RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

BROWN'S DUMP SITE

JACKSONVILLE, DUVAL COUNTY, FLORIDA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA

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TABLE OF CONTENTS

LIST OF ACRONYMS and ABBREVIATIONS . . . . . Page vii
PART 1: THE DECLARATION . . . . . Page 1
1.1 Site Name and Location . . . . . Page 1
1.2 Statement of Basis and Purpose . . . . . Page 1
1.3 Assessment of Site . . . . . Page 1
1.4 Description of Selected Remedy . . . . . Page 1
1.5 Statutory Determinations . . . . . Page 2
1.6 Data Certification Checklist . . . . . Page 3
1.7 Authorizing Signatures . . . . . Page 3
PART 2: INTRODUCTION TO THE SITE . . . . . Page 4
2.1 Site Name, Location, and Brief Description . . . . . Page 4
2.2 Site History and Enforcement Activities (i.e., activities that lead to current problem) . . . . . Page 5
2.3. Previous Investigations . . . . . Page 5
2.3.1 Preliminary Assessment (PA), 1985 . . . . . Page 5
2.3.2 EPA Re-Evaluation of the Site, 1994 . . . . . Page 6
2.3.3 EPA Emergency Response and Removal Branch Site Investigation, 1995 . . . . . Page 6
2.3.4 Corrective Action Report (CAR), 1995 . . . . . Page 6
2.3.5 Expanded Site Inspection Report (ESI), 1998 . . . . . Page 7
2.4 Implementation History of Remedial Investigation (RI), Baseline Human Health Risk Assessment, Ecological Risk Assessment, Feasibility Study . . . . . Page 9
2.4.1 RI Phase I, 1999 - 2000 . . . . . Page 9
2.4.2 RI Phase II, 2001 - 2003 . . . . . Page 9
2.4.3 Baseline Human Health Risk Assessment (BHHRA), 1999-2002 . . . . . Page 10
2.4.4 Ecological Risk Assessment, 1999-2002 . . . . . Page 10
2.4.5 Feasibility Study, 2002 - 2004 . . . . . Page 10
2.4.6 RI Phase III, 2003 - 2005 . . . . . Page 11
2.5 Enforcement Activities . . . . . Page 11
2.6 Other Response Actions . . . . . Page 11
PART 3: SUMMARY OF ENVIRONMENTAL CONTAMINATION . . . . . Page 12
3.1 Site Overview . . . . . Page 12
3.2 Sampling Strategy . . . . . Page 12
3.3 Known and/or Suspected Sources of Contamination . . . . . Page 13
3.4 Surface and Subsurface Soil Contamination . . . . . Page 13
3.5 Sediment Contamination . . . . . Page 14
3.6 Surface Water Contamination . . . . . Page 14
3.7 Groundwater Contamination . . . . . Page 15
3.8 Likelihood for Soil Migration . . . . . Page 16
3.9 Likelihood for Surface Water Migration . . . . . Page 16
3.10 Likelihood for Sediment Migration . . . . . Page 16
3.11 Likelihood for Groundwater Migration . . . . . Page 16

PART 4: SUMMARY OF HUMAN HEALTH RISK ASSESSMENT .... Page 18
4.1 Summary of Site Risks - Human Health Risk Assessment .... Page 18
4.2 Data Collection and Evaluation .... Page 18
4.2.1 Conceptual Site Model for Risk Assessment Purposes .... Page 18
4.2.2 Selection of Contaminants of Potential Concern .... Page 19
4.3 Exposure Assessment (Southern and Northern School Properties) ...... Page 20
4.3.1 Soil .... Page 20
4.4.2 Groundwater .... Page 20
4.3.3 Surface Water .... Page 21
4.3.4 Vegetables .... Page 21
4.4 Toxicity Assessment (Southern and Northern School Properties) .... Page 21
4.4.1 Carcinogenic Health Effects .... Page 21
4.4.2 Non-Carcinogenic Health Effects .... Page 21
4.5 Risk Characterization (Southern and Northern School Properties) ...... Page 22
4.5.1 Evaluation of Carcinogenic Risk .... Page 22
4.5.2 Evaluation of Non-Carcinogenic Effects .... Page 22
4.5.3 Evaluation of Vegetables .... Page 23
4.5.4 Summary of Blood Lead Study .... Page 24
4.6 Uncertainties (Southern and Northern School Properties) .... Page 25
4.7 Identification of Contaminants of Concern (Southern and Northern School Properties) .... Page 29
4.8 Refinement of Contaminants of Concern (Southern and Northern School Properties) .... Page 29
4.8.1 Soil .... Page 30
4.8.2 Groundwater .... Page 31
4.8.3 Refined List of COCs (Southern and Northern Properties, Groundwater) .... Page 32
4.8.4 Risk Management Decision (Southern and Northern Properties, Groundwater) .... Page 32
4.9 Evaluation of Risk (Residential Setting) .... Page 32
4.9.1 Evaluation Approach .... Page 33
4.9.2 Qualitative Evaluation of Groundwater Risk in Residential Area . Page 34
4.9.3 Qualitative Evaluation of Surface Soil Risk in Residential Areas . Page 35
4.9.4 Qualitative Evaluation of Subsurface Soil Risk in Residential Areas .... Page 36
4.9.5 Identification of Contaminants of Concern (Residential Setting) . Page 36
4.9.6 Risk Management Decisions (Residential Setting, Soil and Groundwater) .... Page 36
4.10 Final Contaminants of Concern (Southern and Northern School Property, Residential Setting) .... Page 37
PART 5: SUMMARY OF ECOLOGICAL RISK .... Page 38
5.1 Summary of Ecological Risk Assessment .... Page 38
5.1.1 Step 1 - Level Problem Formulation and Ecological Effects Evaluation .... Page 38

5.1.2 Step 2 - Screening - Level Exposure Estimate and Risk Calculation ... Page 38
5.1.3 Step 3a - Problem Formulation (Refinement of Contaminants of Potential Ecological Concern) ... Page 39
5.2 Risk Management Decision (Final Contaminants of Ecological Concern) ... Page 40
5.3 Risk Management Decision (Remediation for Ecological Cleanup) ... Page 40
PART 6: DESCRIPTION OF REMEDIAL ALTERNATIVES ... Page 43
6.1 Remedial Action Objectives ... Page 43
6.2 Remedial Goals (i.e., cleanup levels) ... Page 44
6.3 Description of Remedial Alternatives ... Page 44
6.3.1 Alternative 1 - No Action ... Page 45
6.3.2 Alternative 2 - Soil Cover with Excavation and Offsite Disposal ... Page 45
6.3.3 Alternative 3 - Shallow Excavation, Offsite Disposal and Soil Cover ... Page 46
6.3.4 Alternative 4 - Deep Excavation and Offsite Disposal ... Page 48
6.4 Common Elements and Distinguishing Features of Each Alternative ... Page 48
6.5 Expected Outcomes of Each Alternative ... Page 49
PART 7: EVALUATION OF REMEDIAL ALTERNATIVES ... Page 51
7.1 Comparative Analysis of Alternatives ... Page 51
7.2 Threshold Criterion 1 - Overall Protection of Human Health and the Environment ... Page 51
7.3 Threshold Criterion 2 - Compliance with Applicable or Relevant and Appropriate Requirements ... Page 52
7.4 Balancing Criterion 3 - Long-Term Effectiveness and Permanence ... Page 53
7.5 Balancing Criterion 4 - Reduction of Toxicity, Mobility, or Volume Through Treatment ... Page 54
7.6 Balancing Criterion 5 - Short-Term Effectiveness ... Page 55
7.7 Balancing Criterion 6 - Implementability ... Page 56
7.8 Balancing Criterion 7 - Cost ... Page 56
7.9 Modifying Criterion 8 - State/Support Agency Acceptance ... Page 57
7.10 Modifying Criterion 9 - Community Acceptance ... Page 57
7.11 Principal Threat Wastes ... Page 57
PART 8: SELECTED REMEDY ... Page 58
8.1 Remedial Action Objectives and Remedial Goals (i.e., cleanup levels) ... Page 58
8.2 Selected Remedy ... Page 59
8.3 Description of the Selected Remedy ... Page 60
8.3.1 Institutional Controls ... Page 63
8.4 Summary of the Estimated Remedy Costs ... Page 66
8.5 Expected Outcomes of the Selected Remedy ... Page 66
8.6 Available Land Use after Remediation ... Page 66
8.7 Anticipated Environmental and Ecological Benefits ... Page 67
8.8 Final Remedial Goals (i.e., clean-up levels) ... Page 67
8.9 Implementation for Ecological Cleanup ... Page 67

PART 9: SUPPORT AGENCY COMMENTS . . . . Page 69
9.1 State Opinion on the Remedy (NCP §300.435(c)(2)) . . . . Page 69
PART 10: STATUTORY DETERMINATIONS (NCP §300.430(f)(5)(ii) and (iii)) . . . . Page 70
10.1 Protection of Human Health and the Environment (NCP §300.430(f)(5)(ii)(A)) . . . . Page 70
10.2 Compliance with Applicable or Relevant and Appropriate Requirements (NCP §300.430(f)(5)(ii)(B)) . . . . Page 70
10.3 ARAR Waivers (NCP §300.430(f)(5)(ii)(C)) . . . . Page 71
10.4 Cost Effectiveness (NCP §300.430(f)(5)(ii)(D)) . . . . Page 71
10.5 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP) (NCP §300.430(f)(5)(ii)(E)) . . . . Page 72
10.6 Preference for Treatment as a Principal Element (NCP §300.430(f)(5)(ii)(F)) . . . . Page 72
10.7 Indication of the Remediation Goals (NCP §300.430(f)(5)(iii)(A)) . . . . Page 72
10.8 Documentation of Significant Changes from Preferred Alternative of Proposed Plan (NCP §300.430(f)(5)(iii)(B)) . . . . Page 72
10.9 Five-Year Requirements (NCP §300.430(f)(5)(iii)(C)) . . . . Page 73
PART 11: COMMUNITY OUTREACH LEADING UP TO PROPOSED PLAN . . . . . . Page 74
11.1 Community Outreach (Fact Sheets, Video, Data Availability Session) . . Page 74
PART 12: PUBLIC PARTICIPATION IN REMEDY SELECTION (NCP §300.430(f)(3)) . . . . Page 76
12.1 Public Notice (NCP §300.430(f)(3)(i)(A)), Public Comment (NCP §300.430(f)(3)(i)(B) and (C)), Public Meeting (NCP §300.435(f)(3)(i)(D) and (E)) . . . . Page 76
12.2 Significant Changes from Preferred Alternative of Proposed Plan . . . . . . Page 76
12.3 Responsiveness Summary ((NCP §300.430(f)(3)(i)(F)) . . . . Page 76
PART 13: COMMUNITY RELATIONS WHEN THE RECORD OF DECISION IS SIGNED (NCP §3 00.430(f)(6)(i) and (ii)) . . . . Page 87
13.1 Public Notice of Availability of ROD (NCP §300.430(f)(6)(i)) . . . . Page 87
13.2 Availability of ROD (NCP §300.430(f)(6)(ii)) . . . . Page 87
PART 14: REFERENCES . . . . Page 88

Photographs

1. Northern Facing Picture of Former Mary McLeod Bethune Elementary School
2. North Facing Picture of Northern School Property

Figures

1. Proposed Sampling Locations for RI Phase III (Figure 12-3 from RI Phase III Work Plan)
2. Phase 1 Depth to Ash (Figure 4-2 from FS)
3. Phase 2 Parcel by Parcel Soil Sampling Results (Figure 4-10a from FS)

4. Areas Exceeding RGOs (Figure 2-1 from FS)
5. Potentially Complete Exposure Pathways (Figure 3-1 from ERA)
6. Known and Assumed Parcels in need of Remediation (Figure 4-1 from FS)

Tables

1. Summary of Sample Location (Table 1 from ESI)
2. Summary of Inorganic Surface Soil Results (Table 2 from ESI)
3. Summary of Extractable Organic Surface Soil Results (Table 3 from ESI)
4. Summary of Pesticides/PCB Surface Soil Results (Table 4 from ESI)
5. Summary of Dioxin/Furan Surface Soil Results (Table 5 from ESI)
6. Summary of Inorganic Groundwater Results (Table 6 from ESI)
7. Summary of Inorganic Surface Water Results (Table 8 from ESI)
8. Summary of Inorganic Sediment Results (Table 9 from ESI)
9. Summary of Organic Sediment Results (Table 10 from ESI)
10. Parcel by Parcel Soil Sampling Procedure - Phase II (Table 2-2 from RI Report)
11. Constituents Detected in Sediment Above Screening Criteria (Table 2-5 from ERA)
12. Inorganic Constituents Detected in Surface Water Above Threshold Criteria (Table 2-6 from ERA)
13. Constituents Detected in Groundwater Above Screening Level (from Groundwater Water Monitoring Re-sampling Report Tables 3, 4, 7, 9, 11)
14. Conceptual Site Model (Human Health Receptor Exposure Pathways (Table 1 from BHHRA)
15. COPCs Identified in the BHHRA (from Page ES-2 from BHHRA)
16. Cancer Toxicity Data - Oral/Dermal (Tables 6.1 and 6.2 from BHHRA)
17. Non-cancer Toxicity Data - Oral/Dermal (Tables 5.1 and 5.2 from BHHRA)
18. Risk Assessment Summary - Reasonable Maximum Exposure (Tables 10.4, 10.5, 10.6 from BHHRA)
19. Risk Assessment Summary - Reasonable Maximum Exposure (Tables 10.1, 10.2, 10.3 from BHHRA)
20. COCs Identified in the BHHRA (reproduction from BHHRA page 5-13)
21. Refined List of COCs from the BHHRA (reproduction from BHHRA Tables 12.1 and 12.2)
22. Surface Soil Samples Collected in Yards (Table B.13.1 from BHHRA)
23. Risk Based Remedial Goal Options (Tables 11.1 and 11.2 from BHHRA)
24. Final Human Health COCs for the Site
25. ERA Step 2's Preliminary Contaminants of Potential Ecological Concern (PCOPEC) (reproduction from ERA Table 2-7)
26. ERA Step 3's Contaminants of Potential Ecological Concern (COPEC) (reproduction of ERA Table 3-1 and 3-12)
27. Human Health Soil Constituents of Concern and Residential RGs (reproduction from Proposed Plan)
28. Human Health Soil Constituents of Concern and Industrial RGs (reproduction from Proposed Plan)
29. Constituents of Potential Ecological Concern and Preliminary Ecological RGs (reproduction from Proposed Plan)

30. Assembly of Remedial Alternative (Table 4-1 from FS)
31. Criteria for Evaluating Remedial Alternatives (reproduction from Proposed Plan)
32. Detailed Evaluation of Remedial Alternatives (Table 5-2 from FS)
33. Comparative Analysis of Remedial Alternatives (reproduction from Proposed Plan)
34. Summary Cost Table (Table 5-3 from FS)
35. Cost Sensitivity of Discount Rates (Table 5-4 from FS)
36. Estimated Cost of Selected Remedy (reproduction from FS)
37. Chemical-Specific ARARs (based on FS, Appendix B)
38. Location-Specific ARARs (based on FS, Appendix B)
39. Action-Specific ARARs (based on FS, Appendix B)
40. Cost Effectiveness Matrix

LIST OF ACRONYMS and ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Regulations
ATV	Alternate Toxicity Value
BDL	Below the laboratory Detection Limit
BHHRA	Baseline Human Health Risk Assessment
bls	below land surface
bgs	below ground surface
CAR	Corrective Action Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	Contaminant (or Chemical) of Concern
COEJ	Community Organized for Environmental Justice
COPC	Contaminant of Potential Concern
COPEC	Contaminant of Potential Ecological Concern
CSF	Carcinogenic Slope Factor
cys	cubic yards (also see yd^3)
DQO	Data Quality Objectives
EPA	United States Environmental Protection Agency
EPA-OTS	EPA Region 4 Office of Technical Services
EPS	Exposure Pathway Scenarios
ERA	Ecological Risk Assessment
EPC	Exposure Point Concentration
ESD	Explanation of Significant Differences
ESI	Expanded Site Inspection
ESV	Ecological screening values
FDEP	Florida Department of Environmental Protection
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
HRS	Hazard Ranking System
GCTL	Florida Groundwater Cleanup Target Level
IRIS	Integrated Risk Information System
JEA	Jacksonville Electric Corporation
LOAEL	Lowest Observed Adverse Effects Level
MCL	Maximum Contaminant Level
MEP	Maximum Extent Practicable
mg/kg	milligrams per kilogram or parts per million (ppm)
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effects Level
NPL	National Priority List
O&M	Operation and Maintenance
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbons

PCB	Polychlorinated Biphenyls
PCOPEC	Preliminary Contaminant of Potential Ecological Concern
ppb	parts per billion
ppm	parts per million
PRG	EPA Region 9 Preliminary Remediation Goals
RAO	Remedial Action Objectives
RBC	EPA Region 3 Risk Based Concentrations
RBCA	Risk Based Corrective Action
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RG	Remedial Goals (i.e., cleanup levels)
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act of 1986
SAS	Superfund Alternative Site
SCTL	Florida Soil Cleanup Target Level
SDWA	Safe Drinking Water Act
SESD	EPA Region 4 Science and Ecosystem Support Division
SI	Site Inspection
SQL	Sample Quantification Limit
SSI	Site Screening Investigation
SVOCs	Semi-Volatile Organic Compounds
TAL	Target Analyte List
TAT	Technical Assistance Team
TCDD	tetrachlorodibenzodioxin
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxicity Equivalence Quotient
μg/kg	micrograms per kilogram
μg/L	micrograms per Liter
US	United States
US FWS	United States Fish and Wildlife Service
VOCs	Volatile Organic Compounds
WESTON	Roy F. Weston, Inc.
yd^3	cubic yards
XRF	X-ray fluorescence
<	less than

PART 1: THE DECLARATION

1.1 Site Name and Location

This Record of Decision (ROD) is for the Brown's Dump Superfund Alternative Site (i.e., "Brown's Dump Site," "Brown's Dump" or "Site"), which is located in the City of Jacksonville and consists of the former Mary McLeod Bethune Elementary School, an electric substation of the Jacksonville Electric Authority (JEA), surrounding single family homes and multiple family complexes (e.g., apartments). The U.S. Environmental Protection Agency (EPA) Site Identification Number is FLD 980 847 016.

1.2 Statement of Basis and Purpose

This decision document presents the Selected Remedy for the Brown's Dump Superfund Alternative Site (the "Site"), which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the Site. In accordance with 40 CFR 300.435, as the support agency, the Florida Department of Environmental Protection (FDEP) has been offered the opportunity to provide input during this process. FDEP does not object to the selected remedy.

1.3 Assessment of Site

The response action selected in this ROD is necessary to protect the public health or welfare and the environment from actual or threatened releases of hazardous substances to the environment.

1.4 Description of Selected Remedy

The overall cleanup strategy for this Site is to prevent the human and ecological exposure to contaminated soil above the Remedial Goals (RGs; i.e. cleanup levels) by excavation, soil covers and Institutional Controls. The major components for the Selected Remedy include:

- ❑ Prevention of human exposure to surface soil contaminated above RGs is provided by soil removal as needed to allow for installation of a 2 foot thick soil cover. For the most part, in residential areas this approach will result in the removal of any contamination above RGs in the upper 2 feet of soil to be followed by backfill with a 2 foot thick soil cover. Approximately 240 residential properties will undergo excavation.
- ❑ Temporary Relocation provided to eligible residents upon their request.
- ❑ Excavation will be followed by restoration activities (e.g., backfilling with clean soil, replacement of flower beds, trees, shrubs, grass, etc.).
- ❑ Stabilization of the banks of Moncrief Creek (e.g., clear banks, excavate soil to

achieve acceptable side slopes, dispose of excavated soil/material properly, installation of erosion controls to prevent erosion of ash/contamination into creek, etc.).

- Place geotextile (or other membrane) topped with gravel under residential houses with open crawlspaces (that can be easily accessed by children) with exceedance of human health RGs to further prevent direct contact with the soil.
- Institute groundwater monitoring to verify the "No Action" decision for the groundwater.
- Solidification/stabilization of excavated soil exceeding the limits of Toxicity Characterization Leaching Procedures (TCLP). An estimated 8,500 cubic yards of excavated soil/ash will need to be solidified/stabilized prior to disposal at an appropriate Subtitle D Landfill.
- Imposition of Institutional Controls to control exposure to remaining soil contamination (e.g., soil contamination located under the soil cover, and soil contamination remaining under buildings, roads, etc.).

1.5 Statutory Determinations

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted every five years from construction completion. The objective of these five year reviews will be to confirm that the remedy is, or will be, protective of human health and the environment. If found to be unprotective, then corrective actions will be taken to bring the remedy to a protectiveness level.

The contaminated soils at the Brown's Dump Site are not considered to be "principal threat wastes" because the Contaminants of Concern (COCs) are not found at highly toxic concentrations that pose a significant risk to either human or ecological receptors, and the contaminated soil can be reliable contained. However, the selected remedy satisfies the statutory preference for treatment as a principal element of the remedy because a small percentage of the excavated soil contains hazardous characteristics requiring it to be considered a RCRA hazardous waste and in need of treatment pursuant to RCRA treatment standard requirements at 40 CFR part 268.

1.6 Data Certification Checklist

The following information is further discussed in Parts 3 through 8 of the Record of Decision. Additional information can be found in the Administrative Record file for this Site.

- ✔ Contaminants of Concern (COCs) and their respective concentrations.
- ✔ Baseline risks represented by the COC.
- ✔ Remedial Goals (i.e., cleanup levels) established for COCs and the basis for these levels.
- ✔ How source materials constituting principal threats are addressed.
- ✔ Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater.
- ✔ Potential land and groundwater use that will be available at the Site as a result of the Selected Remedy.
- ✔ Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.
- ✔ Key factor(s) that led to selecting the remedy (i.e. describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision).

1.7 Authorizing Signatures

Beverly H. Banister 8/24/06

Beverly H. Banister
Acting Division Director
Waste Management Division

Date

PART 2: INTRODUCTION TO THE SITE

2.1 Site Name, Location, and Brief Description

This Record of Decision (ROD) is for the Brown's Dump Site. Brown's Dump is located in the City of Jacksonville and consists of land where ash was deposited from City of Jacksonville municipal incinerators, including the former Mary McLeod Bethune Elementary School, an electrical substation of the Jacksonville Electric Authority (JEA), surrounding single family homes and multiple family complexes (e.g., apartments). The Site's coordinates are latitude 30° 21' 57" N and longitude 81° 41' 06" W. The United States Environmental Protection Agency's (EPA) Site Identification Number is FLD 980 847 016. The lead agency for this Site is the EPA.

In 1999, the EPA identified the City of Jacksonville, the Duval County School Board and JEA as Potentially Responsible Parties (PRPs). In September 1999, the City of Jacksonville voluntarily entered into an Administrative Order by Consent (AOC) with the EPA for the performance of a Remedial Investigation (RI) and Feasibility Study (FS). Therefore, this Site was never listed on the National Priorities List (NPL); rather, it is a Superfund Alternative Site (SAS) which, pursuant to the 1999 AOC, followed the National Contingency Plan (NCP) for the required investigation/study. Site remediation is to be funded by the City of Jacksonville.

The Site is approximately 80 acres in size. From the late 1940's until the mid-1950's, the Site was an operating landfill used to deposit ash from City of Jacksonville municipal incinerators. Investigations have indicated that the contaminated soil (and ash) is present within the Site at depths varying from the surface to greater than 20 feet below land surface (bls).[1] After closure of the landfill in1953, the property was obtained by the Duval County School Board in 1955, through condemnation procedures, for construction of a school. At approximately the same time and later, land surrounding the original landfill began to undergo development of residential homes and apartment complexes.

The original location of the deposition is centered on the northern portion of the former Mary McLeod Bethune Elementary School (See Photographs 1 and 2). School year 2000/2001 was the last year the school was open.

Regarding the reason for school closure, in a letter from the City to the School Board (dated December 8, 2000), the City made the following recommendation:

> "[t]he present schedule would require remediation efforts to start this summer, with no guarantees that work would or could be completed before the start of the school year. Accordingly, it is my

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[1] Except for those homes located along Moncrief Creek and near the northern school property, most of the contamination above the RGs in residential areas is approximately 2 feet (or less) in thickness. The deepest contamination above the RGs is found on the northern school property.

> recommendation that the school not be opened for the 2001-2002 school year."

In an EPA Fact Sheet dated February 2001, EPA stated that the decision to close the school was made by the local officials. The Fact Sheet also stated that "EPA did not make any suggestions or decisions to close the school."

The City's recommendation to the School Board was apparently based on the perceived impact remediation might have if cleanup occurred during the school year. There were also other, equal if not more important, reasons the School Board used in deciding to close the school. For example, it was reported that school facilities were severely out of date (e.g., could not link to the internet) and in dire need of general updating.

2.2 Site History and Enforcement Activities (i.e., activities that lead to current problem)

From the late 1940's until the mid-1950's, the Site was an operating landfill used to deposit ash from City of Jacksonville municipal incinerators. Subsequent sampling of the ash and soil contaminated with ash indicated that the main contaminant of concern (COC) in soil is lead, but other inorganic contaminants of concern also exist (e.g., arsenic). Burning and incineration processes can produce dioxin constituents, and dioxins have been identified as a COC in the Baseline Human Health Risk Assessment (BHHRA). Combustion of organic materials and other wastes in a municipal incinerator may also generate other contaminants that may be present at elevated levels. For instance, carcinogenic polyaromatic hydrocarbons (PAHs) have been identified as a COC in the BHHRA.

2.3. Previous Investigations

What ultimately became the Brown's Dump Site has been investigated numerous times over the years. The following is a summary of EPA's involvement and the involvement of the State of Florida.

2.3.1 Preliminary Assessment (PA), 1985

In 1985, EPA conducted a PA which concluded that the Site should be prioritized for possible federal cleanup as a low-priority. Subsequently, in November 1985, the EPA Environmental Services Division conducted a Site Screening Investigation (SSI), during which the following samples were collected:

- Three surface and subsurface soil samples
- Three sediment samples
- Three groundwater samples
- Two surface water samples

The results of these samples indicated high levels of lead in surface and subsurface soil samples. Additionally, lead was detected in sediment samples collected from Moncrief

Creek. The groundwater and surface water samples did not show any detectable levels of lead; however, the laboratory detection limits were unusually high for these media.

In summary, EPA's first assessment of the Brown's Dump Site in 1985 found concentrations of lead that exceeded a regulatory screening or threshold value in some of the soil/ash samples; however, results did not indicate significant organic contamination of the Site. A Preliminary Hazard Ranking System (HRS) score of lower than 28.5 resulted in the Site's designation as a low priority Site for federal action.

2.3.2 EPA Re-Evaluation of the Site, 1994

In 1994, Brown's Dump was re-evaluated using the revised HRS, resulting in a score of greater than 28.5 for groundwater and soil exposure pathways. In 1995, EPA collected additional soil samples, which again confirmed lead contamination in soil.

2.3.3 EPA Emergency Response and Removal Branch Site Investigation, 1995

In 1995, the Roy F. Weston, Inc., Technical Assistance Team (TAT) of EPA's Emergency Response Removal and Prevention Branch conducted a sampling trip to the Site. The Weston TAT investigation included the collection of eight surface soil and one surface water sample. The results of these samples support that elevated levels of lead found in the previous SSI from 1985. As a result of these levels, a meeting was held on April 25, 1995, to discuss future regulatory activities at the Site. It was concluded during this meeting that the Florida Department of Environmental Protection (FDEP) would take the prime enforcement role for the Site, with EPA providing technical assistance. EPA advised school officials to restrict access to the areas of soil contamination identified by the most recent sample results.

2.3.4 Corrective Action Report (CAR), 1995

FDEP contracted for further Site investigations, and in 1995 a CAR was submitted to FDEP. Specifically, in November of 1995, EMCON Corporation prepared a CAR for the City of Jacksonville Solid Waste Division. The scope of work for the Contamination Assessment included the collection of sixty-two soil boring samples, installation and sampling of eight shallow monitoring wells, the collection of surface water and sediment samples. In addition, a well inventory was completed.

The 1995 CAR concluded that a health risk evaluation for the Site was necessary. Performed at the Site in July 1996, the health evaluation determined that, although the Brown's Dump Site did not currently pose a health risk, and the hazard was not sufficient to warrant soil removal, several interim remedial measures be implemented at the Site. The CAR recommended several Interim Remedial Actions, including installation of fences to restrict access to school property, placement of soil and grass in various locations throughout the Site, continuation of public education program, and removal of surficial soils identified in the school property containing lead concentrations above 78,800 milligrams per kilogram. In December 1995, a sandy soil material capable of sustaining a grass cover was installed in the area of the playground and basketball courts. Additionally, six inches of soil was spread over the area where exposed glass was observed. The egress point along the western property line was covered with sandy soil material and then seeded. Fences were repaired and installed along West 33rd Street and in the area of the courtyard.

