free to call. I will be here today until ~ 4 or a bit after, and will be happy to help.

PS – As this is a Class C stream – there is no applicable standard for manganese.

Have a great weekend –

Connie

From: Nora Zirps [mailto:nzirps@espassociates.com]
Sent: Thursday, July 10, 2014 9:12 AM
To: Brower, Connie
Subject: RE: surface water classification and criteria selection

Thank you Connie. Is there anything else I can provide to make the location search easier?

From: Brower, Connie [mailto:connie.brower@ncdenr.gov]
Sent: Thursday, July 10, 2014 9:08 AM
To: Nora Zirps
Subject: RE: surface water classification and criteria selection

<http://portal.ncdenr.org/web/wq/code-and-rules>

In the above link, see 15A NCAC 02B for the regulations and http://portal.ncdenr.org/c/document_library/get_file?uuid=dfc89f23-a372-4782-b3b0-60e6884b1696&groupId=38364 for the summary table of chemicals.

We do not currently have a dedicated GIS person - so it may take me a bit of time to get the proper classification for you. I will get it as soon as is possible.

Connie

From: Nora Zirps [mailto:nzirps@espassociates.com]
Sent: Thursday, July 10, 2014 8:51 AM
To: Brower, Connie
Subject: RE: surface water classification and criteria selection

Connie,

I was also hoping you could provide the link for the current surface water criteria. Thanks.

Nora

From: Nora Zirps
Sent: Wednesday, July 09, 2014 5:20 PM
To: 'Brower, Connie'
Subject: surface water classification and criteria selection

Connie,

We are currently supporting the Pre-regulatory Landfill Unit assessing Falls Dump in Gastonia. There is a stream adjacent to the site as shown in the attached drawing. Can you provide information on the stream classification and the appropriate surface water criteria to consider when evaluating surface water sample results. Manganese was found in one of the samples and I see there is an (LD). What would we use for a criteria?

Below are several coordinates (NAD83) to assist in locating the stream:

Points to Include	State Plane (meters) - N	State Plane (meters) -E
SW-1A	162658.252	409963.353
SW-1A	162658.252	409963.353
SW-1B	162650.168	409979.196
SW-1C	162639.055	409929.767

Thanks for your help!

Nora

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