Between January and April 1996, 353 soil borings were advanced to further assess the extent of ash in the neighborhood surrounding the Site. Additional soil samples were collected for laboratory analyses of total lead. Two CAR Addenda were submitted in 1996.

On July 9, 1996, EMCON submitted a Baseline Health Evaluation Report for the former Mary McLeod Bethune Elementary School/Brown's Dump Site, evaluating current and potential future health impacts associated with the Site. The report concluded that "blood lead data for Site area children are generally in the range or are below levels reported for the City of Jacksonville overall" and that "overall, excess lead exposure and hazard due to residing in the Brown's dump area is not apparent."

The Baseline Health Evaluation Report also concluded that lead concentration in soil containing ash are higher than levels typically considered to warrant no further action in areas where exposure to children may occur. Therefore, the report recommended a number of remedial actions based on site conditions and potential exposure pathways identified in literature including:

- Completion of any outstanding Interim Remedial Measures previously proposed for the Site in the CAR,
- Verification that access controls on the JEA property remain in place
- Implementation of a public education program,
- Implementation by the Health and Rehabilitation Services of a voluntary testing program including blood lead and lead in home grown produce.
- Removal of the lead "hot spot" identified off school property with verification sampling.

2.3.5 Expanded Site Inspection Report (ESI), 1998

In late 1997, Tetra Tech, an EPA contractor, conducted an ESI at the Site. The purpose of the ESI was to collect data to evaluate significant contamination, migration and exposure pathways for purposes of use in determining whether the Site ranks on the NPL. To accomplish these objectives, sixteen surface soil samples, four groundwater samples, four surface water samples and four sediment samples were collected.

Analytical results of the surface soil samples collected at the Site indicated elevated levels.[2] Table1 provides the sample location and Tables 2 through 5 provide the surface soil sample results from the ESI.

Organic contaminants were not detected in the groundwater samples collected. However, numerous inorganic contaminants typical of those detected in incinerator ash were detected in the groundwater samples collected as part of the ESI (see Table 6).

Several contaminants consistent with those found in incinerator ash were detected on Site and in sediment and surface water samples collected from Moncrief Creek (see Tables 7, 8 and 9).

The twenty-eight ESI samples confirmed much of the information that had been provided about the Site through numerous past investigations. The following is a summary of the ESI findings for each pathway under consideration by the HRS.

- Inorganic constituents attributable to the Site were detected in several groundwater samples. The ESI determined that thirty-one public drinking water wells completed in the Floridan Aquifer and serving a total of 95,933 people are located within the Site's 4 mile radius. Additionally, many people utilize private drinking water wells within the Site 4 mile radius. Therefore, the ESI concluded that the groundwater pathway was of significant concern at the Site.

- Analytical results of sediment samples collected from Moncrief Creek indicate elevated levels of Site attributable contaminants. Moncrief Creek, the Trout River and the St. Johns River are known fisheries and the habitat for federally endangered species. Therefore, the ESI concluded that the surface water migration pathway was also of concern at the Site.

- Surface soil samples collected at the elementary school and in residential areas during the ESI indicated elevated levels of Site attributable contaminants. In fact, the ESI concluded that the soil exposure pathway is the primary concern at the Brown's Dump Site due to the school and residences. The air migration pathway was deemed to be of limited concern due to the low volatility of many of the contaminants and the vegetative or asphalt cover of most of the property.

In summary, analytical results from the environmental samples indicate that surface soil, sediment, surface water, and groundwater had been impacted by releases from the dump. Based on the analytical results from the ESI, further action was recommend for the Site.

[2] Within the ESI, the term "elevated" means the concentration is 3 times background. In those cases where there was no detection of a contaminant at a background location, any sample with a concentration above its quantitation limit (SQL) and the background SQL is considered to be elevated.

2.4 Implementation History of Remedial Investigation (RI), Baseline Human Health Risk Assessment, Ecological Risk Assessment, Feasibility Study

2.4.1 RI Phase I, 1999 - 2000

With the signing of an AOC in September 1999, the City of Jacksonville agreed to performing a Remedial Investigation/Feasibility Study (RI/FS). The purpose of the Remedial Investigation is to determine the nature and extent of contamination that exists at the Site. An RI/FS Kickoff public meeting was held on April 3, 2000. The Remedial Investigation Work Plan was reviewed by EPA, FDEP and the Technical Advisor for Community Organized for Environmental Justice (COEJ), a local community organization. The plan was approved by EPA, and fieldwork for the Remedial Investigation, which consisted of soil, groundwater and surface water sampling, was conducted during the summer of 2000. The draft Remedial Investigation Report was submitted in October 2000.

After review of the October 2000 Remedial Investigation Report, further residential parcel-by-parcel (i.e., lot-by-lot) soil sampling was determined to be needed (i.e., Additional Remedial Investigation - Phase II).

2.4.2 RI Phase II, 2001 - 2003

The work plan for the additional Remedial Investigation soil sampling was reviewed by EPA and the State. COEJ was also provided the opportunity to review this plan. In August 2001, EPA approved the plan for the Phase II Remedial Investigation soil sampling. Field work for the additional soil sampling began October 22, 2001.

The sampling took longer than expected due to difficulties in obtaining signed Access Agreements. On two occasions (September/December 2001), the City mailed Access Agreements to properties targeted for the additional soil sampling. The first mailing went to the mailing address of the property targeted for sampling. The second mailing went to the owner/occupant at the physical address of the property. The second request from the City was followed by a December 2001 EPA Fact Sheet on the Access Agreement.

In January 2002, the EPA and the City walked through the neighborhood making contact with people who had not returned previous requests for access. During the walk through the community, questions on the Access Agreements and the importance of the additional sampling were answered.

In March 2002, U.S. Representative Corrine Brown sent a letter to individuals who had not signed the Access Agreements. Representative Brown's letter encouraged people to sign the Access Agreement so sampling could take place to determine if incinerator ash and contaminated soil are present.

Approximately 70% of the yards (i.e., parcels) targeted for the additional soil sampling in Phase II provided access to be sampled and were sampled. With an acceptable number of parcels sampled in early 2002, the following major actions occurred:

- EPA called for the October 2000 Remedial Investigation to be rewritten to include the information collected during Phase II.
- EPA held a Data Availability Session in October 2002 at the Moncrief Community Center to answer community questions on the results from Phase I and Phase II sampling.
- EPA finalized the Human Health and the Ecological Risk Assessments in the fall of 2002.
- Additional background dioxin sampling was performed in late 2002 and early 2003.
- Additional groundwater sampling was performed in early 2003.

The RI Report was approved in 2005 concurrently with the Feasibility Study. The RI findings are discussed in more detail in Part 3 of this ROD.

2.4.3 Baseline Human Health Risk Assessment (BHHRA), 1999-2002

The BHHRA was performed by an EPA contractor, Black&Veatch, under an RI/FS Work Assignment. The BHHRA was approved by the EPA in October 2002. This document concluded that unacceptable risk existed for COCs in soil and groundwater. These risks were well defined and there were no additional assessments required to develop Remedial Goal Options (RGOs or possible cleanup levels) for the identified COCs. The risks are discussed in more detail in Part 4 of this ROD.

2.4.4 Ecological Risk Assessment, 1999-2002

The Ecological Risk Assessment was performed by an EPA contractor, Black&Veatch, under an RI/FS Work Assignment. The Ecological Risk Assessment was approved by the EPA in November 2002. This document concluded that sediment and surface water do not contain ecologically significant concentrations of contamination and therefore were not considered to be media of ecological concern at the Site. However, comparison of preliminary ecological RGOs to concentrations of contaminants of potential ecological concern (COPEC) in surface soil leads to the conclusion that surface soil presents a risk to terrestrial communities in the Site vicinity. These risks were well defined and there were no additional ecological evaluations or assessments required to develop preliminary remedial goals for the contaminated medium. The risks are discussed in more detail in Part 5 of the ROD.

2.4.5 Feasibility Study, 2002 - 2004

With finalization of both Risk Assessments and completion of Phases I and II of the Remedial Investigation (i.e., with the sampling of a significant number of targeted parcels), work began on the next step in the cleanup agreement with the City, the Feasibility Study. The purpose of the Feasibility Study is to evaluate realistic cleanup alternatives for the Site.

The following is a listing of the main events which occurred with regard to the Feasibility Study:

- A Technical Memorandum dated November 2002 was submitted for review. This memo addressed the first three sections of the Feasibility Study. Review of this Technical Memorandum lead to the call in February 2003 for the full Feasibility Study.
- Feasibility Study (revision 0) was submitted in June 2003 and reviewed.
- Feasibility Study (revision 1) was submitted in October 2003 and reviewed.
- Feasibility Study (revision 2) was submitted in September 2004, revised twice and approved in 2005.

The FS findings are discussed in more detail in Part 6 and 7 of the ROD.

2.4.6 RI Phase III, 2003 - 2005

Around the time the June 2003 Feasibility Study was submitted, it was recognized that several provisions of Florida's Risk Based Corrective Action (RBCA) statute (F.S. §376.30701), enacted on June 20, 2003, would impact Superfund cleanups conducted in Florida. Impacts from this law (along with a desire to collect information needed for quicker implementation of the cleanup) necessitated an additional round of sampling at certain parcels (i.e., Phase III).

RI Phase III sampling actions are to occur concurrent with selection of the cleanup approach and remedial design activities. Information from this sampling event will be reviewed and used to further refine areas in need of cleanup.

2.5 Enforcement Activities

In 2002, the EPA initiated a PRP search. As of the date of this ROD, the PRP search and reporting process has not be completed.

2.6 Other Response Actions

EPA acknowledges that there can be a separate cooperative cleanup agreement for the site between the PRP and FDEP or other regulatory agencies. EPA further acknowledges that the PRP is not prevented from doing additional cleanup concurrent with the CERCLA action as long as additional cleanup does not interfere with or impede the CERCLA action. Examples of such additional cleanup may include cleanup of the site to FDEP soil cleanup target levels that are based on acute toxicity, removal of non-hazardous solid waste, and inclusion of this site in an area-wide program to reduce or eliminate contamination in the river basin of Hogan's Creek."

PART 3: SUMMARY OF ENVIRONMENTAL CONTAMINATION

3.1 Site Overview

The Site comprises approximately 80 acres. Approximately 14 acres of the Site consists of the former Mary McLeod Bethune Elementary School property. The school has been closed since school year 2000/2001. The northern portion of the school property appears to have been the main disposal location during the landfilling operation from 1949 to 1953. This northern portion of the school property is fenced, vacant and overgrown with vegetation and secondary growth forest. Approximately 2 acres of the Site contain an electric substation. The remaining Site acreage is a residential area.

3.2 Sampling Strategy

During the RI, the following media were sampled: surface soil, subsurface soil, sediment, surface water and groundwater. The RI consisted of what ultimately became three phases.

Phase I included surface water, sediment and groundwater sampling and the following soil sampling events:

- Site Characterization Soil Sampling
- Tier 1 (Delineation) Soil Sampling
- Tier 2 (Delineation) Soil Sampling
- Additional Surficial Soil Sampling

Phase II consisted of groundwater sampling and the following soil sampling event:

- Parcel by Parcel Soil Sampling (i.e., residential yard by yard or lot by lot sampling)

All totaled, approximately 570 soil borings (9,557 soil samples) were advanced during Phase I and II.

Around the time the June 2003 Feasibility Study was submitted, it was recognized an additional round of RI sampling at certain parcels would be worthwhile (i.e., RI Phase III). Phase III began in August of 2005 and consists of the following:

- Parcel by Parcel Soil Sampling (i.e., residential yard by yard or lot by lot sampling) of those properties not previously sampled (mainly due to failure to obtain access) and re-sampling of property where information on constituent concentrations is incomplete.

This third round of sampling began collection of information needed for quicker implementation of the cleanup once the remedy is selected. Information collected during this RI phase will be used to further refine areas needing remediation. Any properties identified in Phase III will be addressed in a manner consistent with the selected remedy.

Figure 1 shows the proposed sampling locations for RI Phase III.

3.3 Known and/or Suspected Sources of Contamination

The source of lead, arsenic PAHs, etc. contamination is incinerator ash from the City of Jacksonville municipal incinerators which was deposited at the Brown's Dump. Additionally, Clinton Brown, the former property owner, stated that when the incinerator was not functioning, some municipal waste was brought directly to the landfill. Although the ash varies in color, it can be identified by the presence of glass and metal fragments (collectively referred to as "clinkers").

3.4 Surface and Subsurface Soil Contamination

During Phase I of the RI, surface soil samples were obtained from 312 locations in 2000 through 2002. The intent of the soil sampling effort was to delineate the ash source areas and the perimeter of the source areas through visual observation, x-ray fluorescence (XRF) screening for lead, and laboratory analysis for inorganics. There were also fifteen background soil locations sampled. The background samples were obtained from the surface and subsurface. Of the 312 sample locations, a subset were analyzed for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) and dioxin.

During Phase II of the RI, a total of 260 parcels of property were sampled. Each sampling event at a parcel consisted of a central boring and 4 outer borings designed to spatially represent a land parcel, lot or backyard. The parcel by parcel sampling consisted of one central boring conducted to the water table and checked for visual ash and XRF lead. Four additional corner borings were conducted to 2 feet and checked for visual ash and XRF lead. Any discreet sample with XRF lead measurements in the range of 200 - 400 mg/Kg were analyzed in the laboratory for lead and arsenic. A five-point soil composite sample (0-6 inches bls) was also collected from each parcel. The composite samples were examined in the field for visual ash and XRF lead. In addition, some of the surface soil composite samples were submitted to the laboratory for analysis of Target Analyte List (TAL) metals (20 percent), PAHs (10 percent) and dioxins/furans (10 percent). The detailed procedures for conducting the parcel by parcel sampling during Phase II are explained in Table 10.

Surface and subsurface soils are contaminated with constituents associated with ash (e.g., lead, arsenic, PAHs, etc). Figure 2 shows the depth to ash from Phase I of the RI. These soils contain lead and/or other COCs above Remedial Goals derived from the human health or ecological risk assessments.

The areas of the Site sampled during Phase II that have lead contamination exceeding the lead Remedial Goal of 400 ppm can be seen in Figure 3. The distribution of all contaminants can be seen in Figure 4.

3.5 Sediment Contamination

During RI sampling events in 2000, a total of 13 sediment samples were obtained from Moncrief Creek. Five of these samples were stations located upgradient of the Site. All 13 samples were analyzed for TAL metals, SVOCs, pesticides and polychlorinated biphenyls (PCBs). Three samples were also analyzed for dioxins and two samples for VOCs. Table 11 shows the constituents detected by sediment analysis.

Sediment samples from 4 locations were also taken in 1997. Two of the sediment samples collected in 2000 correspond with locations previously sampled in 1997. Several sources have indicated that the portion of Moncrief Creek adjacent to the Brown's Dump Site had been dredged for maintenance purposes after the1997 sampling. A comparison of the new data (i.e., 2000) to the old data (i.e., 1997) indicated the following:

- Data from sample BDSD-03 in the 1997 sampling event does not correlate well with data from the same location collected in the recent sampling round (BDSW004).

- Lead, copper, mercury, and zinc concentrations identified in 1997 sample BDSD-04 (760JN, 190, 0.62, and 810 mg/KG, respectively) are much higher than the maximum concentrations in the corresponding April 2000 sample (14 J, 6.2 J, 0.011 J, and 52 mg/KG, respectively). This may suggest that the dredging effectively removed much of the contaminated sediment. Another possibility for the significant difference in the results of these two data sets is differences in data quality. The highest value of lead in sediment in 1997 was in a JN-qualified result. The result was more than likely biased high due to interferences with other metals in the sample.

- With the exclusion of BDSD-03 and BDSD-04 in the1997 data set, the data from the recent sampling is similar in terms of the detected contaminants and range of detected concentrations.

- Dioxins were not analyzed for in the 1997 data set. It is important to note that in the April 2000 data set, the reference samples contained higher dioxin concentrations than the samples collected adjacent to the Site. Due to questions raised about obtaining "true" reference samples in an area where the boundaries of the ash have not yet been determined, inorganic compounds were not screened against the reference samples.

The data comparison appears to confirm that areas sampled at BDSD-03 and BDSD-04 (portions of Moncrief Creek adjacent to the Site) have been dredged based on the stark differences between the two data sets at these locations.

3.6 Surface Water Contamination

Surface drainage at the Brown's Dump Site is collected in drainage ways along streets, in storm water collection systems, and in swales. Drainage ways flow north and northwestward into Moncrief Creek. Several tributaries flow into Moncrief Creek near the Site including one stream from the north draining a park and Northwestern High School, and one from the south draining the area south of the school property. Moncrief Creek flow northeastward into the Trout River, located approximately 2.5 miles northeast of the Site, and eventually into the St. Johns River.

During the RI sampling events in 2000, a total of 13 surface water samples were obtained from Moncrief Creek. Five of these samples were stations located upgradient of the Site. These sample locations were co-located with the sediment samples discussed in Part 3.5. All 13 surface water samples were analyzed for TAL metals, SVOCs, pesticides and PCBs. Table 12 shows that constituents detected by surface water analysis. No metals exceeded the refinement screening values utilized in the Ecological Risk Assessment. No VOCs, SVOCs, pesticides or PCB compounds were detected in surface water.

Surface water samples taken from 4 locations in 1997 also exist. Two of the surface water samples collected in 2000 correspond with locations sampled previously in 1997. The original data collected in 1997 from 4 surface water samples (co-located with sediment samples) indicated that lead and zinc are at concentrations that exceed USEPA Region 4 ecological screening values. Two of the surface water samples collected in April 2000 correspond with locations sampled previously (BDSW004 [2000] = BDSW-03 [1997] and BDSW005 [2000] = BDSW-04 [1997]). A comparison of the new data (i.e., 2000) to the old data (i.e., 1997) indicates the following that there is little to no correlation between the 1997 and 2000 data sets. The data comparison appears to support he assumption that the area sampled at BDSB-13 and BDSD-04 (i.e., portions of the creek adjacent to the Site) have been dredged.

3.7 Groundwater Contamination

Groundwater beneath the Site flows toward the creek in a north-northwesterly direction. The groundwater table in the area under investigation is typically encountered between approximately 5 to 15 feet below ground surface (bgs). The average hydraulic gradient, which is defined as the slope of the water table across the Site, was calculated to be 0.009. In general, the gradient appears to be flatter farther from the creek. Near Moncrief Creek, the gradient steepens to approximately 0.02.

No residential wells or community wells near the Site were identified or sampled. During the RI, two groundwater sampling events were performed. One event occurred in 2000 and the second event occurred in 2002. Sixteen monitoring wells were sampled in 2000 and 14 wells were sampled in 2002. Table 13 lists all of the constituents detected above respective health based screening levels during these two groundwater sampling events.

Pesticides for the 2000 sampling event were below the screening criteria except for alpha-BHC and beta-BHC in one of the background wells, BKBDMW001. This same well had slightly elevated pesticides in the 2002 sampling event. Pesticides have been widely used in residential settings to control pest, and they are not considered to be site related detections.

The only metal that exceeded a primary drinking water standard was cadmium at 0.0053 mg/l, which slightly exceeded the cadmium primary drinking water standard of 0.0050 mg/l. However, the dissolved cadmium concentration for this well was 0.0046B mg/l, which is below the primary drinking water standard. Several wells exceeded secondary drinking water standards for aluminum, iron and manganese. However, secondary standards are not health based. EPA observed a slight elevation of manganese and an elevation of iron concentrations near the Site relative to the background wells. However, all the manganese concentrations are within the risk range for manganese (i.e., 0.03 to 0.9 ppm) as calculated in the BHHRA. All but two of the iron concentrations are within the risk range for iron (0.5 to 15 ppm) as calculated in the BHHRA. The aluminum detections are well below the health based Preliminary Remediation Goal (PRG) for aluminum, 36 ppm.

In summary, EPA concluded that the groundwater sampling performed to date indicates a lack of significant groundwater impact from the ash contamination. However, groundwater monitoring will be instituted to verify the "No Action" decisions for groundwater.

3.8 Likelihood for Soil Migration

The likelihood for migration of COCs in soil from the sites is low. Heavy rains could cause existing surface soil contamination above the RGs to migrate from the sites into the creeks or river in storm water runoff. COCs located in soil do not appear to be migrating to groundwater, because groundwater monitoring has not indicated a link between surface soils and groundwater concentrations. Surface soils may also be released into the air in the form of dust via wind.

3.9 Likelihood for Surface Water Migration

Sampling to date has indicated that surface water does not contain ecologically significant concentrations of COC contamination from the sites. Heavy rains could cause existing surface soil contamination to migrate into the creeks or river in storm water runoff..

3.10 Likelihood for Sediment Migration

Concern over the likelihood for sediment migration is not applicable to the Brown's Dump Site. Sampling to date has indicated that sediment does not contain ecologically significant concentrations of contamination.

3.11 Likelihood for Groundwater Migration

Concern over the likelihood for groundwater migration is not applicable to the Brown's Dump Site. Groundwater sampling has not indicated Site contamination in need of remediation. However, groundwater monitoring will be instituted to verify the "No

Action" decisions for groundwater.

PART 4: SUMMARY OF HUMAN HEALTH RISK ASSESSMENT

4.1 Summary of Site Risks - Human Health Risk Assessment

The BHHRA estimates what risks the Site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The BHHRA consists of the following activities:

- Data Collection and Evaluation
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization
- Remedial Goal Options

The following sub-parts of the ROD will summarize each of the above activities which together formed the 2002 BHHRA for the Brown's Dump Site.

4.2 Data Collection and Evaluation

This step in the risk assessment process involves gathering and analyzing the Site data relevant to human health and identifying the contaminants present at the Site that will be included in the risk assessment process. The BHHRA was based on data from the 1997 Expanded Site Investigation (ESI) and the analytical data collected during the Remedial Investigation (i.e., Phase I RI data conducted between April and August 2000).

4.2.1 Conceptual Site Model for Risk Assessment Purposes

For risk assessment purposes, the Site can be thought of as three types of property:

Southern School Property
Northern School Property
Residential Settings

The Southern School Property is currently vacant and fenced; the Northern School Property is vacant, wooded and fenced; the Residential Settings are single family housing, apartment complexes and vacant residential lots with or without houses. Past observations have found that the fence surrounding the Northern School Property is periodically breached by local residents (probably children) requiring repeated repairs. For the purposes of the BHHRA, each of the three types of property were deemed to be residential. Also, the future resident was assumed to be exposed to subsurface soil brought to the surface during construction or renovation activities.

For the purposes of the risk assessment, the former Brown's Dump Site was divided into two primary areas. Area 1 contains the elementary school property (i.e., Southern School Property) and a fenced, grassy area (i.e., Northern School Property). The JEA electrical substation is located inside this fenced area. The Northern and Southern School

Properties (with substation) were designated as Area 1. Area 1 was further divided into two exposure units: Exposure Unit 1 = the Unrestricted Southern School property; Exposure Unit 2 = the restricted Northern School Property (with Substation). Area 2 contains all of the surrounding parcels of land (e.g., residences, apartment buildings).

NOTE: The main body of the BHHRA evaluated the Southern School Property and Northern School Property. All risk associated with the Residential Setting was evaluated separately in an appendix. For the purposes of this ROD, the risks associated with the Southern and Northern School Properties (i.e., Area 1) are discussed in Parts 4.2.2 through 4.8.4. Risk in the Residential Settings (i.e., Area 2) are evaluated in Parts 4.9 through 4.9.6.

4.2.2 Selection of Contaminants of Potential Concern

The Exposure Pathways developed in the BHHRA are presented in Table 14. Contaminants of Potential Concern (COPCs) are a subset of all chemicals positively identified at the Site. The risks associated with the COPCs were expected to be more significant than the risks associated with other less toxic, less prevalent, or less concentrated chemicals at the Site that were not evaluated quantitatively in the BHHRA. The process of determining the COPCs for the Brown's Dump Site included a detailed evaluation of the analytical data, a careful analysis of the sources of contamination and areas that the sources impact, and a review of Site characteristics.

In accordance with EPA Region 4 guidance, the following screening criteria were used to select or eliminate each contaminant:

1. For surface and subsurface soil data, concentrations of detected chemicals were compared to the EPA Region 9 Preliminary Remediation Goals (PRG) for residential soil (EPA, 2000c). If the maximum detected concentration was less than a carcinogenic risk level of 1×10^{-6} or hazard quotient of 0.1, the chemical was eliminated from the COPC list (EPA,1995a). The Florida Soil Cleanup Target Level (SCTL) was used as the screening criterion if it was lower than EPA's PRG.

2. For surface water data, the maximum detected concentration was compared to the Water Quality Standard for human health (consumption of water and organisms) (EPA, 1999b). If the maximum detected concentration was less than the screening level, the chemical was eliminated as a COPC for human exposure.

3. For groundwater data, concentrations of detected chemicals were compared to the EPA Region 9 PRGs for tap water (EPA, 1995a). If the maximum detected concentration was less than a carcinogenic risk level of 1×10^{-6} or hazard quotient of 0.1, the chemical was eliminated from the COPC list (EPA, 1995a). The Florida Groundwater Cleanup Target Level (GCTL) was used as the screening criterion if it was lower than EPA's PRG. Inorganic chemicals were eliminated if the maximum detected concentration was less than two times the mean

background concentration (EPA, 1995a).

4. Inorganic chemicals were eliminated from further consideration if the chemical is considered to be an essential nutrient and have relatively low toxicity (i.e., calcium, magnesium, potassium, and sodium) (EPA, 1995a).

The constituents retained for use in the BHHRA as COPCs for surface soil, subsurface soil, surface water, and groundwater are listed in Table 15.

4.3 Exposure Assessment (Southern and Northern School Properties)

In order to characterize potential risk, two pieces of information are needed: results from the exposure assessment and chemical-specific toxicity information on the COPCs. Part 4.3 of the ROD summarizes the exposure assessment for the Brown's Dump Site. Part 4.4 of the ROD will address the toxicity assessment. The objective of the exposure assessment is to estimate the types and magnitudes of exposures to COPCs that are present at or migrating from the Site. In short, the purpose of the exposure assessment is to estimate the magnitude of potential human exposure to the COPCs. The BHHRA provides a more detailed analysis on of potential exposures associated with COPCs at the site, why possible exposure routes were eliminated as routes of potential concern, and which exposure routes remained as routes of potential concern.

4.3.1 Soil

Surface and subsurface soil is believed to be the major source of potential exposure to human receptors, followed by groundwater, and surface water. The risk assessment conservatively assumed current and future use of the school property (Exposure Unit 1) and the restrictive area north of the school buildings (Exposure Unit 2) to be residential. Therefore, it was assumed that current and future residents may be exposed to Contaminants of Potential Concern (COPCs) in surface soil in Exposure Units 1 and 2. Also, the future resident was assumed to be exposed to subsurface soil brought to the surface during construction or renovation activities. Potential routes of exposure for residents (child and adult) included incidental ingestion of, and dermal contact with, COPCs in soil.

4.4.2 Groundwater

Potable drinking water within a 4-mile radius of the Site is provided by the Jacksonville Public Utilities water well system, community wells and private wells. The closest Jacksonville Public Utility well field is approximately 2,200 feet south of the Site. All municipal wells are screened in the Floridan Aquifer. Based on information obtained through a U.S. Bureau of Census study compilation report, there are approximately 911 residents obtaining potable water from private wells located within a 1-mile radius of the Site.

The BHHRA considered that future residents may be exposed to groundwater if a private well were installed. When evaluating exposure to groundwater, EPA Region 4 considers ingestion, and inhalation of and dermal contact with VOCs while showering to be the most significant exposure routes. However, no VOCs were detected in groundwater at the former Brown's Dump Site; therefore, the risk assessment assumed that ingestion of groundwater by a future resident represented the most significant exposure route for this medium.

4.3.3 Surface Water

Surface drainage flows northward into Moncrief Creek, which is located north of the Site. Moncrief Creek flows into Trout River, which then eventually flows into the St. Johns River. Potential routes of exposure for residents (child and adult) included incidental ingestion of, and dermal contact with, COPCs in soil. Current/future residents may be exposed to COPCs in surface water while recreating in Moncrief Creek.

4.3.4 Vegetables

The BHHRA also considered that some residents may be exposed to Site-related COPCs via ingestion of homegrown vegetables. According to residents, the primary vegetables grown in this area are collard greens, tomatoes, and onions.

4.4 Toxicity Assessment (Southern and Northern School Properties)

In order to characterize potential risk, two pieces of information are needed: results from the exposure assessment and chemical-specific toxicity information on the COPCs. Part 4.3 summarized the exposure assessment for Brown's Dump. This part addresses the toxicity assessment.

The purpose of the toxicity assessment is to assign toxicity values (criteria) to each chemical evaluated in the risk assessment. The BHHRA utilized information from the Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST) and National Center for Environmental Assessment (NCEA). In evaluating potential health risks, both carcinogenic and noncarcinogenic health effects were considered.

4.4.1 Carcinogenic Health Effects

The potential for producing carcinogenic effects is limited to substances that have been shown to be carcinogenic in animals and/or humans. Excessive exposure to all substances, carcinogens and noncarcinogens, can produce adverse noncarcinogenic effects. Therefore, it was necessary to identify reference doses for every chemical selected regardless of its classification, and to identify carcinogenic slope factors (CSFs) for those that are classified as carcinogenic. Table 16 provides carcinogenic risk information which is relevant to the COPCs in both soil and ground water.

4.4.2 Non-Carcinogenic Health Effects

Table 17 provides non-carcinogenic risk information which is relevant to the COPCs in both soil and ground water.

4.5 Risk Characterization (Southern and Northern School Properties)

The objective of the risk characterization is to integrate the exposure and toxicity assessments into quantitative and qualitative expressions of risk. The risk characterization is an evaluation of the nature and degree of potential carcinogenic and noncarcinogenic health risks posed to current and future receptors at the former Brown's Dump Site.

4.5.1 Evaluation of Carcinogenic Risk

The incremental risk of developing cancer from exposure to a chemical at the Site was defined as the additional probability that an individual exposed will develop cancer during his or her lifetime (assumed to be 70 years). This value was calculated from the average daily intake over a lifetime (CDI) and the SF for the chemical as follows (EPA, 1989):

$$\text{Risk} = \text{CDI X SF}$$

When the product of CDI x SF is greater than 0.01, this expression may be estimated as:

$$\text{Risk} = 1 - \exp^{(-\text{CDI X SF})}$$

An excess lifetime cancer risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of Site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for Site-related exposures is 1×10^{-4} to 1×10^{-6}.

Risks that exceed a carcinogenic risk of 1×10^{-6} are presented in Table 18

4.5.2 Evaluation of Non-Carcinogenic Effects

The potential for noncarcinogenic effects was evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a reference dose (RfD) derived for a similar exposure period. A RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). A HQ less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. A HI less than 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. A HI greater than 1 indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows (EPA, 1989):

$$HQ = DI/RfD$$

Where:

HQ	=	Hazard Quotient (unitless)
DI	=	Daily Intake (mg/kg/day)
RfD	=	Reference Dose (mg/kg/day)

All the HQ values for chemicals within each exposure pathway are summed to yield the HI. Each pathway HI within a land use scenario (e.g., future child resident) is summed to yield the total HI for the receptor. If the value of the total HI is less than 1.0, it is interpreted to mean that the risk of noncarcinogenic injury is low. If the total HI is greater than 1.0, it is indicative of some degree of noncarcinogenic risk, or effect, and contaminants of concern are selected (EPA, 1995a). Contaminants of concern are those COPCs that contribute a HQ of 0.1 or greater to any pathway evaluated for the use scenario. Using the HQ equation, the chronic DI values, and the RfD values, a hazard index for current and future child residents was estimated by calculating a HQ for each chemical of potential concern associated with a complete pathway and exposure point. Only chronic HIs are derived, as the subchronic risks will always be equal to or less than the chronic risks.

Sediments that are covered by surface water are likely to be washed off of body surfaces before significant exposures occur. According to EPA Region 4 guidance (EPA, 1995a), it is generally unnecessary to evaluate exposure to sediments covered by water; however, sediments in intermittent streams should be considered as surface soil for the portion of the year the stream is without water. All sediment sampling locations at the Brown's Dump are covered by surface water; therefore, human exposures to sediment in Moncrief Creek were not quantitatively evaluated in the BHHRA. In summary, sediment was not considered as a pathway/media of concern in the BHHRA. The BHHRA did not evaluate sediments because it was felt that human exposure was unlikely or extremely limited due to the sediments being covered by water.

Risks that exceed a Hazard Index of 1 are presented in Table 19.

4.5.3 Evaluation of Vegetables

To address questions regarding exposure to site-related COPCs via ingestion of homegrown vegetables, samples were collected on January 15, 2002, from three gardens located near the 5th and Cleveland portion of the Jacksonville Ash Superfund Alternative Site, another incinerator ash Site similar to Brown's Dump. Two surface soil samples and two vegetable samples were collected from each of the three gardens. The soil samples and vegetable samples were analyzed for lead, arsenic, antimony, and PAHs. Only lead was detected in the vegetables and each of the gardens represented a different level of soil lead contamination. Listed below are the maximum concentrations of lead in the garden soils and the maximum detected concentration of lead in the corresponding vegetable sample:

1. Garden 1: maximum soil lead concentration of 500 mg/kg with a maximum vegetable lead concentration of 0.16 mg/kg,
2. Garden 2: maximum soil lead concentration of 4,400 mg/kg with a maximum vegetable lead concentration of 0.28 mg/kg
3. Garden 3: maximum soil lead concentration of 73 mg/kg with a maximum vegetable lead concentration of 0.089 mg/kg,

The vegetables sampled were collard and/or mustard greens. These vegetables were chosen because of their availability and the fact that they were thought to represent the vegetables most likely to bioaccumulate lead, therefore providing the most conservative data available.

To determine if the lead levels detected would result in an unacceptable risk via ingestion of the vegetables, the IEUBK model was run using the maximum detected lead concentrations in the vegetables from each of the three gardens. The results of the IEUBK model conclude that under these circumstances the average blood lead level would only slightly increase even at the highest detected concentrations of lead in the greens. Based on the IEUBK results, it can be concluded that there is no unacceptable risks associated from ingestion of vegetables from gardens with soil lead concentrations less than 500 mg/kg. The two samples collected from the highest soil lead contamination location (maximum concentration of 4,400 mg/kg lead) showed a slight increase above acceptable levels via ingestion of vegetables, but it has already been determined by EPA that residential exposure to soils with lead concentrations of 4,400 mg/kg is unacceptable via direct contact to those soils.

In conclusion, based on the above data and references, the use of vegetable gardens with soil lead concentrations below or only slightly above EPA's recommended remedial goal of 400 mg/kg should not result in any significant increase in blood lead levels. Garden soil levels of lead significantly above 400 mg/kg may pose unacceptable risk with the risk potential increasing with increasing levels of soil lead. Regardless of the soil lead level, following good gardening and food preparation practices will lower risks.

4.5.4 Summary of Blood Lead Study

In 1995, the Duval County Health Department conducted free lead screening for Pre-Kindergarten and Kindergarten children attending the Mary McLeod Bethune Elementary School. Using the capillary method, five out of 100 children screened (5 percent) had blood lead levels between 10-15 ug/dL. More than 30 children were screened from the Bessie Circle apartment area; one child had a blood lead level of 12 ug/dL. The Health

Department then screened 56 more children in Moncrief Village and Palm Terrace Apartment complexes; one had a blood lead level of 10 ug/dL. They screened eight children at a nearby day care; none had a blood lead level greater than 10 ug/dL. In summary, the County Health Department screened a total of 194 area children. Eight (4.1 percent) had capillary blood lead levels greater than 10 ug/dL. The Duval County Health Department reported that the percentage of children in this area with blood lead levels greater than 10 ug/dL (4 percent) was less than the county-wide percentage (9 percent) (Florida Department of Health, 1997).

The body eliminates most of the lead in the blood in four to five months. Therefore, blood measurements reflect only recent exposure, not long-term exposure. Following increased awareness due to soil sampling and publicity about the Site, people may have modified their behavior and reduced their exposure (e.g., washing children's hands after playing). If people reduced their exposure, their blood lead levels would decrease. Therefore, blood lead levels below 10 ug/dL do not prove that significant lead exposure did not occur in the past (Florida Department of Health, 1997).

4.6 Uncertainties (Southern and Northern School Properties)

Uncertainties in the BHHRA included several factors which are discussed in the following paragraphs.

Data Evaluation

The purpose of data evaluation is to determine which constituents, if any, are present at the Site at concentrations requiring further investigation. The screening process used to select COPCs to evaluate in the BHHRA was intended to include all chemicals with concentrations high enough to be of concern for the protection of public health.

Uncertainty with respect to data evaluation can arise from many sources, such as the quality and quantity of the data used to characterize the Site, the process used to select data to use in the risk assessment, and the statistical treatment of data.

Exposure Pathways and Parameter

The exposure assumptions directly influence the calculated doses (daily intakes), and ultimately the risk calculations. For the most part, site-specific data were not available for this BHHRA; therefore, conservative default exposure assumptions were used in calculating exposure doses such as the selection of exposure routes and exposure factors (e.g., contact rate). In most cases, this uncertainty may overestimate the most probable realistic exposures and, therefore, may overestimate risk. This is appropriate when performing risk assessments of this type so that the risk managers can be reasonably assured that the public risks may not be underestimated, and so that risk assessments for different locations and scenarios can be compared.

In order to estimate a receptor's potential exposure at a site, it is necessary to determine the geographical location where the receptor is assumed to be exposed. Once the area of interest has been defined, the appropriate data can be selected and the exposure point concentration can be calculated. The primary source of uncertainty associated with estimating exposure point concentrations involves the statistical methods used to estimate these concentrations and the assumptions inherent in these statistical methods. Generally, an upper bound estimate of the mean concentration is used to represent the exposure point concentration instead of the measured mean concentration. This is done to account for the possibility that the true mean is higher than the measured mean because unsampled areas of the Site may have higher constituent concentrations. Listed below are a few site-specific uncertainties which relate to the exposure point concentration (EPC) calculation.

- Due to small sample data sets (less than 10 samples per data set), the maximum detected concentration in each exposure unit was used to represent the EPC. This may result in an overestimation of risk.
- COPC concentrations in soil for future use were assumed to be the same as current concentrations, with no adjustment due to migration or degradation. This may overestimate dose.
- Only two subsurface soil samples were collected from Exposure Unit 1. These samples were analyzed for lead only; the results for both samples were nondetect. Therefore, no COPCs were identified and subsurface soil was not quantitatively evaluated for Exposure Unit 1.

Ideally, areas of exposure should be defined based on actual exposures or known behaviors of receptors at the Site. Often, however, this information is unavailable. Lacking absolute knowledge about the behaviors of receptors at or near the Site, it is necessary to make some assumptions. This risk assessment conservatively assumed that current and future use of the Site is residential. Such assumptions add to the uncertainty in the BHHRA.

The reasonable maximum exposure concept was used to develop exposure doses in the current and future scenarios and is defined as the "maximum exposure that is reasonably expected to occur at the site" (EPA, 1989). Several variables that were used to determine the exposure dose for the reasonable maximum exposure were generally based on upper-bound (typically 90th percentile or greater) estimates. These are:

- Maximum detected concentration used to calculate the exposure dose.
- Exposure duration (ED) (upper-bound value).
- Intake/contact rate (IR).
- Exposure frequency (EF).

Therefore, the calculated exposure dose for any given chemical, which results from integration of these variables, typically represents an upper-bound probable exposure dose estimate. The use of these upperbound exposure parameters, coupled with conservative estimates of toxicity, will yield risk results that represent an upper-bound estimate of the occurrence of carcinogenic and noncarcinogenic health effects.

Generally, in order to present a range of possible exposure estimates, a central tendency risk describer is calculated in addition to the reasonable maximum exposure risk. In accordance with Region 4 policy, central tendency risk describers are included in the uncertainty sub-part of the risk characterization. The reasonable maximum exposure approach characterizes risk at the upper end of the risk distribution, while the central tendency approach characterizes either the arithmetic mean risk or the median risk. The inclusion of both reasonable maximum exposure and central tendency risk describers provides perspective for the risk manager. However, the National Contingency Plan (NCP) Section 300.430(d) states, "The reasonable maximum exposure estimates for future uses of the site will provide the basis for the development of protective exposure levels."

Toxicity Assessment

For a risk to exist, both significant exposure to the chemicals of potential concern and toxicity at these predicted exposure levels must exist. The toxicological uncertainties primarily relate to the methodology by which carcinogenic and noncarcinogenic criteria (i.e., CSFs and reference doses) are developed. In general, the methodology currently used to develop CSFs and reference doses is very conservative, and likely results in overestimation of human toxicity (EPA, 1989).

Recent toxicological studies performed by the National Toxicology Program (NTP, 2004a, b, c, d) suggest that dioxin and dioxin-like chemicals may be considerably less carcinogenic than EPA previously thought. California EPA used this recent data to develop an oral cancer slope factor for dioxin that is 40 fold lower than the value in EPA's draft dioxin reassessment (Cal-EPA, 2005; USEPA, 2003). In 2005, California EPA released a draft Public Health Goal for TCDD in water (Cal-EPA, 2005). In this document, an oral cancer slope factor of 2.6E-02 per ngTEQ/kg-day or 26,000 per mgTEQ/kg-day was derived by Monte Carlo analysis to combine cancer potency estimates across the various tumor sites.

In EPA's recent draft assessment (USEPA, 2003) for dioxin and dioxin-like chemicals, the agency estimates an upper bound on the lifetime risk of all cancers combined of 1.0E-03 per pgTEQ/kg-day, or 1,000,000 per mgTEQ/kg-day. This proposed upper-bound slope factor spans a range from 0.5 to 19 times greater than the previous upper bound estimate on cancer slope of 1.6E-04 per pgTEQ/kg-day (USEPA, 1985).

In light of the significant uncertainties surrounding the upper-bound cancer risk estimates, the USEPA Region 4 remedial program currently defaults to using the previous EPA upper-bound cancer slope factor in calculating lifetime excess cancer risk for dioxin and dioxin-like compounds. The agency's final choice of the appropriate upper-bound cancer risk estimate may change.

Risk Characterization

Ideally, areas of exposure should be defined based on actual exposures or known behaviors of receptors at the Site. Often, however, as in the case of this risk assessment, this information is unavailable. Lacking absolute knowledge about the behaviors of receptors at or near the Site, it was necessary to make some assumptions. This risk assessment made assumptions about exposure units (or areas) based on contaminant distribution and likely areas of exposure based on Site features (e.g., presence of the restricted area north of the school). Such assumptions will add to the uncertainty in the BHHRA.

The number of samples used to evaluate a particular medium should also be considered. Unfortunately, a limited number of samples were used to evaluate groundwater at this Site. Again, contributing to the uncertainty in the BHHRA.

Each complete exposure pathway concerns more than one contaminant. Uncertainties associated with summing risks or hazard quotients for multiple substances are of concern in the risk characterization step. The assumption ignores the possibility of synergistic or antagonistic activities in the metabolism of the contaminants. This could result in over-or under-estimation of risk.

The potential risks developed for the Brown's Dump Site were directly related to COPCs detected in the environmental media at this Site. No attempt was made to differentiate between the risk contributions from other sites and those being contributed from the Brown's Dump Site.

Because inorganic chemicals are naturally-occurring, metals are generally compared to site-specific background concentrations when selecting COPCs for a site. If the maximum detected concentration of an inorganic chemical is less than two times the mean background concentration, the chemical is excluded as a COPC in that medium. Samples were collected during the RI field investigation to serve as background samples for the Brown's Dump Site. However, since the boundaries of the ash had not been delineated, inorganic compounds detected in soil were not screened against the background samples due to the uncertainty associated with obtaining "true" background samples from this area. Therefore, no metal was excluded as a COPC in soil based on a comparison with background. This may result in an overestimation of risk.

Soil lead concentrations greater than 400 mg/kg in residential areas are considered a potential health threat. However, the degree of threat depends on the bioavailability of the lead. The lead model applies default assumptions in estimating the bioavailability of lead; however, the bioavailability of lead at the Brown's Dump Site was not measured. Available blood lead data for children attending the school indicates that the bioavailability of lead at the Brown's Dump Site may be low.

Aluminum and iron were identified as COC at the Site. The RfDs for both of these metals are provisional (interim) values, meaning that they have not gone through the verification necessary to be placed by EPA on IRIS or HEAST. Additional toxicological data would be needed in order to complete this verification process. For example, the oral RfD for iron was derived based on inadvertent consumption of iron following consumption of beer brewed in iron vessels. Chromium was also identified as a chemical of concern in soil. This risk assessment assumed that only hexavalent chromium, the more toxic form of chromium, was present at the Site. While this likely results in some overestimation of risk, this uncertainty could be reduced by analyzing samples from areas of concern for hexavalent chromium.

Carcinogenic PAHs were identified as COCs in surface soil in Exposure Units 1 and 2. If PAHs were disposed with ash 40 years ago, these compounds would have likely degraded over time. Therefore, it is possible that the CPAHs detected in surface soil came from sources other than ash (e.g., asphalt). If, however, the CPAHs are indeed originating from the ash, it is likely that they were incorporated into a hard matrix where they are not likely to be bio-accessible (ATSDR, 1995).

2,3,7,8-TCDD (dioxin) was identified as a COC in surface soil in Exposure Units 1 and 2, and subsurface soil in Exposure Unit 2. IRIS does not currently list an RfD or SF for 2,3,7,8-TCDDD. EPA is currently reassessing the toxicity of dioxin. The toxicity data used in this risk assessment were obtained from the 1997 HEAST. Also, 53 dioxin samples that were analyzed by Draft Screening Method 4425 were not used in the BHHRA because of uncertainty associated with the analytical method. Using the 1997 HEAST toxicity data and excluding the dioxin screening data may lead to an under or overestimation of risk.

All of the uncertainties discussed above ultimately effect the risk estimate. Most of the uncertainties identified will result in the potential for overestimation of risk (e.g., the combination of several upper-bound assumptions for some exposure scenarios).

4.7 Identification of Contaminants of Concern (Southern and Northern School Properties)

The BHHRA evaluated soil, surface water and groundwater. Based on the evaluation of health effects, only the soil and groundwater media were found to have COCs. The COCs identified based on the Southern and Northern School Properties for the Brown's Dump Site are presented in Table 20.

4.8 Refinement of Contaminants of Concern (Southern and Northern School Properties)

As indicated in Part 4.6, uncertainties are inherent in the risk assessment process. Most these uncertainties result in the potential for overestimation of risk (e.g., the combination of several upper-bound assumptions for some exposure scenarios). Therefore, the BHHRA included refinement in the number of COCs identified in the risk characterization by examining any chemical-specific uncertainties that may exist.

Chemical-specific uncertainties for several COCs are discussed in the following text. EPA refined the list of COCs after taking into account these uncertainties. Table 21 provides the refined list of COCs.

4.8.1 Soil

A total of 15 chemicals were identified as COCs in on-site surface and subsurface soil: aluminum, antimony, aroclor 1260, arsenic, barium, cadmium, carcinogenic PAHs, chromium, copper, dieldrin, iron, lead, manganese, 2,3,7,8-TCDD (dioxin), zinc. However, the presence of four of these COCs warranted additional discussion and refinement.

Aluminum: The maximum detected concentration of aluminum in surface soil was 6,300 mg/kg. The EPA PRG for aluminum is 7,600 mg/kg; therefore, aluminum was eliminated as a COPC in surface soil. Aluminum was only detected in one subsurface soil sample at a concentration exceeding the PRG (it was detected at a concentration of 10,000 mg/kg in subsurface soil sample BDSB079). Also, as discussed in Part 4, only a provisional RfD was available for aluminum (provisional toxicity values have not gone through the verification necessary to be placed by EPA on IRIS or HEAST). Hazards associated with chemicals with provisional toxicity values are likely to be overly conservative. Therefore, since the hazard quotients for aluminum are based on a provisional RfD and subsurface soil is not currently available for direct contact, aluminum is not likely to pose a significant threat to receptors at the Site. Therefore, for the above noted reasons, aluminum was eliminated as a COPC in surface soil and is not included in Table 21's list of refined COCs.

Iron: Iron, another COC identified in surface and subsurface soil, is the most common of all metals in the environment. Iron is one of the most important elements in nutrition, although iron toxemia occurs when high levels of iron are consumed. The oral RfD for iron is a provisional value. Most of the quantitative chronic oral toxicity data for iron have been obtained from studies of the Bantu population of South Africa. These studies were based on consumption of iron after drinking beer that was brewed in iron vessels. However, data from the Bantu studies were considered inadequate to determine a Lowest Observed Adverse Effects Level (LOAEL) because of confounding factors. The iron RfD is based on the mean dietary iron intakes, dietary plus supplemental, taken from the NHANES II data base. The highest dose level from the NHANES II study was used as a No Observed Adverse Effects Level (NOAEL), and the RfD was established on this basis. Additional toxicological data are needed to complete the verification process for the RfD. As stated above, hazards associated with chemicals with provisional toxicity values are likely to be overly conservative. Therefore, for the above noted reasons, iron was eliminated as a COPC in surface soil and is not included in Table 21's list of refined COCs.

Dieldrin: Dieldrin, a pesticide, was detected in five of eight surface soil samples collected in Exposure Units 1 and 2. However, the detected concentration of dieldrin in only one of the five samples exceeded the corresponding PRG. Dieldrin has a similar chemical structure to aldrin. Aldrin quickly breaks down to dieldrin in the environment. From 1950 to 1970, aldrin and dieldrin were popular pesticides for crops like corn and cotton. Since the Site received ash from municipal solid wastes from 1949 to 1953, the presence of pesticides at the Site is likely related to general pest control in the area during the 1950s through the 1970s. Therefore, for the above noted reasons, dieldrin was eliminated as a COPC in surface soil and is not included in Table 21's list of refined COCs.

Chromium: Chromium was identified as a COC in surface and subsurface soil in Exposure Unit 2. As discussed in Part 4.2.1.1, this risk assessment assumed that only hexavalent chromium, the more toxic form of chromium, was present at the Site. This likely results in some overestimation of risk. Hexavalent chromium is more mobile than trivalent chromium; if hexavalent chromium is detected in soil, it will generally be present in groundwater also. However, chromium was not detected in groundwater. Therefore, it is unlikely that hexavalent chromium is the only form of chromium in the soil. In fact, it is customary to assume that when total chromium is analyzed the ratio of hexavalent chromium to trivalent chromium (the less toxic form of chromium) is 1 to 6. The maximum detected concentrations of chromium in surface soil and subsurface soil were 79 mg/kg and 130 mg/kg, respectively. Both of these concentrations are well below the PRG of 10,000 mg/kg for trivalent chromium. The uncertainty of not knowing the speciation of chromium could be reduced by analyzing samples from areas of concern for hexavalent chromium. Therefore, for the above noted reasons, chromium was eliminated as a COPC in surface soil and is not included in Table 21's list of refined COCs.

4.8.2 Groundwater

Seven chemicals were identified as COCs in groundwater: aldrin, aroclor 1016, arsenic, heptachlor, heptachlor epoxide, iron, and manganese. However, the presence of five of these COCs warranted additional discussion and refinement.

Pesticides: Three of the seven COCs in groundwater (aldrin, heptachlor, and heptachlor epoxide) were detected in only one groundwater sample (BDMW001). Heptachlor epoxide is an oxidation product of heptachlor. Until the 1970s, heptachlor was used extensively in the U.S. to control a variety of insects. From 1950 to 1970, aldrin was a popular pesticide for crops like corn and cotton. Since the Site operated from 1949 to 1953 and pesticides were detected in only one well, the presence of pesticides in the groundwater is likely related to general pest control that occurred in the area after the landfill was closed.

Iron: Iron was identified as another COC in groundwater. As discussed in Part 6.1, iron is an essential element in nutrition. The provisional oral RfD for iron was derived based on the mean dietary iron intakes taken from the NHANES II data base (a NOAEL). Therefore, additional toxicological data are needed to complete the verification process for the RfD. As stated above, hazards associated with chemicals with provisional toxicity values are likely to be overly conservative.

Arsenic: Arsenic was detected in one of 14 groundwater samples analyzed. Arsenic was detected at a concentration of 0.0036 mg/L, which is well below the maximum contaminant level (MCL) of 0.01 mg/L.

Aroclor 1016: Aroclor 1016 was detected in two of 17 samples analyzed; however, both detected concentrations (0.001 mg/L and 0.003 mg/L) were above the MCL of 0.0005 mg/L. Based on the low frequency of detection, it is recommended that additional samples be collected to confirm the presence of aroclor 1016 in groundwater.

4.8.3 Refined List of COCs (Southern and Northern Properties, Groundwater)

The refined lists of COCs based on the Southern and Northern School Properties for the Brown's Dump Site are presented in Table 21.

4.8.4 Risk Management Decision (Southern and Northern Properties, Groundwater)

The BHHRA for the Southern and Northern Properties identified two refined COCs for groundwater, the PCB aroclor 1016 and manganese and recommended additional sampling. The additional groundwater sampling was conducted in 2003. PCB Aroclor 1016 was not detected. In the resampling results, EPA did observe a slight elevation of manganese and an elevation of iron concentrations near the Site relative to the background wells. Iron and manganese were also detected at low concentrations in the background wells. Neither of these metals have maximum contaminant levels (MCLs). However, all the manganese concentrations are within the noncarcinogenic risk range for manganese (i.e., 0.03 ppm to 0.9 ppm) as calculated in the BHHRA. All but two of the iron concentrations are within the noncarcinogenic risk range for iron (i.e., 0.5 ppm to 15 ppm) as calculated in the BHHRA.

EPA concludes that the groundwater sampling performed to date indicates a lack of significant groundwater impact from the ash contamination.

4.9 Evaluation of Risk (Residential Setting)

EPA also had the risks and hazards evaluated that may result from exposure to surface soil at residences surrounding the Brown's Dump Site. The risk assessment assumed that one yard represented an exposure unit for a given receptor. The data used in the BHHRA included soil samples obtained by a sampling strategy where generally one sample was collected from each yard that was evaluated; therefore, it was assumed that exposure point concentrations in a resident's yard were equal to the detected concentrations of COPCs in the sample collected from that yard.

It was not feasible for the risk assessment to quantitatively evaluate exposure to surface soil from 306 locations (exposure units). Therefore, an attempt was made to identify the most highly contaminated samples so that risks and hazards could be estimated for these locations. It was assumed that risks and hazards resulting from exposure to surface soil at these locations would represent the "worst case scenario" for the yards that were sampled during the RI investigation. To this end, the surface soil analytical data were reviewed to determine which locations had the highest numbers, concentrations, and toxicities (potencies) of chemicals. Based on this review, ten sample locations were selected for quantitative evaluation.

The risk assessment concluded that current and future residents may be exposed to site-related chemicals in surface soils. Also, the future resident was assumed to be exposed to subsurface soil brought to the surface during construction or renovation activities. Potential routes of exposure for residents (child and adult) included incidental ingestion of, and dermal contact with, COPCs in soil.

4.9.1 Evaluation Approach

EPA, through its contractor Black & Veatch Special Projects Corporation, evaluated risks and hazards that may result from exposure to surface soil at residences surrounding the Brown's Dump Site. A total of 306 surface soil samples collected from the residential areas of the Brown's Dump Site were used in this analysis. The maximum detected concentration of the 68 chemicals that were detected in surface soil was compared to the corresponding EPA Region 9 PRG. Based on this comparison, 20 chemicals were retained as COPCs in surface soil in the residential areas. COPCs included carcinogenic PAHs, dioxins, aroclor 1260, pesticides, and metals.

As mentioned, the risk evaluation in residential areas assumed that one yard represented an exposure unit for a given receptor. Generally one sample was collected from each yard that was evaluated; therefore, it was assumed that exposure point concentrations in a resident's yard were equal to the detected concentrations of COPCs in the sample collected from that yard.

As mentioned, it was not feasible for the risk assessment to quantitatively evaluate exposure to surface soil from 306 locations (exposure units). Therefore, an attempt was made to identify the most highly contaminated samples so that risks and hazards could be estimated for these locations. It was assumed that risks and hazards resulting from exposure to surface soil at these locations would represent the "worst case scenario" for the yards that were sampled during the RI investigation. To this end, the surface soil analytical data were reviewed to determine which locations had the highest numbers, concentrations, and toxicities (potencies) of chemicals. Based on this review, ten sample locations were selected for quantitative evaluation

According to EPA policy, the target total individual risk resulting from exposures at a Superfund site may range anywhere between 1E-06 and 1E-04. Thus, remedial alternatives should be capable of reducing total potential carcinogenic risks to levels within this range for individual receptors. According to EPA guidance, if the hazard index is greater than 1 or the cumulative cancer risk is greater than a range between 1×10^{-6} and 1×10^{-4} for a land use scenario (i.e., resident), then remedial action is generally warranted (EPA, 1989). A summary of carcinogenic risks and noncarcinogenic hazards resulting from exposure to each of the ten sample locations is discussed below.

Lead, one of the primary contaminants of concern at the Brown's Dump Site, was not included in the quantitative evaluation of risks. There are no toxicity criteria for lead; therefore, lead was evaluated qualitatively by comparing detected concentrations of this metal to EPA's residential soil screening level of 400 mg/kg. Six of the ten surface soil samples that were quantitatively evaluated had detected lead concentrations that exceeded 400 mg/kg. The lead concentrations in these six samples ranged from 630 mg/kg to 39,000 mg/kg. The remaining four samples had detected lead concentrations that were below 400 mg/kg. These concentrations ranged from 133 mg/kg to 340 mg/kg.

All ten samples evaluated as part of this assessment resulted in excess lifetime cancer risks that were within EPA's target risk range of 1E-06 to 1E-04.

Five of the ten samples generated hazard indices greater than 1. The hazard indices for the remaining five samples ranged from 0.2 to 1.

EPA standard default exposure assumptions were used to calculate the risks and hazards outlined above. These exposure assumptions are conservative and are likely to overestimate risks.

An exposure unit should be based on the areal extent of a receptor's movements during a single day. Two types of samples were collected during the RI - Tier 1 and Tier 2. Tier 1 samples were discreet samples collected from a single location. Tier 2 samples were composite samples collected from five locations in the yard. If any of the ten samples quantitatively evaluated in the risk assessment were Tier 1 samples, then the resulting risks and hazards are based on exposure to a single location in a given yard. Without additional data, the single sample was assumed to represent the average concentration across the yard. However, since it was only a single sample taken without knowledge of the distribution of contamination across the Site, it is likely to be below or above the actual average concentration. This could result in an under or overestimation of risks in each yard with a Tier 1 sample.

4.9.2 Qualitative Evaluation of Groundwater Risk in Residential Area

EPA also evaluated risks and hazards that may result from exposure to groundwater in the future. A total of ten detected chemicals were retained as COPCs in groundwater. COPCs included aroclor 1016, pesticides, and metals. As with the soil data, the groundwater analytical data for each sample were reviewed to determine which locations had the highest numbers and detected concentrations of COPCs.

Two of the three groundwater samples evaluated as part of this assessment contained carcinogenic compounds. Assuming a resident ingested groundwater from either of these wells resulted in excess lifetime cancer risks that were within EPA's target risk range of 1E-06 to 1E-04. Exposure to sample BDMW010 resulted in an excess lifetime cancer risk of 1E-04, primarily due to ingestion of aldrin and heptachlor epoxide.

Two of the three groundwater samples had total HIs above 1, the level of concern for noncarcinogenic chemicals. The total HI was 7, primarily due to ingestion of iron. The total HI in another sample was 5, primarily due to ingestion of heptachlor epoxide, aroclor 1016, aldrin, and iron. The total HI for the third sample was 1, due to ingestion of arsenic and iron.

4.9.3 Qualitative Evaluation of Surface Soil Risk in Residential Areas

As previously stated, it was not feasible to calculate risks for over three hundred exposure units; therefore, 296 surface soil sample locations were not included in the quantitative evaluation. Based on the reduced numbers of COPCs at these locations, it was anticipated that the total risk and hazard at each location would be less than the criteria of concern (i.e., cancer risk of 1E-04 or HI of 1). However, the analytical data from each of these 296 locations were evaluated qualitatively by comparing the detected concentration of each COPC to its chemical-specific RGO. If the detected concentration of a chemical was greater than the RGO corresponding to an HQ of 1 or a cancer risk of 1E-06, further action may be required at that sample location (e.g., additional sampling, soil removal).

The comparison of the analytical data from the 296 surface soil samples to the corresponding chemical-specific RGOs was made. Detected concentrations of COPCs in 266 of the 296 samples were all below RGOs. However, a total of 30 surface soil samples contained COPC concentrations that exceeded at least one RGO. Lead was the only contaminant of concern in twenty-six samples (i.e., lead was the only COPC detected at a concentration that exceeded an RGO). One surface soil location contained both lead and carcinogenic PAHs at concentrations that exceeded their respective RGOs. Carcinogenic PAHs were detected at concentrations that exceeded the RGO of 0.09 mg/kg at two surface soil locations. One sample contained arsenic at a concentration that exceeded its RGO of 23 mg/kg. Lead was detected at concentrations of less than 50 mg/kg in all three of these samples.

Comparison of detected concentrations of COPCs in the ten samples that were quantitatively evaluated to their corresponding RGOs results in the following: Lead and CPAHs were the only COPCs that repeatedly exceeded the RGOs. One other COPC, aldrin, was detected at a concentration that exceeded its RGO; however, lead and CPAHs were also detected at concentrations exceeding their RGOs at that location. With the exception of two sample locations, lead was detected at concentrations exceeding 400 mg/kg in all samples containing CPAHs or aldrin at concentrations above RGOs. Benzo(a)pyrene, a CPAH, was detected at a concentration of 0.17 mg/kg. This concentration is approximately two times higher than the RGO of 0.09 mg/kg. Lead was detected at concentrations below its RGO at both of these locations.

Lead, one of the primary contaminants of concern at the Brown's Dump Site, was analyzed at each of the surface sample locations.

Most of the lead samples were analyzed in the field by XRF. A percentage of the lead samples were also submitted to a laboratory for confirmatory analysis. In general, the laboratory results for a sample were 1.2 to 5 times higher than the corresponding XRF result (on average, laboratory results were approximately 2 times higher than XRF results). The evaluation indicated an error of 1.7 percent when XRF lead measurements under 200 mg/kg were compared with corresponding fixed laboratory analytical lead measurements exceeding 400 mg/kg. In other words, 98.3% of XRF samples with less than 200 mg/kg lead also show a lead concentration from a fixed laboratory less than 400 mg/kg, the risk based remedial goal option for lead.

Table 22 provides the calculations of the risks and hazards at the ten surface soil samples that were quantitatively evaluated. The example calculation at the end of the table can be used as a guide to calculate hazards and risks that may result from exposure to COPCs in any of the surface soil samples that were qualitatively evaluated.

4.9.4 Qualitative Evaluation of Subsurface Soil Risk in Residential Areas

Subsurface soil in the residential areas was evaluated qualitatively since it is not currently available for direct contact. A total of 15 chemicals were retained as COPCs in subsurface soils in the residential area. COPCs included dioxins, carcinogenic PAHs, and metals.

The analytical data from each subsurface soil sample were compared to the chemical-specific RGOs for dioxins, carcinogenic PAHs, and metals. Dioxins were sampled and detected in four subsurface soil samples. Detected concentrations of dioxins in all four samples were below the EPA Region 4 RGO of 1 ug/kg. CPAHs were detected in the five samples. All detected concentrations of CPAHs were greater than 0.09 mg/kg, the RGO corresponding to a risk of 1E-06. The maximum detected concentration of benzo(a)pyrene, a carcinogenic PAH, was 2.4 mg/kg (BDSB012).

Detected concentrations of five of the metals that were retained as COPCs (aluminum, barium, manganese, nickel, and zinc) were below the RGO corresponding to an HQ of 1. However, the following metals were detected in subsurface soil at concentrations that exceeded the RGO corresponding to an HQ of 1 (all units are in mg/kg): antimony, arsenic, cadmium, copper, iron, lead and vanadium.

Lead was detected at concentrations exceeding 400 mg/kg at each subsurface soil location where a chemical-specific RGO was exceeded. In other words, lead was detected at concentrations greater than 400 mg/kg in all five subsurface soil samples where CPAHs exceeded the RGO of 0.09 mg/kg. Lead was also detected at concentrations greater than 400 mg/kg in all 12 subsurface soil samples where arsenic exceeded the RGO of 23 mg/kg, etc.

4.9.5 Identification of Contaminants of Concern (Residential Setting)

The BHHRA evaluated soil and groundwater in Residential Setting. The COCs identified based on the Southern and Northern School Properties for the Brown's Dump Site are presented in Table 23.

4.9.6 Risk Management Decisions (Residential Setting, Soil and Groundwater)

Based on the COCs identified in Table 23, the following risk management decisions were made:

Soil

- Because of the widespread use of pesticides in residential markets, the following pesticides were judged not to be Site-related and removed from the COC list: aldrin, gamma-chlordane, and dieldrin.
- For similar reasons as given in Part 4.8.1, aluminum, chromium and iron were also removed from the COC list.
- The BHHRA assumed mercury as methyl-mercury. EPA usually assumes mercury to not be methylated. Hence, the RGO used for mercury in the BHHRA was more protective than necessary, and 21 ppm is protective at HQ=1 given the concentrations seen at the Site. Mercury has been removed from the COC list.
- Comparison of the BHHRA RGO for vanadium (i.e., 430 ppm (hazard index = 1)) to the actual detections at the Site indicates that only two samples (both sub-surface samples) out of 244 samples showed a concentration greater than 430 ppm. Hence, vanadium has been removed from the COC list.

Groundwater

- Because of the widespread use of pesticides in residential markets, the following pesticides were removed from the COC list: aldrin, chlordane, p,p-DDT, heptachlor, heptachlor epoxide.
- Arsenic and iron were removed from the COC list for similar reason as found in Part 4.8.2.

When all of the groundwater sampling performed at the Site is taken into account, there does not appear to be any lead plume within Site groundwater (also see Part 4.8.4).

4.10 Final Contaminants of Concern (Southern and Northern School Property, Residential Setting)

The BHHRA was finalized in 2002. As mentioned, the BHHRA was based on data from 1997 and 2000. Since 2000, additional soil sampling has occurred as part of the Site characterization. No need to further refine the soil COC list has been noted. Table 24 lists the final human health COC list for the Brown's Dump Site.

PART 5: SUMMARY OF ECOLOGICAL RISK

5.1 Summary of Ecological Risk Assessment

Like the Human Health Risk Assessment, the Ecological Risk Assessment (ERA) was performed by EPA. The ERA encompassed all ecological risk assessment activities at the Brown's Dump Site located in Jacksonville, Duval County, Florida through Step 3A of the Interim Final 8-Step Ecological Risk Assessment Process for Superfund (EPA 1997) developed by the EPA. The 8-Step Ecological Risk Assessment process includes the following:

- Step 1 - Screening - Level Problem Formulation and Ecological Effects Evaluation
- Step 2 - Screening - Level Exposure Estimate and Risk Calculation
- Step 3 - Problem Formulation
- Step 4 - Study Design and Data Quality Objective (DQO) Process
- Step 5 - Verification of Field Sampling Design
- Step 6 - Site Investigation and Data Analysis
- Step 7 - Risk Characterization
- Step 8 - Risk Management

The ERA Steps 1 through 3a were inclusive of both the terrestrial and aquatic environments at the Site.

5.1.1 Step 1 - Level Problem Formulation and Ecological Effects Evaluation

For this initial step, EPA developed an understanding of the Site based on the environmental setting of the Site, suspected contaminants present, the fate and transport mechanisms of these contaminants, mechanisms of ecotoxicity for the chemicals, potential ecological receptors, and exposure pathways. Based on the information gathered to describe these elements, assessment and measurement endpoints were selected as a basis for defining risk. The outcome of Step 1 was the generation, by environmental media (i.e., soil, sediment, surface water), of a list of contaminants for consideration in Step 2.

5.1.2 Step 2 - Screening - Level Exposure Estimate and Risk Calculation

During this phase of the ERA, comparison of contaminants were made to surface soil, sediment and surface water ecological screening values (ESVs).

Soil: The surface soil analytical data set from the April 2000 RI sampling was screened against the selected ESVs for soil. This initial screening indicated that several contaminants were present at concentrations exceeding these ESVs. Contaminants exceeding screening values (those presenting a screening hazard quotient (HQ) of 1 or greater) were retained as preliminary contaminants of potential ecological concern (PCOPEC).

Sediment: The sediment analytical data results were screened against the selected ESVs for sediment. This initial screening indicated that several contaminants were present at concentrations exceeding ESVs for sediment. Contaminants exceeding screening values (those presenting a screening HQ of 1 or greater) were retained as PCOPEC.

Surface Water: The surface water analytical data results were screened against the selected ESVs for surface water. This initial screening indicated that several contaminants were present at concentrations exceeding these ESVs. Contaminants exceeding screening values (those presenting a screening HQ of 1 or greater) were retained as PCOPEC.

PCOPEC for surface soil, sediment and surface water are presented in Table 25.

5.1.3 Step 3a - Problem Formulation (Refinement of Contaminants of Potential Ecological Concern)

The first action taken under Step 3 of the ERA process is refinement of the PCOPECs identified in Step 2 to determine the need for, or focus of, further investigations. Contaminants that exceeded the approved ESVs, or that could not be screened due to a lack of an ESV (and therefore identified as PCOPEC) were primarily evaluated based on an approved set of ERVs. The ERVs for each contaminant were approved by EPA's Ecological Technical Assistance Group (ETAG) based on a comparative analysis of the available toxicological studies. Based on the ecological setting and the list of PCOPEC, a preliminary ecological exposure model was developed and is presented on Figure 5.

The preliminary ecological exposure model presents the most significant exposure pathways to ecological receptors based on the following principal exposure routes:

- Direct Exposure to the contaminants in a media of concern
- Food chain transfer of the contaminant in biological tissue of prey organisms

Refinement of PCOPEC was performed to determine contaminants of potential ecological concern (COPEC) for both direct exposure and through food chain exposure.

Based on the refinement of COPEC presented in the ERA, the following conclusions were presented on a media-by-media basis for surface soils, sediment, and surface waters evaluated at the Brown's Dump Site. These conclusions also considered the quality of the available habitat and the benefits/drawbacks to continuing with additional evaluations to more accurately define the ecological risks.

- The ERA concluded that concentrations of COPEC in surface soil present a risk to terrestrial communities in the Site vicinity. Some of the risk is associated with contaminants which pose risk from direct exposure while other risk is associated with contaminants which pose a risk from food chain exposure (see Table 26).

- The ERA's refinement for sediment determined that there were no contaminants observed in sediment that were direct or food-chain exposure COPEC. Based on this information, sediment was eliminated as a medium and exposure pathway of concern. Additional ecological evaluations to more accurately define the risks from sediment were not recommended.

- The surface water refinement determined that there were no contaminants observed in surface water that were direct exposure COPEC. Surface water was not evaluated as a substrate media for food chain exposure because it represents a minor exposure pathway to wildlife. Additional ecological evaluations to more accurately define the risks from surface water were not recommended.

Table 26 lists the contaminants, by environmental media evaluated, which are of a potential ecological concern at the Brown's Dump Site. The table also identifies the preliminary RGs for ecological concerns.

5.2 Risk Management Decision (Final Contaminants of Ecological Concern)

After completion of the ERA through Step 3A, a risk management decision was made that the ecological risks were well defined and no additional ecological evaluations or assessments were required to develop preliminary RGOs for the COPECs listed in Table 26.

A risk management decision was made that the COPECs and the preliminary ecological RGOs identified in Step 3A of the ERA would serve as surrogate Contaminants of Ecological Concern (COEC) and preliminary ecological Remedial Goals (RGs; i.e., cleanup levels) for the Site.

5.3 Risk Management Decision (Remediation for Ecological Cleanup)

Refinement of the above COPECs and preliminary ecological RGs was possible. For example, many of the COPECs for soils are metals and other inorganic chemical that are naturally occurring in the environment. Some of the COPECs are organic chemicals that are also naturally occurring or ubiquitous in urban environments. To determine background concentrations of COPECs, soil sampling was performed. Surface soil was collected at a total of 60 background locations samples. In many cases, the background concentration of the COPEC was above the preliminary ecological RG (e.g., aluminum, iron, mercury). EPA does not require cleanup to below background levels.

With establishment of the environmental medium of concern (soil), identification of the COPECs and determination of surface soil background concentrations, an analysis was performed on the geographic co-location of human health COCs and COPECs. The following paragraphs address both direct and food chain exposure.

A. Ecological Direct Exposure COPECs: Analyses of the Phase I and Phase II soil datasets (surface soil only) in relation to ecological risk indicates that the vast majority of samples exceeding the preliminary RG for aluminum, antimony, copper, iron and zinc (or background concentrations if background is higher than the respective cleanup level) are already set for remediation for other reasons (e.g., residential soil greater than 400 ppm lead). In other words, the remediation decisions based on residential scenarios and human health appear to also address ecological risk from surface soil COPECs with respect to direct exposure. This data is available in the Work Plan Addendum: Phase 3 Additional Sampling Plan: Revision 3, June 2005.

EPA is making a risk management decision that the direct exposure ecological risk to soils in residential settings will be addressed by the cleanup that will occur to address human health risks (see Part 8 of this ROD for discussion of the selected remedy) will also address the food chain ecological risk to soils in residential settings.. Any remaining ecological risk will be small. The remaining direct exposure ecological risk is considered insignificant for the following reasons:

- The preliminary ecological RGOs identified in the 2002 ERA are very conservative.
- The ecological setting at Brown's Dump is not of high ecological value (i.e., it is an urban residential setting).
- A large mass of contaminants will be removed or covered to satisfy cleanup to residential human health. Removal or capping of soil to satisfy cleanup to residential human health will also remove or break most of the ecological exposure pathway.

B. Cleanup to meet Food Chain Exposure COPECs: Along with lead, mercury and DDT are identified as food chain COPECs. The lead human health cleanup number is equivalent to the lead ecological preliminary RG, so the lead ecological problem will be addressed concurrently with the lead cleanup for human health. The ecological cleanup level for 4,4-DDT and mercury are lower than respective human health values.

Analyses of the Phase I and Phase II soil datasets (surface soil only) in relation to ecological risk indicates that the vast majority of samples exceeding the preliminary ecological RG for 4,4-DDT and mercury (or background concentrations if background is higher than the respective ecological cleanup level) are already set for remediation for other reasons (e.g., residential soil greater than 400 ppm lead). In other words, the remediation decisions based on residential scenarios and human health appear to also address ecological risk from surface soil COPECs with respect to food chain exposures.

EPA is making a risk management decision that cleanup to satisfy human health will also address the food chain ecological risk to soils in residential settings. Any remaining ecological risk will be small. The remaining food chain ecological risk is considered insignificant for the following reasons:

- The preliminary ecological RGOs identified in the 2002 ERA are very conservative.
- The ecological setting at Brown's Dump is not of high ecological value (i.e., it is an urban residential setting).
- The food chain exposure is averaged over a large exposure area. A large mass of contaminants will be removed or covered to satisfy cleanup to residential human health. Removal or capping of soil to satisfy cleanup to residential human health will also remove or break most of the ecological exposure pathway.

PART 6: DESCRIPTION OF REMEDIAL ALTERNATIVES

6.1 Remedial Action Objectives

Remedial Action Objectives (RAOs) are specific cleanup objectives. For example, RAOs are site-specific goals for protecting human health and the environment established on the basis of the nature and extent of contamination, resources that are currently and potentially threatened, and the potential for human and environmental exposure. The following RAOs have been identified for the Brown's Dump Site:

- Prevent human exposure to Site COCs through contact, ingestion, or inhalation of surface soil and ingestion of vegetables at the former Mary McLeod Bethune Elementary School, and electric substation of the Jacksonville Electric Authority (JEA), surrounding single family homes and multiple family complexes (e.g., apartments) contaminated above RGs from incinerator ash or other wastes disposed at the Brown's Dump Site with a carcinogenic risk greater than 1×10^{-6} (i.e., one in a million), with a noncarcinogenic hazard index greater than 1 and lead in excess of 400 mg/kg.
- Prevent impacts to terrestrial biota from exposure to surface soils at the former Mary McLeod Bethune Elementary School, an electric substation of the JEA, surrounding single family homes and multiple family complexes (e.g., apartments) contaminated above RGs from incinerator ash or other wastes disposed at the Brown's Dump Site and containing contaminants of potential ecological concern (COPECs) in excess of preliminary ecological Remedial Goals (RGs).[3]
- Control erosion and transport of soils containing visible ash,[3] lead in excess of 400 mg/kg or COPECs in excess of preliminary ecological RGs[4] along the banks of Moncrief Creek to prevent possible unacceptable risks to human health or ecological impacts.
- Place geotextile (or other membrane) topped with gravel under residential houses with open crawlspaces (that can be easily accessed by children) with exceedance of human health RGs to further prevent direct contact with the soil.[4]
- Institute groundwater monitoring to verify the "No Action" decision for the groundwater. Superfund 5 year reviews of post-remedial groundwater monitoring will be used to determine effectiveness of this site specific source removal in reducing groundwater contaminant levels and the potential for dishcarge to surface water.

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[3] Cleanup to satisfy the human health RGs will also provide adequate cleanup to protect ecological receptors (i.e., separate actions to address ecological risk in soil is not needed).

[4] Geotextile with gravel in open crawlspaces and groundwater monitoring were not part of the remedies submitted in the Feasibility Study. EPA has added these RAOs in response to concerns by the Florida Department of Environmental Protection and community members.

6.2 Remedial Goals (i.e., cleanup levels)

Remedial Goals (RGs) for residential and industrial settings and ecological concerns were identified which meet the above RAOs (see Tables 27, 28 and 29, respectively). The residential and preliminary ecological RGs were originally identified in the 2002 BHHRA and the 2002 ERA. As noted in Tables 27 and 28, many Florida soil cleanup target levels (SCTLs) for residential and industrial scenarios were utilized as default RGs to achieve the risk levels of 1×10^{-6} and HI of 1. Because the SCTLs for barium and copper under a residential setting are based on acute toxicity, EPA chose to utilize the values in its BHHRA for these two constituents. It is believed that the on-site BHHRA, which is based on exposures assumptions and toxicity values for chronic exposures, will also be generally protective for short term exposures for these two constituents. The values in the BHHRA and these RGs were used in the Feasibility Study to direct the investigation and evaluation of possible remedial alternatives.

6.3 Description of Remedial Alternatives

To meet the RAOs and RGs outlined respectively in Parts 6.1 and 6.2, a range of technology types and process options available for remediation were screened in the 2005 Feasibility Study. The purpose of this screening was to identify the technologies that may be applicable for remediation of the media of concern at the Site. The primary screening of technology types[5] and process options[6] used the following factors to evaluate the state of the technology: site conditions, waste characteristics, the nature and extent of contamination, and the presence of constituents that could limit the effectiveness of the technology.

Technologies and process options that remained after the primary screening were further evaluated using a qualitative comparison based on effectiveness, implemenetability and cost.

Those technologies and process options considered infeasible based on effectiveness, implementability and cost were removed from further consideration. The remedial technologies and process options that remained after the screening were then assembled into a range of alternatives, essentially four alternatives which will be explained in the following sub-parts.

NOTE: Remedial alternatives which require any combination of cover installation and/or soil excavation also include restoration activities (e.g., replacement of flower beds, trees, shrubs, grass, etc.). Likewise, any remedial alternatives that require excavation will also

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[5] For example, in situ biological treatment, consolidation, physical treatment, excavation, administrative controls, engineered caps, etc.

[6] For example, landfarming, onsite consolidation, stabilization/solidification, excavation, city ordinances, asphalt, etc.

require characterization of the excavated soil to determine proper disposal (i.e., determination if the soil is hazardous or not hazardous from a disposal standpoint). In addition, the three active alternatives all include the option for temporary relocation provided to eligible residents upon their request.

In order to obtain a succinct explanation of each alternative, please see Table 30, which presents a matrix of the main components included in each alternative, and Parts 6.3.1 through 6.3.4 of the ROD, which summarize each alternative.

6.3.1 Alternative 1 - No Action

The No Action alternative was evaluated as a baseline option for comparison to the other alternatives. Under this alternative, no remedial action would be performed to control exposure to COCs exceeding the RGs. Any reduction in soil or sediment contaminant concentrations would be due to natural dispersion, attenuation, and degradation processes.

Capital Cost:	$ 0.00
Annual Operation and Maintenance:	$5,200
Present Worth:	$70,000

6.3.2 Alternative 2 - Soil Cover with Excavation and Offsite Disposal

The remedial objectives would be met by Alternative 2 (Soil Cover with Excavation and Offsite Disposal) primarily by providing a 0.5 foot cover of uncontaminated soil over all parcels exceeding RGs. This soil cover would prevent direct contact, ingestion or inhalation of surficial soils by people while also preventing impacts to terrestrial biota. Some excavation would be needed to allow for placement of the soil cover without creating storm water drainage problems or surface grade problems with fixed surface features or structures. Potential exposure to contaminated subsurface soil above the RGs is to be addressed through administrative notices and restrictions on excavation of subsurface soil.

Soil below existing structures and roadways would not be removed. Erosion of soils exceeding RGs and ash located along the banks of Moncrief Creek is to be prevented in this alternative through stabilization of the banks of Moncrief Creek. Stream banks would be cleared of vegetation and banks judged to have an excessive slope would be cut back. Erosion control matting would be placed, cover soil added and a new grass cover established on the sideslopes. An option for providing at least two feet of clean soil between the bank stabilization measures and the ash/soil contamination would be also considered.

The estimated volume of soil to be removed is 30,000 cubic yards (cys). The estimated time to complete this alternative is 18 months.

The main components of Alternative 2 are as follows:

- Administrative notices and restrictions (i.e., Institutional Controls)
- Soil cover (with excavation where required) and offsite disposal at an appropriate landfill
- Solidification/stabilization, as needed for proper offsite disposal in an appropriate landfill
- Moncrief Creek bank stabilization

Capital Cost:	$10,900,000
Annual Operation and Maintenance:	$35,000
Present Worth:	$11,400,000

6.3.3 Alternative 3 - Shallow Excavation, Offsite Disposal and Soil Cover

The RGs would be met under Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover) by providing at least 2 feet of clean soil over all parcels and surface soil areas exceeding the RGs and application of administrative notices and restrictions on excavation of subsurface soil remaining above RGs. The purpose of the cover soil would be to prevent direct contact with contaminated soil above the RGs, prevent erosion of contaminated soil above the RGs and minimize impacts to terrestrial biota.

In general, providing the minimum of 2 feet of soil meeting RGs would be accomplished through excavation of soil in the upper 2-feet that exceeds RGs and replacement with clean topsoil. The Remedial Design will address selection of an appropriate "warning mesh" for installation prior to placement of the cover or clean fill material. [note: Delete the above three sentences. Page 38 of the Superfund Lead-Contaminated Residential Sites Handbook (EPA 2003) notes that mixing surface soils above RGs to achieve a cleanup goal is not an acceptable remedial component. It's also unclear how 'thin', 'marginally exceeding', 'sparingly' would be defined] Also, undeveloped parcels north of the school property with surface soils above RGs, may receive 2 feet of clean cover soil without excavation, provided drainage and other grade considerations can be satisfied. However, if removal of two feet of contaminated soil with surface soils above will remove all or a substantial amount of the contamination from the undeveloped parcels to the north of the school property, then removal as opposed to soil cover will be preferable. Areas exceeding RGs below buildings, or asphalt or concrete roadways, driveways and sidewalks which maintain a break in the exposure pathway would be considered adequately covered. Potential exposure to contaminated subsurface soil above the RGs is to be addressed through administrative notices and restrictions on excavation of subsurface soil.

As with Alternative 2, current residential parcels that are designated to be redeveloped for industrial land use would be remediated to industrial cleanup standards. Remediation of industrial land use parcels, former school property (developed land), former school property (undeveloped land), and remaining undeveloped land (mostly found adjacent to the creek), will involve installation of a 2 foot thick cover with excavation as needed to allow for placement of the cover. Areas exceeding RGs below buildings, or asphalt or concrete roadways, driveways and sidewalks which maintain a break in the exposure pathway would be considered adequately covered and not require removal of soils. [note: the text should clarify what is considered a building (e.g., is a shed a 'building'?] Any soil excavated for foundations or basement would be solidified pursuant to RCRA treatment standard requirements at 40 CFR §268 as necessary and disposed offsite at a subtitle D landfill.

As with Alternative 2, areas of soil contamination exceeding RGs would be excavated as necessary to allow placement of the soil cover without creating storm water drainage problems or surface grade problems. It is assumed for cost estimating that all residential properties exceeding RGs (estimated at 200 properties) would have the full thickness of soil exceeding RGs, up to a maximum thickness of 2 feet, excavated and disposed offsite.

Erosion of soils exceeding RGs and ash along the banks of Moncrief Creek is prevented in this alternative through stabilization of the banks of Moncrief Creek. Stream banks would be cleared of vegetation and banks judged to have an excessive slope would be cut back. Erosion control matting would be placed, cover soil added and a new grass cover established on the sideslopes. Acceptable side slopes and other design elements for the bank stabilization will be determined in the remedial design by professional engineers trained in slope stability and bank stabilization design. An option for providing at least two feet of clean soil between the bank stabilization measures and the ash/soil contamination above the RGs would be also considered. [note: Regarding the previous sentence, it's unclear how this would be implemented, and whether this option is to be considered during remedial design. If this is to be considered part of the selected remedy, a sentence noting this should be incorporated into Section 8]

The Remedial Design will address selection of an appropriate "warning mesh" for installation prior to placement of any cover or clean fill material.

The estimated volume of soil to be removed is 85,000 cys. The estimated time to complete this alternative is 24 months.

The main components of this alternative are:

- Administrative notices and restrictions (i.e., Institutional Controls)
- Shallow soil excavation, offsite disposal and soil cover in residential areas
- Soil cover with excavation as needed in select non-residential areas [i.e., former school property (developed land), former school property (undeveloped land), and remaining undeveloped land (mostly found adjacent to the creek], and industrial areas
- Solidification/stabilization of excavated soil pursuant to RCRA treatment standard requirements at 40 CFR §268, as needed for proper offsite disposal
- Moncrief Creek bank stabilization
- Temporary Relocation will be provided to eligible residents upon their request.

Capital Cost: $20,500,000

Annual Operation and Maintenance:	$35,000
Present Worth:	$21,000,000

6.3.4 Alternative 4 - Deep Excavation and Offsite Disposal

The RGs would be met under Alternative 4 (Deep Excavation and Offsite Disposal) by excavation of all soil exceeding RGs above the water table. Digging below the water table is deemed infeasible. Soil below existing structures and roadways would not be removed. To address subsurface soil remaining below structures, roadways, etc. and above RGs, administrative notices and restrictions on excavation would be utilized.

With removal of all soil exceeding RGs along stream banks, stabilization of the banks of Moncrief Creek would be needed.

The estimated volume of soil to be removed is 290,000 cys. The estimated time to complete this alternative is 32 months.

The main components of this alternative are:

- Administrative notices and restrictions (i.e., Institutional Controls)
- Soil excavation and offsite disposal
- Solidification/stabilization of excavated soil, as needed for proper offsite disposal

Capital Cost:	$43,400,000
Annual Operation and Maintenance:	$5,200
Present Worth:	$43,470,000

6.4 Common Elements and Distinguishing Features of Each Alternative

All of the alternatives, except Alternative 1 (no action) include some amount of excavation, covers,[7] solidification/stabilization (when needed), offsite disposal in an appropriate landfill, monitoring, surface regrading and re-vegetation, and Institutional Controls. The main difference between the alternatives is related to the volume of soil removed and thickness of cover. For example, Alternative 2 would remove less soil than Alternative 3 because Alternative 2 envisions a 0.5 foot cover while Alternative 3 envisions a 2 foot cover. Alternative 3 would remove less soil than Alternative 4 because Alternative 3 envisions a 2 foot cover while Alternative 4 would remove all of the contaminated soil above the RGs above the water table.

A similarity is that all of the remedial alternatives (except Alternative 1) require a combination of cover installation and/or soil excavation, which would necessitate restoration activities (e.g., post-excavation replacement of flower beds, trees, shrubs,

[7] References to covers should be understood to be soil covers in residential areas and either man-made material (e.g., asphalt, concrete, etc.) or soil in industrial areas.

grass, etc.). Likewise, Alternatives 2, 3 and 4 include offsite disposal of excavated soil; hence, these alternatives would also require characterization of the excavated soil to determine proper disposal (i.e., determine if the soil is hazardous from a disposal standpoint and in need of treatment pursuant to RCRA treatment standard requirements at 40 CFR part 268). As more soil is removed, there is a greater chance that more soil would be found to be hazardous waste (i.e., fail TCLP) and hence require more stabilization/solidification.

All of the alternatives (except Alternative 1) include Institutional Controls. A small difference between the alternatives is related to the "amount" of Institutional Controls necessary due to the volume of soil envisioned for removal. In general, as the volume of soil removed increases, it is believed that less area will remain contaminated above the RGs and subject to triggering the management controls envisioned under Institutional Controls. However, even if all of the contaminated soil above the RGs in the yards is removed, contamination above the RGs under houses, roads, driveways will remain and the management controls could be triggered by future digging operations.

Alternatives 2 and 3 envision the same bank stabilization actions along Moncrief Creek and complete removal of contaminated soil in Alternative 4 would require post-excavation stabilization actions similar to that for Alternatives 2 and 3; therefore, the portion of each alternative dealing with Moncrief Creek is basically equivalent.

6.5 Expected Outcomes of Each Alternative

The No Action Alternative would leave the Site presenting the same risks as are currently present.

The expectation is that Alternatives 2 (Soil Cover with Excavation and Offsite Disposal), 3 (Shallow Excavation, Offsite Disposal and Soil Cover) and 4 (Deep Excavation and Offsite Disposal) would either eliminate and/or reduce or manage the risks due to contamination above RGs from the Site. However, the robustness of this elimination and/or risk management increases as the volume of soil removed increases and the thickness of clean cover increases. For example, the thicker the soil cover, the more soil is available to maintain an incomplete pathway over time. In addition, Alternative 3's requirement for excavation of the top two feet of soil contaminated above the RGs, and installation of a 2 foot thick soil cover in residential areas would greatly increase the amount of contaminated soil removed from a particular piece of property, maybe even leading to the removal of all the contamination above the RGs on a particular parcel except that which might exist under more permanent structures like houses, driveways, etc.

As previously noted, each of the alternatives would leave, at varying depths, a volume of contaminated soil above the RGs in the subsurface which would require Institutional Controls. The expectation is that properly operating Institutional Controls will manage those digging activities which have the chance to encounter and move large volumes of contaminated subsurface soil above the RGs. These Institutional Controls should function equivalently regardless of the alternative selected (i.e., regardless of the amount of soil removed or the thickness of the soil cover).

Because Alternatives 2, 3 and 4 all include removal or soil covering at least the upper 0.5 foot of contaminated soil exceeding the human health RGs, the expectation is that all of these alternatives would reduce the risk to ecological receptors (i.e., terrestrial receptors) and greatly minimize, reduce or eliminate any future contaminant migration to Moncrief Creek.

PART 7: EVALUATION OF REMEDIAL ALTERNATIVES

7.1 Comparative Analysis of Alternatives

In this Part of the ROD, each alternative is evaluated using the nine evaluation criteria required in Section 300.430(f)(5)(i) of the NCP. Specifically, the four alternatives are compared in relation to the evaluation criteria described in Table 31 to determine which alternative best eliminates or reduces risks posed by contaminated soil above the RGs.

The following sub-parts of this ROD profile the relative performance of each alternative against the two threshold criteria and the five balancing criteria and conclude with an opinion on which alternative compares most favorable against the criterium under consideration. The two modifying criteria are addressed in Parts 9 and 11 of the ROD.

Table 32 provides a side by side comparison of each alternative in relation to the threshold and balancing criteria. Table 33 summarizes the relative performance of the remedial alternatives summarized narratively in the following sub-parts.

NOTE: The No Action Alternative will not meet any of the cleanup criteria, and will not be discussed in detail in the below text.

7.2 Threshold Criterion 1 - Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced or controlled through treatment, engineering controls and/or Institutional Controls.

All of the alternatives, except the no-action alternative, are protective of human health and the environment by eliminating, reducing, or controlling risks posed by the Site through removal (and treatment where needed) of contaminated soil above the RGs, engineering controls (e.g., soil cover), and/or Institutional Controls. Alternatives 2, 3 and 4 are similar in their overall protectiveness because potential risks related to exposure to the contaminated soils above the RGs are eliminated, reduced or managed and risks related to erosion of ash to Moncrief Creek are eliminated or reduced.

Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover) is viewed to be more robust in terms of overall protection because it provides a thicker barrier of clean soil (i.e., 2 feet in Alternative 3 versus 0.5 feet in Alternative 2) to minimize the potential for risks related to exposure to subsurface soil contamination above the RGs or accumulation of chemicals in vegetables for those who garden. In addition, Alternative 3's requirement for a 2 foot thick soil cover in residential areas would greatly increase the amount of contaminated soil removed from a particular piece of property, maybe even leading to the removal of all the contamination above the RGs on a particular parcel except that which might exist under more permanent structures like houses, driveways, etc.

Because less contaminated soil above the RGs is removed (or a thinner soil cover is utilized), Alternative 2 (Soil Cover with Excavation and Offsite Disposal) may pose increase risks related to digging activities in residential setting when compared to Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover). However, the risks of uninformed large digging or construction operations under either Alternative 2 or 3 (or 4) should be manageable through Institutional Controls.

While Alternative 4 (Deep Excavation and Offsite Disposal) removes the greatest amount of soil exceeding RGs, this reduction in residual risk is counterbalanced by an increase in risks to the community during the estimated 32 month construction period and the substantial truck traffic (estimated 75,000 truck loads) that would occur. These risks related to construction could be significant and would have to be actively managed. Dust control efforts will be important because nearly all the ash with high concentrations of lead will be excavated, loaded into trucks and transported offsite. The potential for vehicle or pedestrian accidents is much higher for Alternative 4 (Deep Excavation and Offsite Disposal) in relation to the other alternatives because of the estimated 75,000 trucks to be loaded and driven through the surrounding neighborhoods during Alternative 4's 32 month construction period.

Alternatives 3 and 4 would significantly eliminate or reduce the risk to both human health and the environment, possibly even lessening the area in need of ongoing Institutional Controls once remediation is complete.

The three active remedial alternatives are deemed protective of Human Health and the Environment (i..e, Threshold Criteria 1 is met).

7.3 Threshold Criterion 2 - Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking waiver. Please see Part 10.2 and Tables 37, 38 and 39 for a more in-depth listing of the Site's ARARs.

None of the identified ARARs are expected to hinder implementation of Alternatives 2, 3 and 4 to the point where the alternative cannot be pursued. Alternative 2 (Soil Cover with Excavation and Offsite Disposal) would not meet the FAC 62-785 Brownfield Cleanup Criteria for a minimum of 2 feet of soil meeting residential cleanup criteria because Alternative 2 (Soil Cover with Excavation and Offsite Disposal) provides only a minimum of 0.5 feet of cover soil rather than 2 feet. However, this 2 foot minium is considered a to-be-considered (TBC) and not an ARAR.

7.4 Balancing Criterion 3 - Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once RGs (i.e., clean-up levels) have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Each alternative, except the No Action alternative, provides some degree of long-term protection. However, all alternatives result in varying amounts of soil remaining that exceed the RGs. For example, there is an estimated 340,000 cys of soil above the water table that would remain under the No Action Alternative. Alternative 2 (Soil Cover with Excavation and Offsite Disposal) would result in removal of about 30,000 cys, leaving approximately 310, 000 cys. Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover) would result in a residual volume of about 255,000 cys. Alternative 4 (Deep Excavation and Offsite Disposal) would leave about 50,000 cys below roadways, buildings, driveways and sidewalks.

Alternatives 2, 3, and 4 all rely on Institutional Controls to prevent or manage excavation of subsurface soil exceeding RGs and subsequent spreading on the surface where long-term exposure could occur. Alternative 4 (Deep Excavation and Offsite Disposal) offers the greatest long-term effectiveness because, for the most part, its reliance on Institutional Controls would be for soils that are already greatly isolated from the potential for exposure (i.e., below buildings, or asphalt or concrete roadways, driveways and sidewalks which maintain a break in the exposure pathway).

Alternative 2 (Soil Cover with Excavation and Offsite Disposal) is the least favorable in terms of long term effectiveness because it provides for only 0.5 feet of cover soil. However, the Institutional Controls for Alternative 2 (Soil Cover with Excavation and Offsite Disposal) are still considered adequate and reliable because only commercial construction contractors would have the equipment to engage in the amount of excavation that could result in enough subsurface soil to be spread on the surface to pose a substantial potential risk if not managed properly. These contractors would be notified of the requirements for excavation and proper disposal of soils through the construction permit process (i.e., one of the envisioned Institutional Control measures).

In contrast to the Institutional Controls which should be able to address commercial digging within the area of remaining subsurface contamination above the RGs, it would be more difficult to ensure proper excavation of soils below either 0.5 feet (Alternative 2) or 2 feet (Alternative 3) by individual residents. However, these activities would typically be for small excavations such as planting bushes or installing posts, that would not result in substantial potential risk if the soil were dispersed on the surface. Alternative 2 (Soil Cover with Excavation and Offsite Disposal) would require some targeted deeper excavations based on land use to minimize risks (e.g., a deeper 2 foot soil cover in garden and playground areas).

Alternatives 2 and 3 envision the same bank stabilization actions along Moncrief Creek and complete removal of contaminated soil above the RGs in Alternative 4 would require post-excavation stabilization actions similar to that for Alternatives 2 and 3; therefore, the portion of each alternative dealing with Moncrief Creek is basically equivalent with regard to long-term permanence. The stabilization action along Moncrief Creek is an engineered action. As with any engineered action, ongoing monitoring and maintenance would be required to ensure that the structure continues to operate as designed. In this case, ensuring that future erosion does not allow remaining contamination above the RGs to resurface.

In the following order, Alternatives 2, 3 and 4 provide an increasing degree of permanent reduction in risk and decreasing amount of residual risk after cleanup. It is believed that Alternative 4 (Deep Excavation and Offsite Disposal) provides the best long term effectiveness and permanence.

7.5 Balancing Criterion 4 - Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Instead of using an active treatment method, Alternatives 2, 3 and 4 addresses the threat of contaminated soil above the RGs by breaking the exposure pathway. In order to accomplish the breaking of the exposure pathway, soil excavation (with offsite disposal) will occur in many locations to be followed by installation of a cover . Toxicity Characteristic Leaching Procedures (TCLP) test data collected during the RI suggest that about 10% of the soil exceeding the RGs will fail the TCLP limit for lead and require solidification pursuant to RCRA treatment standard requirements at 40 CFR part 268 prior to offsite disposal. In other words, if TCLP testing finds the soil to be hazardous waste under RCRA, then treatment (i.e., stabilization/solidification) pursuant to RCRA treatment standard requirements at 40 CFR part 268 is needed prior to land disposal. As a result, it is estimated that Alternatives 2, 3 and 4 will treat an estimated 3,000, 8,500 and 29,000 cys of soil, respectively. Solidification does not destroy the lead; therefore, it is a reversible process. However, the treated soil would be isolated in an appropriate landfill and would not be expected to leach to groundwater over the long-term.

Solidification will reduce the mobility of the contaminants; however, the volume is actually increased with the solidification materials. Therefore, the toxicity may be considered reduced proportionally over the increased volume, although the amount of contamination is not reduced.

All of the alternatives will, as needed, reduce the toxicity, mobility or volume of the contaminants. Although all of the alternatives would use basically the same treatment process if the need for treatment is triggered, because of the greater volume of material potentially available for treatment, Alternative 4 (Deep Excavation and Offsite Disposal) provides the largest potential for reduction of toxicity, mobility and volume of contaminants.

7.6 Balancing Criterion 5 - Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until RGs are achieved.

Because there would be no remedial construction activities associated with Alternative 1 (No Action Alternative), this alternative has the least short-term construction impacts. The other alternatives would include construction activities with varying levels of impacts to construction workers, the community and the environment. The amount of impact is proportional to the amount of excavation of contaminated soil above the RGs and the amount of truck traffic through the neighborhoods. The estimated number of truck loads of soil, trucks per day and the duration of construction are estimated as follows:

- Alternative 2 - 11,000 truck loads, 30 trucks/day, 18 months construction
- Alternative 3 - 32,000 truck loads, 60 trucks/day, 24 months construction
- Alternative 4 - 75,000 truck loads, 110 trucks/day, 32 months construction

Alternative 4 (Deep Excavation and Offsite Disposal) would have by far the greatest impact to the community during the estimated 32 month construction period. Alternatives 2 and 3 have considerably less impact to the community. Potential impacts to workers can be minimized through adherence to proper health and safety requirements during excavation and cover activities. Likewise impacts to the environment can be minimized through mitigative measures such as use of silt fences to control erosion and watering of dry soils to minimize dust generation.

Potential environmental impacts are most likely during bank stabilization of Moncrief Creek. Alternatives 2 and 3 envision the same bank stabilization actions along Moncrief

Creek and complete removal of contaminated soil above the RGs in Alternative 4 would require post-excavation stabilization actions similar to that for Alternatives 2 and 3. Impacts to the creek during stabilization would require coordination with local officials and management actions to limit erosion of soils during stabilization.

It is believed that Alternative 2 (Soil Cover with Excavation and Offsite Disposal) would provide the most cleanup advantage relative to short-term effectiveness.

7.7 Balancing Criterion 6 - Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Excavation and placement of soil covers on residential properties will require extensive coordination with local community officials and individual residents. Alternatives 2 through 4 have the same implementability concerns relative to the substantial coordination because all three alternatives would target similar numbers of residential properties. The availability of local landfill capacity could be strained with implementation of Alternative 4 (Deep Excavation and Offsite Disposal) because of the large volume of soil to be disposed (290,000 cys).

Alternatives 2 and 3 envision the same bank stabilization actions along Moncrief Creek and complete removal of contaminated soil above the RGs in Alternative 4 would require post-excavation stabilization actions similar to that for Alternatives 2 and 3; therefore, the portion of each alternative dealing with Moncrief Creek is basically equivalent with regards to implementability. This portion of each alternative would require extensive coordination with local officials and individual property owners along the creek.

Since Alternative 1 (No Action Alternative) is already implemented, it is believed that Alternative 1 (no action) would be the easiest to implement. However, of the active alternatives, Alternative 2 (Soil Cover with Excavation and Offsite Disposal) would probably be the most implementable because this alternative has the smaller volume of soil to be removed.

7.8 Balancing Criterion 7 - Cost

The estimated costs for each alternative are summarized in Table 34.

The cost estimates presented above have been developed strictly for comparing the four alternatives. The final costs of the project and the resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, the implementation schedule, the firm selected for final engineering design, and other variables.[8] Therefore, final project costs will vary from the cost estimates. Because of these factors, project feasibility and funding needs must be reviewed carefully before specific financial decisions are made or project budgets are established to help ensure proper project evaluation and adequate funding.

The cost estimates are order of magnitude estimates having an intended accuracy range of +50 to -30 percent. The range does not account for changes in the scope of the alternatives. The specific details fo remedial actions and cost estimates would be refined during final design.

A cost sensitivity analysis was performed to evaluate the effect of differing discount rates and volumes of contaminated media. Many other factors that have substantial uncertainty can also effect the present worth costs of alternatives but they are not as significant as the factors listed above. Remedy failure and its potential to require additional remedial work in future years is not significant at this Site because the primary technologies are excavation and covering which are not technologies that are likely to fail. The project duration is also not likely to greatly effect the relative costs between alternatives because the duration would likely vary by only a few years at most.

Discount rates were varied because they effect the present work costs of operation and maintenance (O&M). Table 35 presents the effects of varying discount rates.

7.9 Modifying Criterion 8 - State/Support Agency Acceptance

See Part 9 of the ROD

7.10 Modifying Criterion 9 - Community Acceptance

See Part 11 of the ROD

7.11 Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). Identifying principal threat waste combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile, which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur.

The contaminated soils at the Brown's Dump Site are not considered to be "principal threat wastes" because the COCs are not found at highly toxic concentrations that pose a

[8] For example, cost estimates in the Feasibility Study included parcels which were assumed to be contaminated above the RGs. Due to access not being granted at certain parcels, assumptions on contamination above the RGs were made based on sampling results from adjacent parcels.

significant risk to either human or ecological receptors and the contaminated soil can be reliable contained.

PART 8: SELECTED REMEDY

8.1 Remedial Action Objectives and Remedial Goals (i.e., cleanup levels)

The RAOs for the Brown's Dump Site are as follows:

- Prevent human exposure to Site COCs through contact, ingestion, or inhalation of surface soil at the former Mary McLeod Bethune Elementary School, an electric substation of the JEA, surrounding single family homes and multiple family complexes (e.g., apartments) contaminated above the RGs from incinerator ash or other wastes disposed at the Brown's Dump Site with a carcinogenic risk greater than 1×10^{-6} (i.e., one in a million), with a noncarcinogenic hazard index greater than 1 and lead in excess of 400 mg/kg.
- Prevent impacts to terrestrial biota from exposure to surface soils contaminated above the RGs from incinerator ash or other wastes at the former Mary McLeod Bethune Elementary School, an electric substation of the JEA, surrounding single family homes and multiple family complexes (e.g., apartments) contaminated above RGs from incinerator ash or other wastes disposed at the Brown's Dump Site and containing chemicals of potential ecological concern (COPECs) in excess of preliminary ecological Remedial Goals (RGs).[9]
- Control erosion and transport of soils containing visible ash, lead in excess of 400 mg/kg or COPECs in excess of preliminary ecological RGs[10] along the banks of Moncrief Creek to prevent possible unacceptable risks to human health or ecological impacts.
- Place geotextile (or other membrane) topped with gravel under residential houses with open crawlspaces (that can be easily accessed by children) with exceedance of human health RGs to further prevent direct contact with the soil.[10]
- Institute groundwater monitoring to verify the "No Action" decision for the groundwater. Superfund 5 year reviews of post-remedial groundwater monitoring will be used to determine effectiveness of this site specific source removal in reducing groundwater contaminant levels and the potential for dishcarge to surface water.

Remedial Goals (RGs) for residential and industrial settings and ecological concerns were

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[9] Cleanup to satisfy the human health RGs will also provide adequate cleanup to protect ecological receptors (i.e., separate actions to address ecological risk in soil is not needed).

[10] Geotextile with gravel in open crawlspaces and groundwater monitoring were not part of the remedies submitted in the Feasibility Study. EPA has added these RAOs in response to concerns by the Florida Department of Environmental Protection and community members.

identified which meet the above RAOs (see Tables 27, 28 and 29, respectively). As mentioned in Part 6 of the ROD, many Florida soil cleanup target levels (SCTLs) for residential and industrial scenarios were utilized as default RGs to achieve the risk levels of 1×10^{-6} and HI of 1. Because the SCTLs for barium and copper under a residential setting are based on acute toxicity, EPA chose to utilize the values in its BHHRA for these two constituents. It is believed that the on-site BHHRA, which is based on exposures assumptions and toxicity values for chronic exposures, will also be generally protective for short term exposures for these two constituents.

As mentioned in Part 2.4.6. some properties are in need of RI Phase III sampling. Basically, the RI Phase III sampling is of properties not previously sampled (mainly due to failure to obtain access) or properties in need of re-sampling because information on constituent concentrations is incomplete. The third round of RI sampling begins collection of information needed for quicker implementation of the cleanup once the remedy is selected. Information collected during RI Phase III will be used to further refine areas needing remediation, bit will not alter the cleanup approach selected in this ROD. Any properties identified in RI Phase III as needing remediation will be addressed in a manner consistent with the selected remedy.

8.2 Selected Remedy

EPA has chosen to use only one Operable Unit for this Site. Based upon consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives, and public and state comments, the selected remedy for the Brown's Dump Site is Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover) with the following clarification.

> Soil excavation in residential areas is the preferred option to allow for installation of the 2 foot thick layer of clean soil. Installation of a soil cover in residential areas without excavation will only be considered in circumstances where both of the following conditions are met:
>
> - storm water drainage, surface grade conditions, surrounding aesthetics (i.e, no isolated mounds) allow installation of the 2 foot thick soil cover without excavation, and
> - excavation of the upper 2 feet will not remove all of the contaminated soil exceeding RGs. In other words, contamination above the RGs is present in the upper 2 feet, but it is not present in the uppermost interval of soil (e.g., the top half foot is clean, top foot is clean), and contamination above the RGs exists at depths greater than 2 feet.

This alternative was the remedy proposed in the July 2005 Proposed Plan. In summary, Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover) was found to be the most balanced alternative with the best chance of eliminating or significantly reducing current/future risks at the Site (i.e., achieving the RAO and associated RGs).

8.3 Description of the Selected Remedy

A Remedial Design will be conducted prior to implementation. However, the following is an outline of the selected remedy. Implementation of Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover) will include the following major actions to meet the RGOs and the associated RGs (i.e., cleanup levels):

Implementation of Alternative 3 would include the following actions to address soil *which exceeds residential RGs in Table 27:*[11]

Residential Property

- Prevention of human exposure to surface soil is provided by removal of soil above RGs in the upper two feet and installation of a 2 foot thick soil cover.[12] For the most part, this approach will result in the removal of any contamination above the RGs in the upper 2 feet of soil to be followed by backfill with a 2 foot thick soil cover. Excavated soil will be solidified/stabalized pursuant to RCRA treatment standard requirements at 40 CFR part 268, as needed, prior to off-site disposal at an appropriate Subtitle D Landfill. Soil excavations in yards pose some very site-specific issues. Here are some examples of the types of site-specific issues the Remedial Design will have to address:
  - Excavation of less than 2 feet is to be allowed adjacent to the foundation of buildings and other structures and around the base of trees.
  - Removal of trees is to be optional in that large trees can remain undisturbed unless the property owner desires to have the tree removed for remediation purposes.
  - Excavation is to require removal of small yard vegetation and structures (e.g., bushes, small sheds, etc.) unless property owner specifically requests that such vegetation or structures remain undisturbed.
  - Prevention of potential human exposure to subsurface soil above RGs below 2 feet is provided by installation of the 2 foot thick soil cover and Institutional Controls. Subsurface soil remaining above RGs will be marked by a warning mesh or fabric (i.e., snow fencing, etc.) to indicate the presence of contamination. Where practical, excavation below 2 feet is to be allowed to lesson or eliminate the need for Institutional Controls.
  - Regarding the undeveloped parcels north of the school property which

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[11] As explained in Part 5.3 of the ROD, cleanup to satisfy the human health RGs in Table 27, will also provide adequate cleanup to satisfy the Preliminary Ecological RGs in Table 29.

[12] Temporary Relocation will be provided to eligible residents upon their request prior to excavation. Any Temporary Relocation will follow the *Superfund Response Actions: Temporary Relocation Guidance* (OSWER Directive 9230.0-97, April 2002).

may receive 2 feet of clean cover soil without excavation, provided drainage and other grade considerations can be satisfied, EPA will be the final decision maker on whether or not remediation of parcels can be fully satisfied by cover without excavation or whether some excavation is needed. Further, regarding those undeveloped parcels north of the school property where removal of two feet of contaminated soil above the RGs as opposed to soil cover is preferable, then EPA would be the final decision maker on whether or not full removal or cover in the undeveloped parcels to the north of the school property will be pursued.

- Prevention of potential human exposure to subsurface soil below 2 feet is provided by installation of the 2 foot thick soil cover and Institutional Controls. Where practical, excavation below 2 feet is to be allowed to lesson or eliminate the need for Institutional Controls.
- Place Geotextile (or other membrane) topped with gravel under residential houses with open crawl spaces (that can be accessed by children) with exceedances of human health RGs to further prevent direct contact with the soil.
- Prevention of potential human exposure to the contaminated soil footprint above the RGs under existing buildings, or asphalt or concrete roadways, driveways and sidewalks which maintain a break in the exposure pathway is provided by Institutional Controls.

Former School Property (Developed Land)

- Prevention of human exposure to surface soil is provided by soil removal as needed to allow for installation of a 2 foot thick soil cover.
- Excavated soil will be solidified/stabilized pursuant to RCRA treatment standard requirements at 40 CFR part 268, as needed, prior to off-site disposal at an appropriate Subtitle D Landfill.
- Prevention of potential human exposure to subsurface soil is provided by installation of the 2 foot thick soil cover and Institutional Controls.
- The Remedial Design will address selection of an appropriate "warning mesh" for installation prior to placement of the cover or clean fill material.
- Prevention of potential human exposure to the contaminated soil footprint above the RGs under existing buildings, or asphalt or concrete roadways, driveways and sidewalks which maintain a break in the exposure pathway is provided by Institutional Controls.

Former School Property (Undeveloped Land) and Remaining Undeveloped Land (mostly found adjacent to the creek)

- Prevention of human exposure to surface soil is provided by soil removal as needed to allow for installation of a 2 foot thick soil cover.
- Excavated soil will be solidified/stabilized pursuant to RCRA treatment standard requirements at 40 CFR part 268, as needed, prior to off-site disposal at an appropriate Subtitle D Landfill.
- The Remedial Design will address selection of an appropriate "warning mesh" for

installation prior to placement of the cover or clean fill material.

- Prevention of potential human exposure to subsurface soil below 2 feet is provided by installation of the 2 foot thick soil cover and Institutional Controls.

Implementation of Alternative 3 would include the following actions to address soil, *which exceeds industrial RGs listed in Table 28*:

Industrial Property (including Residential Property designated to be redeveloped for Industrial Use)

- Prevention of human exposure to surface soil is provided by installation of a barrier (e.g., building, asphalt, concrete or soil cover with soil removal as needed to provide minimum 2 feet of clean cover).
- Excavated soil will be solidified/stabilized pursuant to RCRA treatment standard requirements at 40 CFR part 268, as needed, prior to off-site disposal at an appropriate Subtitle D Landfill.
- Prevention of potential human exposure to subsurface soil below 2 feet is provided by installation of the 2 foot thick soil cover and Institutional Controls.
- The Remedial Design will address selection of an appropriate "warning mesh" for installation prior to placement of the cover or clean fill material.
- Prevention of potential human exposure to the soil footprint under existing buildings, or asphalt or concrete roadways, driveways and sidewalks which maintain a break in the exposure pathway is provided by Institutional Controls.
- Prevention of potential future human exposure to the upper 2 feet of surface soil exceeding residential RGs from a change in land use is provided by Institutional Controls.

Implementation of Alternative 3 would include the following actions to control erosion and transport of contaminated bank soils above the RGs into Moncrief Creek:

Moncrief Creek

- Stabilization of the banks of Moncrief Creek (e.g., clear banks, excavate soil to achieve acceptable side slopes,[13] properly dispose of excavated soil/material (with stabilization/solidification where necessary, pursuant to RCRA treatment standard requirements at 40 CFR part 268, as needed, prior to off-site disposal at an appropriate Subtitle D Landfill), installation of erosion controls to prevent erosion of ash/contamination above the RGs into creek, etc.). Acceptable side slopes and other design elements for the bank stabilization will be determined in the remedial design by professional engineers trained in slope stability and bank stabilization design.

All actions which require any combination of cover installation and/or soil excavation

[13] There is to be the option for providing at least two feet of clean soil between the bank stabilization measures and the ash/soil contamination above the RGs.

include restoration activities (e.g., replacement of flower beds, trees, shrubs, grass, etc.).

All actions that require excavation will also require characterization of the excavated soil to determine proper disposal (i.e., determination if the soil is hazardous or not hazardous from a disposal standpoint).

Temporary Relocation will be offered to eligible residents prior to excavation. Any Temporary Relocation will follow the *Superfund Response Actions: Temporary Relocation Guidance* (OSWER Directive 9230.0-97, April 2002).

Figure 6 indicates the properties known (or suspected) to need remediation. This figure includes some assumed contaminated parcels above the RGs based on their location relative to known contaminated parcels above the RGs. As mentioned in Part 3.2, some properties are in need of RI Phase III sampling. Basically, the RI Phase III sampling is of properties not previously sampled (mainly due to failure to obtain access) or properties in need of re-sampling because information on constituent concentrations is incomplete. The third round of RI sampling begins collection of information needed for quicker implementation of the cleanup once the remedy is selected. Information collected during RI Phase III will be used to further refine areas needing remediation. Any properties identified in RI Phase III as needing remediation will be addressed in a manner consistent with the selected remedy.

8.3.1 Institutional Controls

EPA guidance (EPA 2000d) recommends four specific factors be considered when documenting the Institutional Controls to be implemented at a Site: Objective, Mechanism, Timing and Responsibility. The following is a listing of these factors relative to the Brown's Dump Site.

6. **Objective:** The objective of the Institutional Controls is to assist the active portion of the selected remedy (i.e., the cover/excavation portion) in preventing and/or managing potential human exposure to subsurface soil contamination remaining above RGs (e.g., under buildings, or asphalt or concrete roadways, driveways and sidewalks which maintain a break in the exposure pathway), or at depths greater than 2 feet in yards). The Institutional Controls will also keep property remediated to industrial RGs from reverting to another use designation (e.g., residential) without proper remediation to satisfy the proposed non-industrial use.

2. **Mechanism:** The remedy relies on Institutional Controls to direct and control human behavior to eliminate or manage exposure to soil contamination above the RGs remaining at the Site. Institutional Controls are non-engineered instruments, such as administrative and/or legal controls, that help to minimize and/or manage the potential for human exposure to contamination above the RGs and/or protect the integrity of a remedy. The following are general explanations of the four categories of Institutional Control mechanisms available for use followed by those

controls to be used for the Brown's Dump Site:

- *Proprietary Controls* - These controls are based on State law and use a variety of tools to prohibit activities that may compromise the effectiveness of the remedy or restrict activities or future uses of resources that may result in unacceptable risk to human health or the environment. They may also be used to provide site access for operation and maintenance activities. The most common examples of proprietary controls are easements and covenants.

- *Governmental Controls* - These controls impose land or resource restrictions using the authority of an existing unit of government. Typical examples of governmental controls include zoning, building codes, drilling permit requirements and State or local groundwater use regulations.

- *Enforcement and Permit Tools with IC Components* - These types of legal tools include orders, permits, and consent decrees. These instruments may be issued unilaterally or negotiated to compel a party to limit certain site activities as well as ensure the performance of affirmative obligations (e.g., to monitor and report on an IC's effectiveness).

- *Informational Devices* - These tools provide information or notification about whether a remedy is operating as designed and/or that residual or contained contamination above the RGs may remain on Site. Typical information devices include State registries, deed notices, and advisories.

For the Brown's Dump Site, Institutional Controls, including some or all of the following, will be used:

a. *Proprietary Control:* Any land owned by the City that has contamination above the RGs remaining at depth (> 2 feet) or under, or buildings or asphalt or concrete roadways, driveways and sidewalks which maintain a break in the exposure pathway will have restrictions placed on the deed via restrictive covenant that runs with the land to inform future interested parties or owners of the presence of contaminated soil above the RGs and of the requirement to maintain the soil cover or barrier (e.g., building) or asphalt or concrete roadways, driveways and sidewalks which maintain a break in the exposure pathway).

b. *Governmental Controls:* The City of Jacksonville will establish Governmental Controls under its administrative authorities with the expressed intent to prevent and/or manage future human contact with subsurface (> 2 feet) or sub-structure contaminated soil above the RGs. Implementation of at least one of the Governmental Controls should be analogous to the Aquifer Delineation Zone Program in Florida (Chapter

62-524). For example, the Aquifer Delineation Zone Program identifies a zone of groundwater contamination. When a permit application (e.g., well installation) is received, the application is checked against existing Aquifer Delineation Zones in that area. If the application is for a well within that zone, then certain well construction requirements are applied to ensure that contaminated groundwater above the RGs does not enter the well (e.g., double casing of wells, ensuring the recovery zone is not within the contaminated zone, etc.). Similarly, the City of Jacksonville, in consultation with EPA, will identify a Brown's Dump Soil Delineation Zone for that area where soil contamination remains at depth (> 2 feet) above the RGs after covering/excavation. When the City receives an application for an activity within the Brown's Dump Soil Delineation Zone (e.g., to dig for utilities, to build a house, to tear down a house, to add on to a house, to install a swimming pool, to dig a basement, to repair roads, etc.), then that application must be flagged and appropriate restrictions or appropriate management scheme applied prior to approval of the application.

Regarding the management scheme to be applied in the Soil Delineation Zone, the existing Ash Management Plan must be finalized and adopted as part of the Institutional Control. The Ash Management Plan is envisioned to be one of the main management tools when digging within the Brown's Dump Soil Delineation Zone. The City's Ash Management Plan must include, at a minimum:

i. procedures for identification of Ash,
ii. procedures for notifications to City and regulatory officials if Ash is encountered,
iii. procedures for handling, storing and characterizing Ash for proper disposal, transporting Ash,
iv. minimum requirements for documenting Ash handling and disposal activities, and
v. tips to reduce exposure to contaminated soils above the RGs.

The City of Jacksonville will also identify and work with other governmental permitting authorities (e.g., St. Johns River Water Management District, Army Corp of Engineers, etc.) to establish a procedure to ensure that appropriate restrictions or management schemes are applied prior to approval of an application by the other governmental authority which could impact soil contamination remaining above the RGs in the Soil Delineation Zone.

c. *Information Device* - Any property owner that has contamination above the RGs remaining at depth (> 2 feet) or under their house, concrete driveways, etc., will be offered the opportunity to and be assisted with drafting language that can be included in a homeowner's deed to notify potential buyers of contamination and/or restrict future activities of the property so as to maintain the soil cover..

3. **Timing:** The Institutional Controls must be explained in the Remedial Design (RD) and the Operations and Maintenance (O&M) Plan. These controls must stay in place as long as subsurface soil contamination above the RGs remains.

4. **Responsibility:** The City of Jacksonville is responsible for implementing and, where possible given the Institutional Control instrument, enforcing the above identified Institutional Controls. O&M Reports or similar status reports such as an IC Implementation Report, that summarizes all ICs implemented for the Site including mapping of all areas with soil above RGs left in place, location and type of ICs, deficiencies of the ICs, and other information as needed, will be prepared by the City of Jacksonville. EPA is responsible for monitoring (e.g., in O&M Report, in IC Implementation Report, during the 5 year reviews, etc.) the implementation and effectiveness of the Institutional Controls.

8.4 Summary of the Estimated Remedy Costs

The selected remedy is estimated to cost $20,400,000. Table 36 provides detailed information on capital and Operation and Maintenance (O&M) costs for the Remedy.

The information in the above cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate having an intended range of +50 to -30 percent of the actual project cost.

8.5 Expected Outcomes of the Selected Remedy

The expected outcome is removal of complete soil exposure pathways for both human and ecological receptors.

8.6 Available Land Use after Remediation

Residential Property

The RGs (i.e., clean-up levels) were chosen based on residential, restricted use scenarios. After the soil excavations are completed, the property would be available for residential, commercial or industrial uses with appropriate restrictions or management scheme (i.e., Institutional Controls) only on activities which would adversely impact the function of the soil cover or existing buildings to maintain a break in the exposure pathway.

Former School Property (Developed Land)

The RGs (i.e., clean-up levels) were chosen based on residential, restricted use scenarios. After the soil excavation as needed to install the 2 foot of soil cover is completed, the property would be available for residential, commercial or industrial uses with appropriate restrictions or management scheme (i.e., Institutional Controls) only on activities which would adversely impact the function of the soil cover or existing buildings to maintain a break in the exposure pathway.

Former School Property (Undeveloped Land) and Remaining Undeveloped Land (mostly found adjacent to the creek

The RGs (i.e., clean-up levels) were chosen based on residential, restricted use scenarios. After the soil excavation as needed to install the 2 foot of soil cover is completed, the property would be available for residential, commercial or industrial uses with appropriate restrictions or management scheme (i.e., Institutional Controls) only on activities which would adversely impact the function of the soil cover to maintain a break in the exposure pathway.

Industrial Property (including Residential Property designated to be redeveloped for Industrial Use)

The RGs (i.e., clean-up levels) were chosen based on industrial, restricted use scenarios. After installation of a barrier (e.g., building, asphalt, concrete or soil cover with soil removal as needed to provide minimum 2 feet of clean cover), the property would be available for industrial uses with appropriate restrictions or management scheme (i.e., Institutional Controls) only on activities which would adversely impact the function of the cover, whether asphalt, concrete, soil, building, etc., to maintain a break in the exposure pathway.

8.7 Anticipated Environmental and Ecological Benefits

Removal of the contaminated soil above the RGs and stabilization of Moncrief Creek Banks will eliminate the potential for contaminated run-off to enter Moncrief Creek.

8.8 Final Remedial Goals (i.e., clean-up levels)

The Final RGs for soil are included in Table 27, 28 and 29. The goals for ecological remediation only apply to surface soil.

8.9 Implementation for Ecological Cleanup

As mentioned in Part 5.3, remediation of soils to human health RGs will remediate almost all of the exceedances of preliminary ecological RGs or soil background (whichever is higher). Remediation to human health RGs will remove or break the exposure pathway of a large amount of contaminated soil, thereby lowering the average concentration of ecological COPECs at the Site.

Due to the relatively low quality ecological habitat offered by urbanized settings, the ubiquitous nature of many of the ecological COPECs and the conservative nature of the preliminary ecological RGs, it is believed that those locations not targeted for soil cleanup to protect human health will not result in substantive remaining ecological risk.

The overall conclusion is that cleanup to satisfy the human health RGs will also provide adequate cleanup to protect ecological receptors (i.e., separate actions to address ecological risk in soil is not needed).

EPA recognizes that a separate resolution between the PRP and FDEP or any other regulatory agencies is possible, whereby the multiple sources resulting in elevated levels of contaminants in the streams and in groundwater contaminant discharge to surface water will be addressed in a venue separate from the CERCLA Remedy.

PART 9: SUPPORT AGENCY COMMENTS

9.1 State Opinion on the Remedy (NCP §300.435(c)(2))

The State of Florida, as represented by the Florida Department of Environmental Protection (FDEP), has been the support agency during the field investigative and remedy re-analysis leading up to this ROD. In accordance with 40 CFR 300.435, as the support agency, FDEP has provided input during this process. FDEP does not object to the selected remedy.

On September 12, 2005, FDEP provided comments on the Proposed Plan. A response to their comments are included in the Responsiveness Summary (see Part 12.2).

On September 29,2005, FDEP provided comments on the draft ROD. EPA responded to their comment in a letter dated March 29, 2006, (see Part 12.2).

PART 10: STATUTORY DETERMINATIONS (NCP §300.430(f)(5)(ii) and (iii))

10.1 Protection of Human Health and the Environment (NCP §300.430(f)(5)(ii)(A))

The selected remedy will adequately protect human health and the environment through engineering controls (i.e., soil cover) and associated excavation and Institutional Controls.

Engineering Controls (2 foot Thick Soil Cover) and Excavation

Surface Soil Contamination: For both residential and industrial scenarios posing cancer risks of greater than $1x10^{-6}$ or noncarcinogenic risk greater than a Hazard Quotient of 1, soil contaminant concentrations in the upper 2 feet will be addressed. Prevention of human exposure to surface soil is provided by removal of soil above RGs in the upper two feet and installation of a soil cover. In industrial areas, prevention of human exposure to surface soil contamination above industrial RGs is provided by installation of an asphalt, concrete or cover with soil removal as needed to provide minimum 2 feet of clean cover.

Institutional Controls

Subsurface Soil Contamination: To ensure that significant volumes of soil contamination above the RGs, remaining after shallow excavation or remaining under existing structures, is not disturbed unknowingly in the future, the City of Jacksonville will place Proprietary Controls on property it owns and will impose Governmental Controls on actions taken at property within the Brown's Dump Soil Delineation Zone.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements (NCP §300.430(f)(5)(ii)(B))

ARARs include applicable or relevant and appropriate provisions of standards, requirements, criteria or limitations presented in the tables described below:

Chemical Specific ARARs

The primary chemical ARARS are provided in Tables 37.

Location Specific ARARs

Location specific ARARs are provided in Table 38.

Action Specific ARARs

Action specific ARARs are provided in Table 39.

"To-Be-Considered" (TBC)[14]

The following is a listing of those TBCs utilized in the remedy:

- Standards found in 20 CFR 1910 from the Occupational, Health and Safety Administration (OSHA) are carried as to-be-considered values pursuant to 40 CFR 300.400(g)(3).

- Some of the soil cleanup target levels (SCTLs) for residential and industrial scenarios found Chapter 62-777 are utilized as default values to satisfy the State chemical-specific ARAR relating to a carcinogenic risk of 1×10^{-6} and a hazard index of 1 for noncarcinogens (see Tables 27 and 28).

- Chapter 62-780's 2 foot minimum for breaking exposure pathways between people and contaminated soil is utilized as a default thickness.

10.3 ARAR Waivers (NCP §300.430(f)(5)(ii)(C))

This Part of the ROD explains any federal or state laws that the remedy will not meet, the waiver invoked, and the justification for invoking the waiver.

No ARAR waivers are utilized in this ROD.

10.4 Cost Effectiveness (NCP §300.430(f)(5)(ii)(D))

This Part of the ROD explains how the Selected Remedy meets the statutory requirement that all Superfund remedies be cost-effective. A cost-effective remedy in the Superfund program is one whose "costs are proportional to its overall effectiveness" (NCP §300.430(f)(1)(ii)(D)). The "overall effectiveness" is determined by evaluating the following three of the five balancing criteria used in the detailed analysis of alternatives: (1) Long-term effectiveness and permanence; (2) Reduction in toxicity, mobility and volume (TMV) through treatment; and, (3) Short-term effectiveness. "Overall effectiveness is then compared to cost" to determine whether a remedy is cost-effective (NCP §300.430(f)(1)(ii)(D)).

For determination of cost effectiveness, a cost effectiveness matrix was utilized. In the matrix, the alternatives were listed in order of increasing costs. For each alternative, information was presented on long term effectiveness and permanence, reduction of toxicity, mobility and volume through treatment, and short term effectiveness. The

[14] By definition, ARARs are promulgated, or legally enforceable federal and state requirements. EPA has also developed another category known as "to be considered" (TBCs), that includes nonpromulgated criteria, advisories, guidance, and proposed standards issued by federal or state governments. TBCs are not potential ARARs because they are neither promulgated nor enforceable. It may be necessary to consult TBCs to interpret ARARs, or to determine preliminary remediation goals when ARARs do not exist for particular contaminants. Identification and compliance with TBCs is not mandatory in the same way that it is for ARARs.

information in those three categories was compared to the prior alternative listed and evaluated as to whether it was more effective (+), less effective (-) or of equal effectiveness (=).

The selected remedy is considered cost effective because it is a permanent solution that reduces human health and ecological risks to acceptable levels at less expense than the next most extensive risk reducing alternative evaluated.

10.5 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP) (NCP §300.430(f)(5)(ii)(E))

The selected remedy for soil, provides for reduction of toxicity, mobility and volume, but not through treatment. A large volume of contaminated soil above the RGs will be transported off-site, resulting in a permanent solution. The selected remedy provides for treatment of contaminated soil above the RGs only as needed to satisfy RCRA Land Ban Disposal requirements.

10.6 Preference for Treatment as a Principal Element (NCP §300.430(f)(5)(ii)(F))

The selected remedy considers that a small percentage of the excavated soil will be in need of treatment as a principal element. For example, it is believed that some of the soil contains hazardous characteristics requiring it to be considered a RCRA hazardous waste and therefore in need of treatment pursuant to RCRA treatment standard requirements at 40 CFR part 268.

10.7 Indication of the Remediation Goals (NCP §300.430(f)(5)(iii)(A))

Tables 27, 28 and 29 list the RGs to be met by the remedy. Confirmatory sampling or similar means will be used to determine satisfaction of the RGs and disposal requirements.

10.8 Documentation of Significant Changes from Preferred Alternative of Proposed Plan (NCP §300.430(f)(5)(iii)(B))

The Proposed Plan for the Brown's Dump Site was released for public comment in July 2005. The public comment period was from July 28, 2005, to September 12, 2005. The Proposed Plan identified Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover) as the remedy. Written comments were received by EPA during the public comment period. EPA reviewed the verbal comments submitted during the public meeting, which was transcribed by a court reporter. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate. See Part 10 of this ROD for a response to the comments received.

In the July 2005 Proposed Plan, Alternative 4 was listed as most advantageous for Short-Term Effectiveness. This listing was in error. Actually, Alternative 1 would provide the

most cleanup advantage relative to short-term effectiveness, then Alternative 2, Alternative 3 and finally Alternative 4.
The preferred remedy was changed to include groundwater monitoring to verify the "No Action" decision on the groundwater and geotextile (or other appropriate membrane) topped with gravel will be placed under houses with open crawlspaces (that are accessible by children) with soil containing COCs above RGs. The goetextile and gravel will remove the possibility of exposure to soils under houses with open crawlspaces. These changes to the preferred remedy in the Proposed Plan are made based on concerns expressed by the FDEP and community members.

References to the voluntary removal of ash > 25% that were made in the Proposed Plan have been removed from the final remedy in the ROD. This is a remedy implementation issue that can be considered during the Remedial Design and not a remedial goal.

10.9 Five-Year Requirements (NCP §300.430(f)(5)(iii)(C))

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that do not allow for unlimited use and unrestricted exposure, a statutory 5 year review will be conducted within five years of construction completion for the Site to ensure that the remedy is, or will be, protective of human health and the environment.

PART 11: COMMUNITY OUTREACH LEADING UP TO PROPOSED PLAN

11.1 Community Outreach (Fact Sheets, Video, Data Availability Session)

First Fact Sheet

The first EPA Fact Sheet discussing the Brown's Dump Site was distributed October 1999. A Community Relations Plan was prepared in February 2000, and an RI/FS Kickoff public meeting was held on April 3, 2000.

Second and Third Fact Sheets

In order to increase participation in the RI sampling of residential yards, an EPA Fact Sheet requesting access for sampling was issued in December 2001. In January 2002, the EPA and the City walked through the neighborhood making contact with people who had not returned previous requests for access. During the walk through the community, questions on the Access Agreements and the importance of the additional sampling were answered.

In March 2002, U.S. Representative Corrine Brown sent a letter to individuals who had not signed the Access Agreements. Representative Brown's letter encouraged people to sign the Access Agreement so sampling could take place to determine if incinerator ash and contaminated soil above the RGs are present.

Another EPA Fact Sheet was distributed to the community in May 2002 providing the status of the investigation and again asking for cooperation with any future access requests for sampling.

Data Availability Session and Video

A Data Availability Session was held locally at the Moncrief Community Center on October 3, 2002. The session's objectives included the following:

- To provide community members with a summary of the Site's status.
- To provide property owners with an opportunity to obtain the analytical results from past soil sampling of their property prior to finalization of the Remedial Investigation (RI) Report.
- To provide community members with the opportunity for one on one discussions of past soil sampling results, interim temporary covers and the Site's status.

A Site Summary Video dated October 2002 was also made available to the press and public.

In August 2004, EPA issued its fourth Fact Sheet to the community. The fourth Fact Sheet summarized past Site actions and outlined the next steps to selection of a remedy.

Fourth Fact Sheet

In August 2004, another EPA Fact Sheet was distributed to the community providing the status of the investigation and signaling that with submission of the Feasibility Study, the process for selecting a cleanup approach was nearing.

PART 12: PUBLIC PARTICIPATION IN REMEDY SELECTION (NCP §300.430(f)(3))

12.1 Public Notice (NCP §300.430(f)(3)(i)(A)), Public Comment (NCP §300.430(f)(3)(i)(B) and (C)), Public Meeting (NCP §300.435(f)(3)(i)(D) and (E))

Mailing of the Proposed Plan Fact Sheet to the community began on July 28, 2005. The Administrative Record file was made available to the public on August 1, 2005. The Administrative Record was also placed in the information repository maintained at the EPA Region 4 Superfund Record Center and at the Clanzel T. Brown Community Center. The notice of the availability of the Administrative Record and an announcement of the Proposed Plan public meeting was published in the Florida Times Union on August 2, 2005. A public comment period was held from July 28, 2005, to September 12, 2005. The Proposed Plan was presented to the community in a public meeting on August 9, 2005, at the Clanzel T. Brown Community Center. At this meeting, representatives from EPA answered questions about problems at the Site and the remedial alternatives and took public comments.

12.2 Significant Changes from Preferred Alternative of Proposed Plan

The preferred remedy was changed to include groundwater monitoring to verify the "No Action" decision on the groundwater and geotextile (or other appropriate membrane) topped with gravel will be placed under houses with open crawlspaces (that are accessible by children) with soil containing COCs above RGs. The goetextile and gravel will remove the possibility of exposure to soils under houses with open crawlspaces. These changes to the preferred remedy in the Proposed Plan are made based on concerns expressed by the FDEP and community members.

References to the voluntary removal of ash > 25% that were made in the Proposed Plan have been removed from the final remedy in the ROD. This is a remedy implementation issue that can be considered during the Remedial Design and not a remedial goal.

12.3 Responsiveness Summary ((NCP §300.430(f)(3)(i)(F))

Community Comments

Verbal and written comments were received during the public comment period. Many questions were asked and answered at the public meeting. A copy of the written comments and a copy of the public meeting transcript (including EPA responses at the meeting) are in the Administrative Record. When viewed as a whole, there were several themes found in the written and verbal comments received. A brief summary of the major themes/comments is contained in the following paragraphs followed by EPA's response.

1. **Summary of Verbal Comments from Public Meeting:** Some community members expressed concern with contamination above the RGs remaining at depths below 2 feet, below trees, houses, roads after installation of the soil cover

and associated soil excavation is complete.

Response: *The prevention of human exposure to surface soil is provided by 2 feet of uncontaminated soil, and along with the Institutional Controls constitute a protective remedy by eliminating and/or managing future human contact with subsurface or sub-structure contaminated soil. Use of a thickness of 2 feet of clean soil to break the exposure pathway is actually very protective; in fact, more protective than what is being done at many other lead sites across the country. For example, on page 37 of the Superfund Lead-Contaminated Residential Sites Handbook (EPA 2003), it is stated that "...the top 12 inches in a residential yard can be considered to be available for direct human contact. With the exception of gardening, the typical activities of children and adults in residential properties do not extend below a 12-inch depth. Thus, placement of a barrier of at least 12 inches of clean soil will generally prevent direct human contact and exposure to contaminated soil left at depth...Twenty-four (24) inches of clean soil cover is generally considered to be adequate for gardening areas...24-inch barrier normally is necessary to prevent contact of contaminated soil at depth with plant roots, root vegetables, and clean soil that is mixed via rototilling. "*

On page 44 of the Superfund Lead Handbook, the following point is made regarding placement of a marker, which will be placed in all areas at the Jacksonville Ash Site where contamination above the RGs remain at depth, "[iI]f contamination above the RGs is not removed to the full depth of contamination above the RGs on a property, a permanent barrier/marker that is permeable, easily visible and not prone to frost heave, should be placed to separate the clean fill from the contamination...Examples of suitable barriers/markers include snow fencing (usually orange), a clean, crushed limestone layer, and geofabric."

Implementation of the remedy at the Brown's Dump Ash Site will result in some areas with soil contamination above the RGs remaining at depth (i.e., under the 2 foot thick soil cover, under houses, roads, etc.). To address those areas with contamination remaining above RGs, the remedy relies on Institutional Controls to eliminate or manage exposure to soil contamination remaining at the Site. Institutional Controls are non-engineered instruments, such as administrative and/or legal controls, that help to minimize and/or manage the potential for human exposure to contamination and/or protect the integrity of a remedy.

2. **Summary of Verbal Comments from Public Meeting:** Some community members expressed a desire to be relocated.

Response: *EPA's preference is to address the risks and choose methods of cleanup which allow people to remain safely in their homes and businesses. However, the National Contingency Plan (NCP- 40 CFR part 300, App. D(g)) does state that, "[t]emporary or permanent relocation of residents, businesses, and community facilities may be provided where it is determined necessary to protect human health and the environment." Temporary relocation is specifically* *provided for in the ROD. Regarding applicability of permanent relocation, two possible EPA triggers for using permanent relocation were identified during stakeholder forums hosted by EPA and held between May 1996 and October 1997 on the Interim Policy on the Use of Permanent Relocations as Part of Superfund Remedial Actions. Specifically, EPA stated that its primary reasons for conducting a permanent relocation would be to address an immediate risk to human health (where an engineering solution is not readily available) or where the structures (e.g., homes or businesses) are an impediment to implementing a protective cleanup.*

In the July 8, 1999, EPA Federal Register public noticing the Interim Policy on the Use of Permanent Relocations as Part of Superfund Remedial Actions the following was stated: "[t]o date, the overwhelming majority of Superfund sites located in residential areas are being cleaned up without the need to permanently relocate residents and businesses. For example, at the Glen Ridge, Montclair/West Orange Radium Sites in New Jersey, and the Bunker Hill Mining Site in Idaho EPA has successfully excavated contaminated soils from approximately 5,000 residential properties down to levels of contamination that no longer pose unacceptable risks. By addressing the risks at these Sites through cleanups, people were able to remain in their homes and entire communities were kept intact." In summary, EPA Region 4 believes that some degree of soil excavation, followed by institutional controls, around existing homes/buildings is technically feasible, reasonable, cost effective and protective of human health and the environment at Brown's Dump. For example, permanent relocation can be considered under existing regulations and can only be selected based upon the nine criteria for selecting a cleanup remedy. Permanent relocation could satisfy the essential criteria (i.e., protection of human health and the environment; compliance with ARARs), but permanent relocation would likely have a difficult time comparing favorably with other alternatives during application of the five balancing criteria (i.e., cost, implementability, short-term effectiveness, long term effectiveness, Reduction of Toxicity/Mobility/Volume). Permanent relocation also faces a serious hurdle during application of the modifying criteria, particularly community acceptance. During community outreach to gain access for RI sampling, during the 2002 Data Availability Session and during the August 2005 Availability Session, EPA Region 4 heard community voices who do not want to move and do not believe permanent relocation is needed.

3. **Summary of Verbal Comments from Public Meeting:** Some community members expressed concern that their minority community is being treated differently with regard to the proposed cleanup approach.

   Response: *The U.S. EPA is committed to the fair treatment of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear disproportionately* *high and adverse human health or environmental effects resulting from Federal agency programs, policies, and activities. The remedy selection process has been undertaken in full compliance with this definition of fair treatment.*

4. **Verbatim Written Comment Received on August 31, 2005:** As was expressed at the recent community meetings held in our city, the overwhelming majority of the people are opposed to the cleanup plan recommended by the EPA. The disruption that such an operation would subject our citizens to is unconscionable! This callous disregard for the protracted human suffering that our people have endured is a national disgrace. We believe that there is a much better way of addressing this problem.

Redevelopment of Brown's Dump would on the one hand remove a significant number of residents away from the contaminated site and at the same time allow the city to recover the cost of remediation many times over. We do understand that there will still have to be cleanup, but to a much lower standard. This is a very reasonable and rational approach that is the ultimate in a win win situation. On the other hand, the "cleanup" as proposed, would create a living nightmare for residents. While this so called cleanup is in progress (which will take several years), contaminated dust will be flying everywhere, muddy and filthy conditions will be a daily reality, the old, the sick and the dying along with the innocent children would be forced to live in the mist of 32,000 truck loads of hazardous waste being hauled down our residential streets at the rate of at least 60 trucks per day. We're talking about 60 filthy truck loads every single day for at least two years.

Unreasonable restrictions on activities will remain after "cleanup." A treeless community in the hot climate in which we live would be criminal (planting trees could breach the barrier). The contamination that you would leave behind under houses, sidewalks, streets, schools, driveways, parking lots and apartments will continue to migrate, thereby risking recontamination. Given the population density of Brown's Dump, what becomes obvious to even the casual observer is that cleanup, as proposed, is unfeasible. Redevelopment on the other hand is both economically feasible and provides the maximum protection to our citizens. Our community is in dire need of redevelopment. This is a once in a lifetime opportunity for all parties to come out winners.

Response: *This comment expresses opposition with the proposed cleanup approach and offers an alternative, redevelopment. The opposition notes several aspects of the proposed plan which are unacceptable in their opinion, most notably, hazardous waste truck traffic, unreasonable restrictions after cleanup, a treeless community, contamination remaining after cleanup. The solution offered to address these concerns is redevelopment.*

Regarding the concern over extensive truck traffic, EPA acknowledges that truck traffic hauling the contaminated soil above the RGs out of the community will *increase in the area during cleanup. However, EPA views the truck traffic as a necessary aspect to the cleanup and should be analogous to a similar sized development project in that construction equipment must be used in order to complete the job. Regarding the hazardous waste to be hauled in the trucks, please note that most of the contaminated soil above the RGs is not expected to be a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA). In addition, there are management schemes which will be used to eliminate contaminated dust from leaving the trucks during transport.*

The cleanup approach does include Institutional Controls to protect the public against exposure to residual contamination above the RGs remaining after cleanup. However, EPA does not view these as unreasonable restrictions. In fact, it is not envisioned that these controls will restrict actions in the community. Rather, they will allow actions to occur with the knowledge that contamination above the RGs exists in certain areas along with appropriate management controls (i.e., the restrictions are not designed to eliminate actions in the area, rather the restrictions are to allow for informed actions to be undertaken with appropriate precautions).

There are many reasons a community might experience a loss of trees, e.g., disease. EPA also notes that any community in Florida could be rendered treeless by a hurricane. Regarding the trees and cleanup, the cleanup approach is flexible in that trees do not have to be removed to attain cleanup. There will be the option for careful machine digging or hand digging around trees which will allow for removal of an acceptable amount of soil contamination above the RGs while also protecting the tree. Alternatively, the tree could be removed if the home owner wishes to have the tree removed. If removed, they will be replaced with a less mature tree which, with time, should grow leading to the replacement of the tree canopy.

The comment's recommended alternative to the EPA cleanup approach, redevelopment, is not precluded by EPA's cleanup approach. In fact, EPA believes that the cleanup approach does not preclude and may even lead to redevelopment in the area. For example, EPA recognizes that the expansion, reuse or development of property may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Therefore, the cleanup approach is designed to remove contamination above the RGs and should aid the real estate marketplace by removing uncertainty which exists due to the existing contamination.

The cleanup approach has the added benefit of not breaking up the community. Although EPA acknowledges that there are segments of the populace that oppose the EPA recommended plan, EPA is also sensitive to the fact that there is another segment of the populace that does not wish to have their community redeveloped out from under them. EPA believes that a more balanced approach is to retain the community structure by providing the community with a protective cleanup;

thereby allowing the community to remain cohesive and strong and ready to work toward redevelopment. Much of the Brown's Dump Site is property already in residential use. However, a segment of the Brown's Dump is undeveloped (i.e., along the creek) and another segment is public property owned by the City (i.e., the former school property). It is the city's responsibility to determine the best use of their property. Cleanup will allow a property to be ready for sustainable and beneficial use. The Agency stands ready to share information about reuse at other Superfund sites, the significant positive economic impacts and benefits from reuse of sites, potential partners in redevelopment, about assistance available, and the reuse potential of the Brown's Dump Site given the selected remedy.

State Comments

5. FDEP provided EPA with comments on the Proposed Plan in a letter dated September 12, 2005. FDEP comments are reproduced below, and changes to the ROD, where possible, have since been incorporated.

Verbatim Written Comment Received on September 12, 2005:

The Florida Department of Environmental Protection (FDEP) is committed to working with the U.S. Environmental Protection Agency (EPA) and the City of Jacksonville to develop a plan that will best remediate Brown's Dump and the Jacksonville Ash Sites. We appreciate your dedication and focus in developing a plan to clean up these sites. Through our collective efforts and expertise, we will be able to develop a comprehensive plan best suited for these neighborhoods. Below, we have offered a few comments regarding the above referenced sites:

Upon completion of the delineation of ash disposal areas, DEP has no objection to leaving contamination on-site if appropriate engineering and institutional controls are put in place to reduce or eliminate exposure to contaminants. The proposal to remove the upper two feet of ash and ash-impacted soils would meet a portion of DEP's requirements. At the same time, the overall remedial approach must include institutional controls equivalent to those described in DEP's Institutional Controls Procedures Guidance (November 2004) cited in the Referenced Guidelines section in Florida Administrative Code Chapter 62-780, Contaminated Site Cleanup Criteria. While existing building pads and paved areas may serve initially as an engineering control, without the corresponding properly recorded institutional control (i.e., restrictive covenants), assurance cannot be given that the engineering controls will remain in place, particularly upon property transfer.

The proposed remedial approach does not address accessing properties with uncooperative property owners. Due to the large number of properties that have not been sampled because the property owners have not yet granted site access, the approach needs to be improved to address this aspect of remediation. The City of Jacksonville needs to have a plan in place to eliminate or minimize exposure to contaminants through sampling of all properties. A complete sampling plan will reduce exposure risks. This should also include sampling at the limits of the defined ash sites needed to clearly demonstrate that all areas of ash have been found. That sampling should also include nonresidential and city owned properties, such as Brooklyn Park. Also, we understand that EPA does not intend to compel the responsible party (City of Jacksonville) to remediate properties with uncooperative owners. DEP is concerned that this approach may leave areas of contamination unaddressed.

The engineering control of leaving waste in place under existing buildings, in conjunction with a corresponding institutional control ensuring the buildings will remain in place appears adequate in these projects except for buildings that are above grade. We would appreciate information on the following questions:

- What data exists to characterize the levels of contamination under these buildings?
- What engineering controls are proposed to prevent animals and small children from exposure by crawling under these structures?
- Is EPA proposing to leave paving, such as driveways or parking lots, in place as the engineering control for the material beneath the paving?
- How will the proposal to leave trees, shrubs and vegetation with underlying ash and ash-impacted soils, be evaluated in the exposure risks on the individual lots?

DEP's rules require that a Professional Engineer certify that this engineering control is consistent with commonly accepted engineering practices and is appropriately designed and constructed for its intended purpose. A corresponding institutional control will be necessary to ensure that driveways or parking lots are properly maintained and not removed.

As previously commented on April 26, 2005, DEP requests that the remedial goals for Copper and Barium in soils be set at 150 and 120 mg/kg, respectively, to comply with State cleanup target levels. The potential for surface water impacts from the concentrations of iron in groundwater should also be addressed.

Response: *Although many of the comments are remedy implementation issues, and not directly related to the remedy selection process of the ROD, the following paragraphs contain EPA's response, observation or technical opinion to each statement made by FDEP in its comment letter.*

EPA believes that Institutional Control mechanisms identified in this ROD, namely governmental controls and voluntary proprietory controls (deed restrictions), along with EPA monitoring of the institutional control will be equally successful to forced restrictive covenants in addressing the State's concern that engineering controls remain in place (and effective). It is not EPA policy to force deed restrictions onto private property owners. EPA does not view *a specific Institutional Control mechanism in isolation. The selected remedy's approach is to identify several specific types of Institutional Controls for use in meeting the objective of preventing and/or managing potential human exposure to subsurface soil contamination remaining above RGs while the responsibility for monitoring the implementation and effectiveness of the control will be with EPA. During the Remedial Design, EPA will explore several forms of Institutional Controls with the City of Jacksonville including annual notification letters and the possible use of Florida's real estate statutes.*

EPA believes the homeowners should be able to make an informed decision about allowing their property to be remediated. EPA will insure that the City of Jacksonville provides information about the Site contaminants and their potential risks. However, EPA believes that private homeowners have the right to refuse cleanup. It is not EPA's policy to force remediation on land owners who refuse it. Furthermore, it is not EPA policy to force access for sampling, although EPA did allow tenants of rental properties to sign access during RI sampling if the property owner did not sign the access. Once again EPA thinks it is the right of the property owner or tenant to decide if the property will be sampled. It will be up to the City of Jacksonville to decide whether to force access and by what means. EPA will look at expanding the model Consent Decree language which typically states that the PRP will use all available means to gain access to properties. EPA will work with the City to gain access for sampling all identified parcels in need of sampling. EPA will require the City of Jacksonville to mail annual letters notifying residents of the presence of contamination and offering to sample and remediate the contamination.

Risk associated with elevated soil lead levels is directly proportional to the duration and frequency of exposure. Although EPA believes that the soil under crawl spaces are not frequented nor is the duration such that unacceptable risks occur, in an attempt to eliminate any possible direct exposure to soil in open crawl space that are accessible by children, the remedy has been modified to include placement of a geotextile mat topped with a layer of gravel.

If property owners do not wish vegetation to be removed (e.g., trees), then hand digging around such vegetation will occur. However, the target depth of two feet might not be reached (i.e., soil removal will have to be to a practicable extent). It is EPA's technical judgement that the risk associated with contaminated soil remaining above RGs under bushes, trees, etc. is minor. Risk in a residential setting is apportioned across the entire property. EPA believes that spatially averaged (i.e., mean, composite) concentrations best represents exposure to site contaminants over the long term because it is assumed that any individual moves randomly across the exposure area over time. It is not believed that the small pockets of remaining contamination associated with trees, bushes, etc. will pose an unacceptable risk, although EPA will seek to use the City of Jacksonville's tree cutting ordinance as a method to have City oversight of tree removal that might result in soil exposures.

During implementation of the remedy, the status of constructed driveways will be determined. Such structures will have to be adequate to serve as barriers to contaminated soil. It is EPA's technical judgement that the on-site BHHRA, which is based on exposures assumptions and toxicity values for chronic exposures, will also be generally protective for short term exposures for these two constituents.

As stated in the Ecological Risk Assessment, no direct exposure contaminants of concern, including iron, were observed in surface water (i.e., the surface water iron concentrations along or downgradient of the Site were less than the nationally recommended surface water criteria, 1 mg/l). In fact, the only surface water detection above 1 ppm was at one of the background sample locations (i.e., 4.6 mg/L).

Iron can occur in either the divalent (Fe^{+2}) or trivalent (Fe^{+3}) valence states under typical environmental conditions. The valence state is determined by the pH and Eh of the system, and the chemical form is dependent upon the availability of other chemicals (e.g., chlorides, sulfates, carbonates). EPA's technical judgement is that any iron containing groundwater (which across the Site is approximately 6 mg/l) entering Moncrief Creek would have minor impact on the surface water quality. For example, ferrous iron (Fe^{+2}) is oxidized to ferric iron (Fe^{+3}), which readily forms the insoluble iron hydroxide complex $Fe(OH)_3$. Groundwater usually has a low dissolved oxygen content and redox potential. When the oxygen or oxidation potential of the water is increased (as when discharge into a flowing creek), the metal ions will tend to loose electrons, and their oxidation level will be increased (i.e., soluble ferrous (Fe^{+2}) iron will be converted to insoluble ferric (Fe^{+3}) iron). EPA's technical judgement is that iron bacteria will utilize as an energy source any iron discharging into Moncrief Creek.

EPA notes that the sediment iron background concentrations in Moncrief Creek are 1,600 mg/kg, 280 mg/kg, 14,000 mg/kg, 93,000 mg/kg, 2,900 mg/kg (average 22,356 mg/kg). The Sediment iron concentrations detected in Moncrief Creek at the Site are 850 mg/kg, 1,000 mg/kg (J), 380 mg/kg (J), 1,100 mg/kg, 3,100 mg/kg, 2,800 mg/kg, 1,400 mg/kg, 1,500 mg/kg (average: 1,516 mg/kg). More importantly, when the five background surface water iron sample results (i.e., 0.34 mg/L, 4.6 mg/L, 0.43 mg/L, 0.59 mg/L, and 0.42 mg/L.) are compared to the State surface water quality standard (0.3 mg/L), EPA's technical conclusion is that background iron levels at Brown's Dump exceed the State surface water quality standard. EPA does not cleanup below background.

Department of Health

6. **Verbatim Written Comment Received on September 12, 2005:** Our mission is to continually improve the health and environment of our community. We would like to thank you for the opportunity to provide comments related to the Jacksonville Ash sites and the Brown's Dump feasibility study. First, I would like to express our appreciation for your excellent efforts and strong support while we worked together as a team to successfully address the many challenges and opportunities that the Jacksonville Ash sites and Brown's Dump brought to our city.

The additional availability sessions were appreciated by the residents and our local community. You worked diligently with us to ensure that the health and safety of the residents of Jacksonville were addressed at the community meetings. Teamwork was vital to our success and your organization was a key player. I am confident that our shared commitment to excellence and partnership will better prepare us to respond to all matters of public health and safety in the near future.

Response: *EPA appreciates the sentiment expressed in these opening paragraphs. EPA has also found the working relationship with the Department of Health worthwhile and useful as the Agency has tried to address the many challenging aspects associated with the Jacksonville Ash Site.*

Below is a list of recommendations from the Duval County Health Department from their review.

- All properties within the delineation of contaminated areas should be required to be remediated with appropriate engineering and institutional controls to reduce or eliminate exposure to contaminants. This should also include properties that have crawl spaces located under them where children and pets could be potentially exposed.

Response: *EPA believes that Institutional Control mechanisms identified in this ROD, namely governmental controls and voluntary proprietory controls (deed restrictions), along with EPA monitoring of the control will be successful in insuring that engineering controls remain in place (and effective). It is not EPA policy to force deed restrictions onto private property owners. During the Remedial Design, EPA will explore several forms of Institutional Controls with the City of Jacksonville including annual notification letters and the possible use of Florida's real estate statute.*

Risk associated with elevated soil lead levels is directly proportional to the duration and frequency of exposure. Although EPA believes that the soil under crawl spaces are not frequented nor is the duration such that unacceptable risks occur, in an attempt to eliminate any possible direct exposure to soil in open crawl space that are accessible to children, the remedy has been modified to *include placement of a geotextile mat topped with a layer of gravel.*

- The remedial goals for contaminants should be set according to the Florida Administrative Code Chapter 62-780, Contaminated Site Cleanup Criteria for all Jacksonville Ash Sites and Brown's Dump.

Response: *The Agency has recognized the carcinogenic risk level of 10^{-6} and the noncarcinogenic hazard index of 1 as ARARs. As such, the remedial goals in the ROD were selected to meet these risk levels.*

- The proposal should allow removal of up to 3 feet of soil to minimize the amount of contaminated media left subsurface. **The current proposal does not adequately address the remediation strategy for the contaminated media surrounding trees and shrubbery.*

Response: *At EPA lead sites, the Agency's experience is that a minimum of one foot of clean soil should establish an adequate barrier from contaminated soil above the RGs in a residential yard for the protection of human health. The rationale for establishing a minimum cover thickness of one foot is that the top 12 inches of soil in a residential yard can be considered to be available for direct human contact. For those areas used for vegetable gardening purposes, EPA recommends 2 feet. EPA is expanding on EPA's recommended practice by using 2 feet, not one foot, and installation of an ppropriate "warning mesh" for installation prior to placement of the cover or clean fill material, at the Brown's Dump Site. It is EPA technical judgement that this interval is protective, and there is no need to increase this interval to 3 feet.*

If property owners do not wish vegetation to be removed (e.g., trees), then hand digging around such vegetation will occur. However, the target depth of two feet might not be reached (i.e., soil removal will have to be to a practicable extent). EPA believes that the risk associated with contaminated soil remaining above RGs under bushes, trees, etc. is minor. Risk in a residential setting is apportioned across the entire property. In other words, the exposure area is the specific parcel under review. EPA believes that spatially averaged (i.e., mean, composite) concentrations best represents exposure to site contaminants over the long term. For risk assessment purposes, any individual is assumed to move randomly across the exposure area over time. It is not believed that the small pockets of remaining contamination above the RGs associated with trees, bushes, etc. will pose an unacceptable risk.

- The owner shall execute an agreement with the City of Jacksonville, under which the owner agrees to have a covenant placed upon the deed that restricts excavation, construction, conveyance, sale or other transfer of title of the property within the delineated areas.

Response: *Although the comment, as written, states that the Department of*

Health recommends that property within the delineated areas cannot be conveyed, sold or transferred, EPA interprets the comment to actually mean that such property transfers can occur but with proper notification as offered in the recommended covenant.

EPA believes that Institutional Control mechanisms identified in this ROD, namely governmental controls and voluntary proprietary controls (deed restrictions), along with EPA monitoring of the control will be successful in addressing the State's concern that engineering controls remain in place (and effective). It is not EPA policy to force deed restrictions onto private property owners. EPA does not view a specific Institutional Control mechanism in isolation. The selected remedy's approach is to identify several specific types of Institutional Controls for use in meeting the objective of preventing and/or managing potential human exposure to subsurface soil contamination remaining above RGs while the responsibility for monitoring the implementation and effectiveness of the control will be with EPA. During the Remedial Design, EPA will explore several forms of Institutional Controls with the City of Jacksonville including annual notification letters and the possible use of Florida's real estate statute.

PART 13: COMMUNITY RELATIONS WHEN THE RECORD OF DECISION IS SIGNED (NCP §3 00.430(f)(6)(i) and (ii))

13.1 Public Notice of Availability of ROD (NCP §300.430(f)(6)(i))

The availability of the ROD will be public noticed in the Florida Times Union within thirty (30) calendar days from signature of the ROD.

13.2 Availability of ROD (NCP §300.430(f)(6)(ii))

Upon signature, the ROD will be included in the Administrative Record. The updated Administrative Record will be sent to the local repository within thirty (30) calendar days of signature of the ROD. The local repository is located at:

Clanzel T. Brown Center
4415 Moncrief Road
Jacksonville, Florida

Supporting information for the ROD is already in the Administrative Record, which also resides at the local repository.

PART 14: REFERENCES

The references listed below are the documents used in writing this ROD.

1. Accurate Reporting Service, 2005. Original Transcript of the Proposed Plan Presentation, Brown's Dump Superfund Site, Jacksonville, Duval County, Florida, August 9, 2005.

2. ATSDR, 1995. Toxicological Profile of PAHs, Atlanta, Georgia.

3. Cal-EPA, 2005. Draft Public Health Goal for TCDD in water.

4. City of Jacksonville, 2004. Feasibility Study prepared by CH2M Hill (May 2005), Brown's Dump Superfund Site, Jacksonville, Duval County, Florida.

5. City of Jacksonville, 2003. Remedial Investigation Report prepared by CH2M Hill (July 2003), Brown's Dump Superfund Site, Jacksonville, Duval County, Florida.

6. City of Jacksonville, 2003. Groundwater Re-sampling Report prepared by CH2M Hill (September 2003), Brown's Dump Superfund Site, Jacksonville, Duval County, Florida.

7. EPA, 2002. Final Risk Assessment (September 2002) prepared by Black&Veatch Special Projects Corp. Brown's Dump Superfund Site, Jacksonville, Duval County, Florida.

8. EPA, 2002. Final Ecological Risk Assessment (September 2002) prepared by Black&Veatch Special Projects Corp. Brown's Dump Superfund Site, Jacksonville, Duval County, Florida.

9. EPA, 2003. Superfund Lead-Contaminated Residential Sites Handbook (i.e., Lead Handbook), OSWER 9285.7-50, June 2003). Available at http://www.epa.gov/superfund/lead/products/handbook.pdf

10. EPA, July 2005. Proposed Plan Fact Sheet, Brown's Dump Superfund Site, Brown's Dump Superfund Site, Jacksonville, Duval County, Florida.

11. EPA, 2001. Comprehensive Review Guidance (EPA 540-R-01-007, OSWER No. 9355.7-03B-P, June 2001). Available at http://www.epa.gov/superfund/resources/5year/guidance.pdf

12. EPA, 2001. Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action (EPA/530/R-01/015, September). Available at http://www.epa.gov/correctiveaction/resource/guidance/gw/gwhandbk/gwhbfinl.pdf

13. EPA, 2000a. Integrated Risk Information System, November 2000.

14. EPA 2000b. Letter to David A. Ludder, Legal Environmental Assistance Foundation, from H. Glenn Adams, Risk Assessment Specialist, US EPA Region 4, October 11.

15. EPA, 2000c. Preliminary Remediation Goals, Region 9, November.

16. EPA, 2000d. Institutional Controls: A Site Manager's Guide to Identifying, Evaluating, and Selecting ICs at Superfund and RCRA Corrective Action Cleanup.

17. EPA, July 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (EPA 540-R-98-031, OSWER 9200.1-23P, PB98-963241, July 1999).

18. EPA, 1998. Expanded Site Inspection (March 1998) prepared by Tetra Tech EM, Inc. Brown's Dump Superfund Site, Jacksonville, Duval County, Florida.

19. EPA, 1995. US EPA Region 9 Preliminary Remediation Goals.

20. EPA, 1990. National Oil and Hazardous Waste Contingency Plan (55 FR 8666 and 40 CFR 300).

21. EPA, 1989. Risk Assessment Guidance for Superfund, Volume 1 - Human Health Evaluation Manual (Part A), December.

22. EPA, 2003. NAS Review Draft of EPA's Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds EPA 600/P-00/001Cb.

23. EPA, 1985. Health effects assessment document for polychlorinated dibenzo-p-dioxins. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC. EPA/600/8-84/014F.

24. FDOH, 1997. Health Consultation, Brown's Dump, Jacksonville, Duval County, Florida, February 6.

25. National Toxicology Program (NTP), 2004a. Toxicology and Carcinogenesis Studies of 3,3',4,4',5-Pentachlorobiphenyl (PCB 126) (CAS No. 57465-28-8) in Female Harlan Sprague-Dawley Rats (Gavage Studies).

26. National Toxicology Program (NTP), 2004b. Toxicology and Carcinogenesis Studies of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) (CAS No. 1746-01-6) in Female Harlan Sprague-Dawley Rats (Gavage Studies).

27. National Toxicology Program (NTP), 2004c. Toxicology and Carcinogenesis Studies of 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (CAS No. 57117-31-4) in Female Harlan Sprague-Dawley Rats (Gavage Studies).

28. National Toxicology Program (NTP), 2004d. Toxicology and Carcinogenesis Studies of a Mixture of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) (CAS No. 1746-01-6), 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (CAS No. 57117-31-4), and 3,3',4,4',5-Pentachlorobiphenyl (PCB 126) (CAS No. 57465-28-8) in Female Harlan Sprague-Dawley Rats (Gavage Studies).

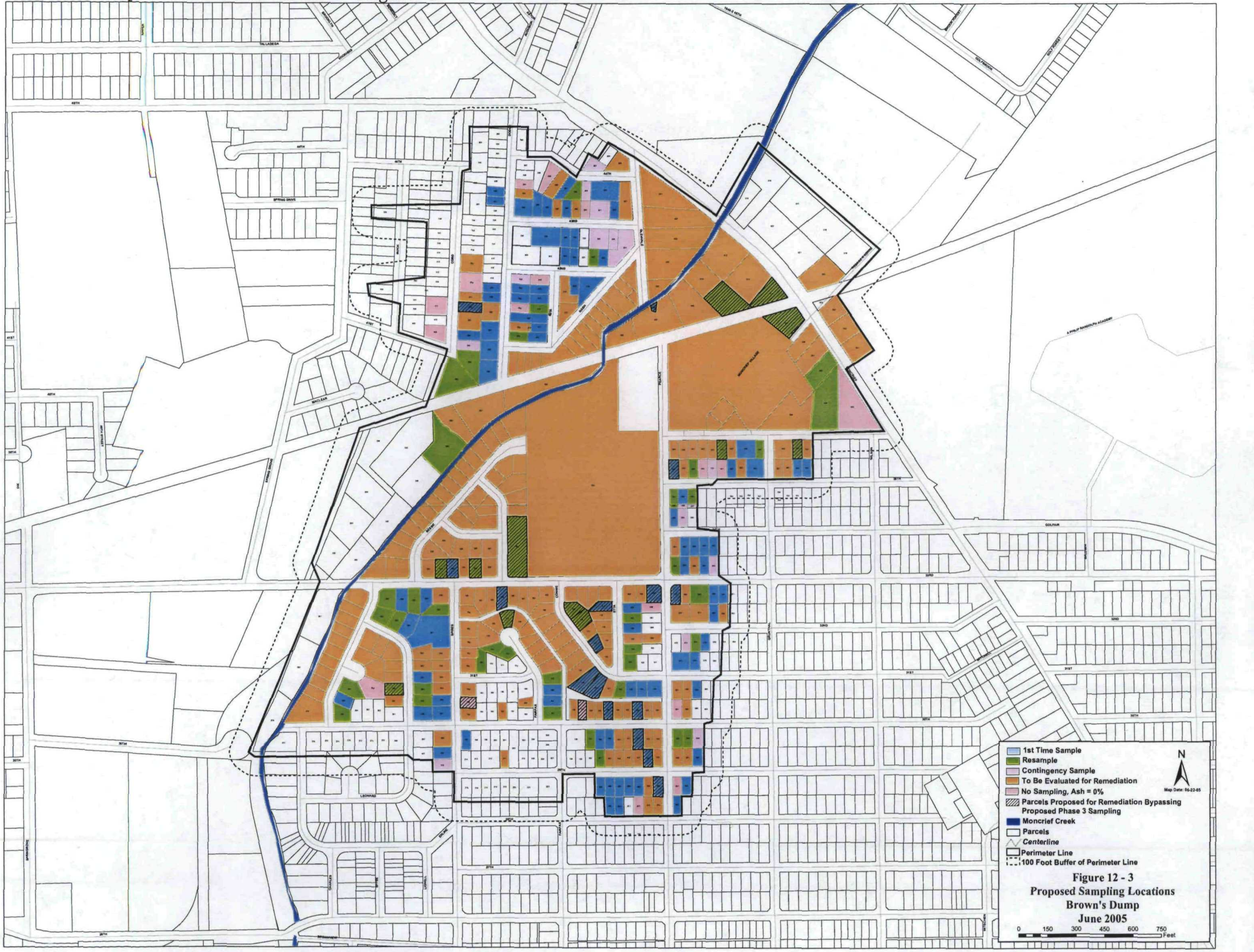
PHOTOGRAPHS

Photograph 1
(Northern Facing Picture of Former Mary McLeod Bethune Elementary School - 2005)

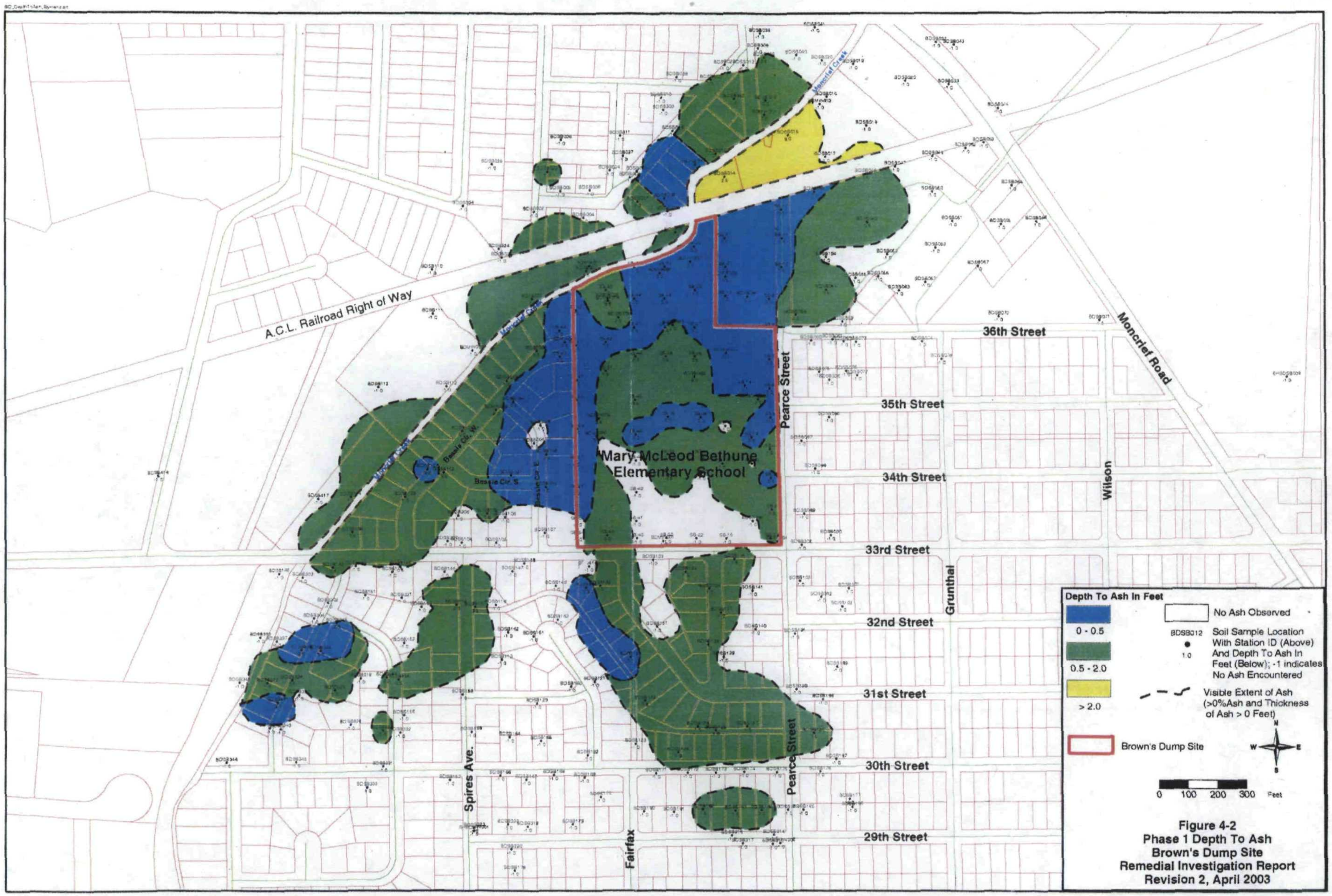
Photograph 2
(North Facing Picture of Northern School Property - 2005)

FIGURES

Brown's Dump Record of Decision - Figure 1



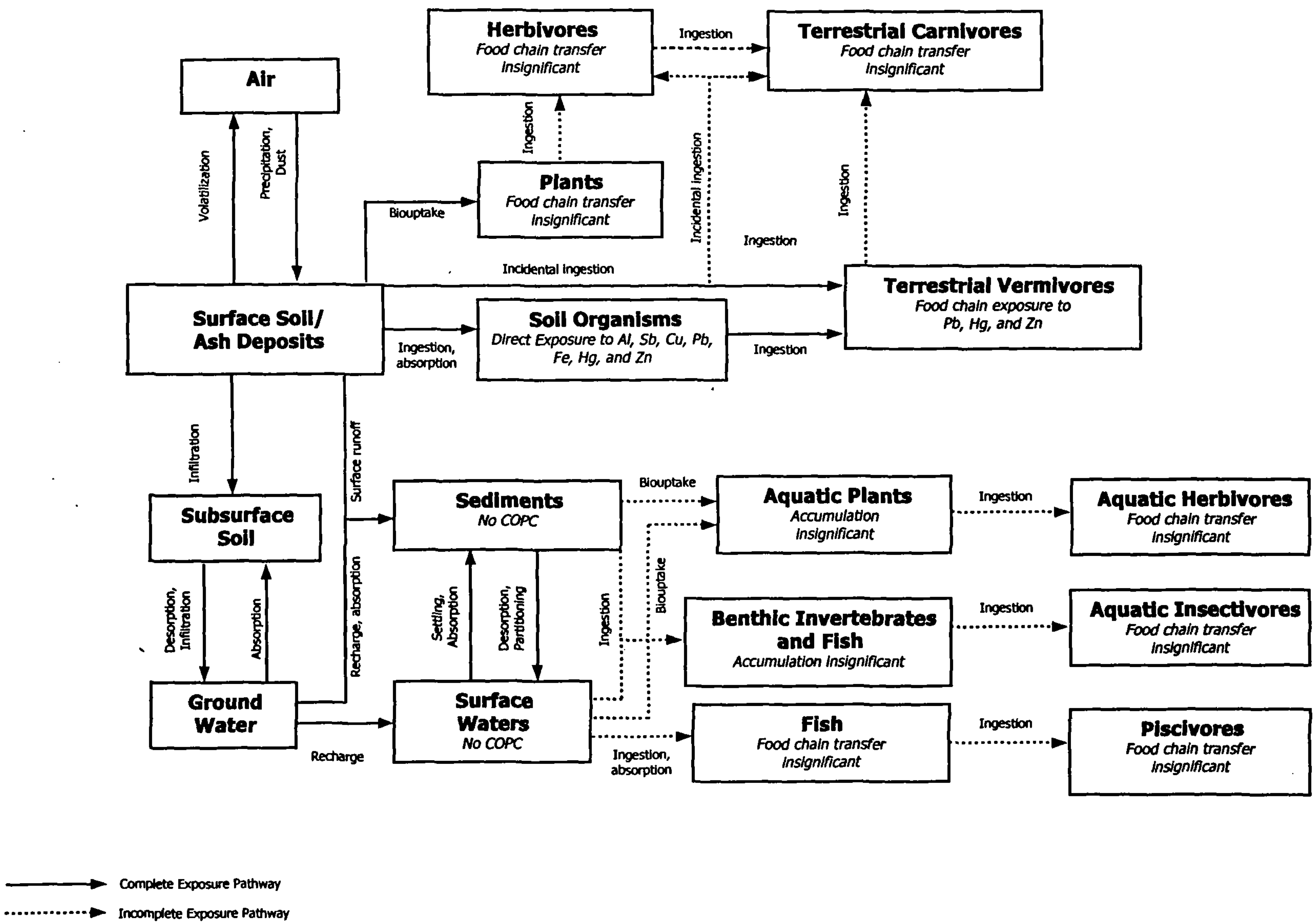
Brown's Dump Record of Decision - Figure 2



Brown's Dump Record of Decision - Figure 3

Brown's Dump Record of Decision - Figure 4

Brown's Dump Record of Decision - Figure 4 Continued



Brown's Dump Superfund Site
Ecological Risk Assessment
Jacksonville, Duval County, Florida

Figure 3-1
Potentially Complete Exposure Pathways

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Brown's Dump Record of Decision - Figure 6

TABLES

SUMMARY OF SAMPLE LOCATIONS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

Sample Number	Sample Type	Location	Rationale
BD-SS-01	Surface Soil	South of the site across 33rd Street West on the banks of Moncrief Creek	Background soil sample for comparison to on-site samples
BD-SS-02	Surface Soil	Moncrief Creek Village Apartments, 45 feet southwest of the Pearce Street building	Determine presence or absence of hazardous substances
BD-SS-03	Surface Soil	The Brown Residence at 4520 Bessie Circle West cul-de-sac, just under the hedge in the front yard	Determine presence or absence of hazardous substances
BD-SS-04	Surface Soil	The Porter Residence at 1671 West 34th Street in the southwest corner of the front yard	Determine presence or absence of hazardous substances
BD-SS-05	Surface Soil	The Ward Residence at 1663 West 33rd Street, approximately 2 feet southwest of the front porch	Determine presence or absence of hazardous substances
BD-SS-06	Surface Soil	On the elementary school property, 100 feet from the southeast corner of the southernmost building	Determine presence or absence of hazardous substances
BD-SS-07	Surface Soil	In the elementary school courtyard, approximately 67 feet from the fence	Determine presence or absence of hazardous substances
BD-SS-08	Surface Soil	On the elementary school property, 30 feet west of the northernmost building	Determine presence or absence of hazardous substances
BD-SS-09	Surface Soil	On the east side of the elementary school beside the basketball court	Determine presence or absence of hazardous substances
BD-SS-10	Surface Soil	In the elementary school playground, near the slide and swing	Determine presence or absence of hazardous substances
BD-SS-11	Surface Soil	On Bessie Circle cul-de-sac in a fenced ERRB area. Note: the ERRB fence in this area was found down in one area	Determine presence or absence of hazardous substances
BD-SS-12	Surface Soil	From the edge of the elementary school property north of the ERRB fence line	Determine presence or absence of hazardous substances
BD-SS-13	Surface Soil	The Griffin Residence at 4531 Bessie Circle cul-de-sac, approximately 2 feet west of the driveway	Determine presence or absence of hazardous substances
BD-SS-14	Surface Soil	Bessie Circle Apartment Complex, approximately 8 feet west of the building	Determine presence or absence of hazardous substances

Sample Number	Sample Type	Location	Rationale
BD-SS-15	Surface Soil	North of the ERRB fence line, approximately 10 feet from the northern-most elementary school building	Determine presence or absence of hazardous substances
BD-SS-16	Surface Soil	Bessie Circle Apartment Complex in the northeast corner	Determine presence or absence of hazardous substances
BD-SD-01	Sediment	Collected 0.2 mile upstream of the 33rd Street bridge	Background sediment sample for comparison to downgradient samples
BD-SD-02	Sediment	Approximately 300 feet downstream of the 33rd Street bridge	Determine presence or absence of hazardous substances
BD-SD-03	Sediment	Approximately 15 feet upstream of the Railroad bridge	Determine presence or absence of hazardous substances
BD-SD-04	Sediment	Approximately 120 feet upstream of the Moncrief Road bridge	Determine presence or absence of hazardous substances
BD-SW-01	Surface Water	Collected 0.2 mile upstream of the 33rd Street bridge	Background surface water sample for comparison to downgradient samples
BD-SW-02	Surface Water	Approximately 300 feet downstream of the 33rd Street bridge	Determine presence or absence of hazardous substances
BD-SW-03	Surface Water	Approximately 15 feet upstream of the railroad bridge	Determine presence or absence of hazardous substances
BD-SW-04	Surface Water	Approximately 120 feet upstream of the Moncrief Road bridge	Determine presence or absence of hazardous substances
BD-MW-01	Groundwater	On the south side of the elementary school playground, adjacent to 33rd Street	Background groundwater sample for comparison to downgradient samples
BD-MW-04	Groundwater	Adjacent to the Bessie Circle cul-de-sac	Determine presence or absence of hazardous substances
BD-MW-05	Groundwater	North of the ERRB fence line, adjacent to Moncrief Creek	Determine presence or absence of hazardous substances
BD-MW-06	Groundwater	North of the ERRB fence line, approximately 200 feet east of BD-MW-05	Determine presence or absence of hazardous substances

Notes:

BD	Browns Dump	SD	Sediment
SS	Surface soil	SW	Surface water
ERRB	Emergency Response and Removal Branch	MW	Monitoring well

SUMMARY OF INORGANIC SURFACE SOIL ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE mg/kg	SAMPLE NUMBER															
	Background	On Site														
	BDSS01	BDSS02	BDSS03	BDSS04	BDSS05	BDSS06	BDSS07	BDSS08	BDSS09	BDSS10	BDSS11	BDSS12	BDSS13	BDSS14	BDSS15	BDSS16
Aluminum	1,100	2,300	2,400	1,800	1,200	830	1,300	2,100	1,100	990	4,500	5,000	3,300	1,900	5,500	1,600
Antimony	1.1UR	11J	2.9J	--	--	1.4J	--	3.3J	--	2J	21J	19J	32J	6.8J	11J	2UJ
Arsenic	3J	5.6J	4.1J	2.4J	--	--	--	5.1J	--	--	18	35	11	--	15	--
Barium	28	160	140	56	24	18	36	110	4.1	10	590	1,200	400	84	550	93
Cadmium	1U	2.1	2	1.4	0.45J	0.27J	0.68J	1.9	--	0.14J	8.8	7.9	5.3	1.1	8.1	1.5
Calcium	5,200	4,300	13,000	4,200	2,400	1,300	630	1,200	650	4,600	18,000	6,800	9,000	2,200	8,400	3,600
Chromium	3.5J	11J	14J	15J	4.7J	3.8J	6.6J	15J	1.7J	3.7J	58J	79J	140J	11J	57J	15J
Cobalt	0.69J	1.8J	1.9J	0.77J	0.52J	0.50J	0.83J	2.1J	--	--	7.5J	14	5J	1J	9.1J	1.5J
Copper	12	83	67	46	40	29	33	120	2.4J	9.9	360	4,100	240	38	420	52
Cyanide	0.5U	0.56	0.74	0.57	--	--	1.3	2.8	0.61	--	1.1	0.68	2.6	--	14	2.8
Iron	9,800J	13,000J	8,300J	5,500	3,500J	4,100J	9,100J	17,000J	420J	1,800J	56,000	110,000J	29,000J	8,800J	79,000J	11,000J
Lead	22J	950J	370J	200J	100J	130J	150J	380J	5J	51J	1,800JN	9,100JN	1,900JN	460J	1,200JN	180J
Manganese	43J	140J	89	110J	57J	67J	65J	150J	4.7J	22J	470J	790J	260J	98J	590J	110J
Magnesium	220J	580J	740J	240J	200J	120J	200J	220J	50UJ	220J	1,700	4,900	1,100	210	720	340
Mercury (Total)	0.1U	0.12	0.21	0.17	0.33	--	--	0.22	--	--	5.6	0.24	0.41	0.24	0.95	0.36
Nickel	1.4J	9.7	8.3J	4.4J	3.7J	5.1J	4.2J	12	--	2.6J	41	100	24	4J	44	7.2J
Potassium	130J	130J	290J	86J	80J	76J	96J	140J	40UJ	--	560	530	320J	150J	210J	160J
Silver	0.37J	0.97J	0.90J	0.45J	0.30J	--	--	1.1J	--	--	4.3	4.4	2.7	0.47J	4.6	--
Sodium	75J	34	70	36J	36J	--	52	35J	46J	30	76	330	86	41J	120	50J
Vanadium	5.4J	8.6J	8.4J	6.7J	4J	6.8J	5.4J	5.2J	1.8J	2.5J	30	16	18	52J	21	6.5J
Zinc	37	1,700	690	390	130J	100	200	630	17	76	3,800	2,800	2,700	230	2,200	340

Notes:

mg/kg	Milligrams per kilogram	--	Material analyzed for, but not detected.
J	Estimated value	U	Material analyzed for, but not detected. Number shown is the sample quantitation limit.
N	Presumptive evidence of material	R	Rejected data

Shaded areas indicate elevated concentrations of constituents.

SUMMARY OF EXTRACTABLE ORGANIC SURFACE SOIL ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (µg/kg)	SAMPLE NUMBER															
	Background	On Site														
	BDSS01	BDSS02	BDSS03	BDSS04	BDSS05	BDSS06	BDSS07	BDSS08	BDSS09	BDSS10	BDSS11	BDSS12	BDSS13	BDSS14	BDSS15	BDSS16
Acenaphthene	400UJ	--	--	--	--	--	--	--	--	500J	--	--	--	--	49J	--
Carbazole	400UJ	50J	--	--	--	--	48J	--	--	810J	--	--	--	--	110J	--
Fluorene	400UJ	--	--	--	--	--	--	--	--	470J	--	--	--	--	--	--
Phenanthrene	400UJ	370	--	40J	--	--	320J	45J	160J	5,600J	100J	310J	--	39J	900	--
Anthracene	400UJ	67J	--	--	--	--	38J	48J	--	800J	--	55J	--	--	71J	--
Fluoranthene	400UJ	1,200	57J	78J	41J	--	540	72J	260J	7,200J	240J	380	92J	88J	2,000	--
Pryene	400UJ	850J	85J	94J	44J	--	440J	82J	170J	4,100J	240J	470J	95J	70J	2,000J	--
Benzo (a)anthracene	400UJ	540	--	56J	--	--	260J	46J	120J	2,100J	180J	250J	--	--	690	--
Chrysene	400UJ	470	49J	51J	--	--	220J	44J	97J	2,300J	140J	190J	57J	43J	730	--
Bis(2-ethylhexyl) phthalate	400UJ	--	--	--	--	470J	--	--	--	1,200J	--	--	--	--	500	670
Benzo(b and/or k) fluoranthene	400UJ	830J	120J	77J	39J	--	370J	60J	170J	3,500J	270J	290J	110J	87J	1,300J	--
Benzo-a-pyrene	400UJ	450	64J	41J	--	--	210J	--	83J	1,900J	160J	170J	62J	--	740	--
Indeno(1,2,3,-cd) pyrene	400UJ	220J	--	--	--	--	110J	--	--	1,100J	77J	110J	--	--	380J	--
Dibenzo(a,h) anthracene	400UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	150J	--
Benzo(ghi) perylene	400UJ	230J	57J	--	--	--	110J	--	--	1,000J	98J	120J	43J	--	440	--
Phenol	400UJ	--	--	--	--	--	--	--	40J	--	--	--	--	--	--	--
Naphthlene	400UJ	--	--	--	--	--	--	--	--	120J	--	--	--	--	--	--
Dibenzofuran	400UJ	--	--	--	--	--	--	--	--	320J	--	--	--	--	--	--
Acenaphthylene	400UJ	--	--	--	--	--	--	--	--	--	--	--	--	--	47J	--

SUMMARY OF EXTRACTABLE ORGANIC SURFACE SOIL ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (µg/kg)	SAMPLE NUMBER															
	Back-ground	On Site														
	BDSS01	BDSS02	BDSS03	BDSS04	BDSS05	BDSS06	BDSS07	BDSS08	BDSS09	BDSS10	BDSS11	BDSS12	BDSS13	BDSS14	BDSS15	BDSS16
6 Unidentified Compounds	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5,000J	NA	NA
Alkanes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	600J	NA	NA
Anthracenedione	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200JN	NA
Cyclo-pentaphenanthrenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100JN	NA
Benzanthracenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	90JN	NA
Benzo-naphthothiophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	90JN	NA
Benzopyrene (Not A)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	600JN	NA
Methylenebis(chiloro) benzenamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	600JN

Notes:

µg/kg	Micrograms per kilogram
J	Estimated value
N	Presumptive evidence of material
U	Material analyzed for, but not detected. Number shown is the sample quantitation limit.
NA	Not analyzed for analytes
--	Material analyzed for, but not detected.

Shaded areas indicate elevated concentrations of constituents.

SUMMARY OF PESTICIDE/PCB SURFACE SOIL ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (µg/kg)	SAMPLE NUMBER															
	Background	On Site														
	BDSS01	BDSS02	BDSS03	BDSS04	BDSS05	BDSS06	BDSS07	BDSS08	BDSS09	BDSS10	BDSS11	BDSS12	BDSS13	BDSS14	BDSS15	BDSS16
4,4'-DDE (P,P'-DDE)	4.0U	9.4	20	110	--	--	--	--	--	--	270C	--	--	--	--	--
4,4'-DDD (P,P'-DDD)	4.0U	--	--	24	--	--	--	--	--	--	41C	--	--	--	--	2.7JN
4,4'-DDT (P,P'-DDT)	4.0U	--	--	73	--	--	--	--	--	--	99C	--	--	--	--	7.1N
Alpha-Chlordane /2	2.0U	--	--	--	--	--	--	--	--	--	13	--	--	--	--	--
Beta BHC	2.0U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.81JN
Dieldrin	4.0U	--	--	--	8.9	1.8J	5.4	--	--	7.8N	--	2.2J	--	--	59	4.4
Endrin	4.0U	7.9JN	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	4.0U	--	--	--	0.87J	--	--	--	--	--	--	--	--	--	--	--
Gamma-Chlordane /2	2.0U	--	--	--	--	--	--	--	--	--	14	--	8.4	--	4.0	--
Heptachlor	2.0U	--	--	--	--	--	1.1J	--	--	--	--	1.6J	--	--	--	0.44J
PCB-1254 (AROCHLOR 1254)	58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PCB-1260	40U	--	--	--	--	84	280	120	--	350	500C	33J	800C	--	1,400C	--

Notes

µg/kg	Micrograms per kilogram	--	Material analyzed for, but not detected.
J	Estimated value	U	Material analyzed for, but not detected. Number shown is the quantitation limit.
N	Presumptive evidence of material	R	Rejected data
C	Confirmed by Gas Cromatagraph Mass Spectrometer		Shaded areas indicate elevated concentrations of constituents.

SUMMARY OF DIOXIN/FURAN SURFACE SOIL ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (ng/kg)	SAMPLE NUMBER															
	Background	On Site														
	BDSS01	BDSS02	BDSS03	BDSS04	BDSS05	BDSS06	BDSS07	BDSS08	BDSS09	BDSS10	BDSS11	BDSS12	BDSS13	BDSS14	BDSS15	BDSS16
2,3,7,8-Tetrachloro-dibenzodioxin	2.5UR	--	4.2J	--	--	--	1.9J	--	--	--	--	--	7.0J	--	--	--
Tetrachloro-dibenzodioxin (Total)	4.8J	9.0J	57J	4.3J	2.9J	1.4J	9.7J	14J	--	12J	260J	20J	300J	8.9J	58J	14J
1,2,3,7,8-Pentachloro-dibenzodioxin	6.2U	2.5J	12	--	--	--	4.8J	3.0J	5.7J	--	--	5.7U	5J	1.5J	--	1.8J
Pentachloro-dibenzodioxin (Total)	6.2UJ	11J	82J	--	1.3J	--	9.5J	11J	--	--	260J	19J	350J	6.1J	11J	9.1J
1,2,3,4,7,8-Hexachloro-dibenzioxin	6.2U	--	13	2.7J	--	0.9J	--	3.1J	--	--	410	29	110	3.5J	56J	4.6J
1,2,3,6,7,8-Hexachloro-dibenzodioxin	6.2U	18	41	14	15	1.9J	8.2	16	--	--	170	9.6	200	9.1	38J	16
1,2,3,7,8,9-Hexachloro-dibenzodioxin	6.2U	15	47	10	5.3J	1.5J	--	11	--	--	180	9.7	240	7.7	36J	10
Hexachloro-dibenzodioxin (Total)	15J	150J	580J	140J	49J	21J	28J	150J	--	--	2,300J	130J	1,900J	63J	290J	100J
1,2,3,4,6,7,8-Heptachloro-dibenzodioxin	15	310	1,000	270	410	46	99	350	4.9J	25	2,600	180	3,300	230	960	440
Heptachloro-dibenzodioxin (Total)	33J	580J	2,200J	540J	1,200J	100J	200J	710J	11J	54J	4,600J	350J	6,000J	390J	1,800J	770J
Octachloro-dibenzodioxin	130	1,600	7,300J	1,700	11,000J	490	530	2,500J	24	170	17,000	980	23,000	1,500	6,200	3,500J
2,3,7,8-Tetrachloro-dibenzofuran	2.5U	4.5	14	4.6	--	--	3.6	5.7	--	--	57	14	41	--	21J	5.2J
Tetrachloro-dibenzofuran (Total)	11J	80J	130J	38J	16J	24J	38J	51J	1.2J	51J	410J	160J	650J	13J	410J	32J

SUMMARY OF DIOXIN/FURAN SURFACE SOIL ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (ng/kg)	SAMPLE NUMBER															
	Background	On Site														
	BDSS01	BDSS0 2	BDSS03	BDSS04	BDSS05	BDSS06	BDSS07	BDSS08	BDSS09	BDSS10	BDSS11	BDSS12	BDSS13	BDSS14	BDSS15	BDSS16
1,2,3,7,8-Pentachloro-dibenzofuran	6.2U	--	--	17	11	24	19	22	2.7J	31	240	17	230	8.5	270	9.2
2,3,4,7,8-Pentachloro-dibenzofuran	6.2U	3.4J	4.5J	1.9J	--	--	1.2J	5.8	--	--	31	9.5	59	3.1J	58	2.5J
Pentachloro-dibenzofuan (Total)	3.6J	240J	240J	170J	84J	79J	99J	230J	13J	160J	1,100J	210J	1,200J	85J	1,400J	95J
1,2,3,6,7,8-Hexachloro-dibenzofuran	6.2U	8.5	--	15	6.9	10	16	--	1.2J	--	--	--	--	3.6J	100J	7.7
2,3,4,6,7,8-Hexachloro-dibenzofuran	6.2U	14	8.1	9.6	3.2J	2.4J	2.9J	11	--	--	--	--	39	5.8	9.2J	6.4
Hexachloro-dibenzofuran (Total)	4.6J	220J	130J	110J	48J	36J	49J	89J	5.3J	57J	780J	97J	930J	99J	200J	120J
1,2,3,4,6,7,8-Heptacholorodibenzofuran	6.2U	110	140	97	80	15	44	120	2.3J	--	780	59	1,100	220	340	290
1,2,3,4,7,8,9,-Heptachlorodibenzofuran	6.2U	3.7J	--	--	--	--	--	--	--	--	34	2.1J	54	2.8J	12J	3.7J
Heptachloro-dobenzofuran (Total)	6.2UJ	110	360J	98J	380J	34J	68J	190J	3.5J	--	810J	61J	1,100J	220J	340J	290J
Octachloro-dibenzofuran	5.0J	120	390	100	180	21	40	76	3.1J	9.1J	2,800	78	2,900	130	360	200
TEQ (Toxic Equiv. Value, From I-TEF/89)	0.3	15J	44J	13	20J	4.0J	11J	17J	0.4J	2.0	160	15	210	12J	88J	19J

Notes

ng/kg	Nanograms per kilogram
J	Estimated value
R	Rejected data
U	Material analyzed for, but not detected. Number shown is the sample quantitation limit.
--	Material analyzed for, but not detected.

Shaded areas indicate elevated concentrations of constituents.

RC 8/24/99

correction: units: µg/L

SUMMARY OF INORGANIC GROUNDWATER ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (mg/L)	SAMPLE NUMBER			
	Background	On Site		
	BDMW01	BDMW04	BDMW05	BDMW06
Aluminum	32	180	370	420
Arsenic	2U	--	20	--
Barium	24	75	230	120
Cadmium	1U	--	5	2J
Calcium	2,500	38,000	87,000	79,000
Cobalt	2U	--	7J	--
Copper	4U	17	32	27
Iron	12UJ	28,000J	9,300J	12,000J
Lead	3U	29	73	64
Magnesium	1,200	11,000	13,000	25,000
Manganese	5J	150	2,100	75
Nickel	4U	--	19J	--
Potassium	2,000J	8,400J	16,000J	58,000J
Sodium	2,500	28,000	13,000	38,000
Vanadium	2U	--	--	2J
Zinc	20U	110	910	330

Notes:

mg/L	Milligrams per liter
J	Estimated value
U	Material analyzed for, but not detected. Number shown is the sample quantitation limit.
R	Rejected data
--	Material analyzed for, but not detected.

Shaded areas indicate elevated concentrations of constituents.

Correction: units = μg/L) REC 8/24/99

SUMMARY OF INORGANIC SURFACE WATER ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (mg/L)	SAMPLE NUMBER			
	Background	On Site		
	BDSW01	BDSW02	BDSW03	BDSW04
Aluminum	36	28	70	57
Antimony	5UR	--	--	--
Arsenic	16	12	11	--
Barium	43	37	42	50
Calcium	53,000	45,000	50,000	54,000
Chromium	6J	4J	4J	3J
Iron	650J	540J	640J	520J
Lead	3	4	--	3
Magnesium	12,000	9,900	9,200	9,000
Manganese	27	25	25	27
Potassium	2,900J	3,100J	3,300J	3,400J
Sodium	14,000	170,000	13,000	12,000
Zinc	24	22	20	100

Notes:

mg/L	Milligrams per liter
J	Estimated value
U	Material analyzed for, but not detected. Number shown is the sample quantitation limit.
R	Rejected data
--	Materials analyzed for, but not detected.

Shaded areas indicate elevated concentrations of constituents

SUMMARY OF INORGANIC SEDIMENT ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (mg/kg)	SAMPLE NUMBER			
	Background	Downgradient		
	BDSD01	BDSD02	BDSD03	BDSD04
Aluminum	420	200	730	3,300
Antimony	1.2UR	--	--	6.8J
Arsenic	1U	--	--	5.8
Barium	5.9	3.9	10	180
Cadmium	0.08U	--	0.30J	3.7
Calcium	1,800	1,500	2,900	4,200
Chromium	2J	2.2J	14J	28J
Cobalt	0.37U	--	--	4.1J
Copper	7	9	19	190
Cyanide	0.16U	--	--	1.4
Iron	940J	410J	1,700J	49,000J
Lead	10J	11J	30J	760JN
Magnesium	100U	--	190	1,100
Manganese	4.9J	4.2J	10J	30J
Mercury (Total)	0.07U	--	--	0.62
Nickel	0.94U	--	--	25
Potassium	70UJ	--	170J	330J
Silver	0.21U	--	--	1.8J
Sodium	40U	--	49J	160J
Vanadium	1.6J	1.1J	3J	7.7J
Zinc	17	17	69	810

Notes:

mg/kg	Milligrams per kilogram	R	Rejected data
J	Estimated value	N	Presumptive evidence of material
U	Material analyzed for, but not detected. Number shown is the sample quantitation limit.		
--	Material analyzed for, but not detected.		

Shaded areas indicate elevated concentrations of constituents.

SUMMARY OF ORGANIC SEDIMENT ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (µg/kg)	SAMPLE NUMBER			
	Background	Downgradient		
	BDSD01	BDSD02	BDSD03	BDSD04
Pesticides/PCBs				
4,4'-DDT	4.1U	--	11N	--
Endosulfan	0.68J	--	--	--
Gamma-BHC (Lindane)	2.1U	--	10	--
Heptachlor	2.1U	--	11	--
Aldrin	2.1U	--	9.7	--
Dieldrin	0.45JN	--	9.7	--
Endrin	4.1U	--	7.3J	0.96J
4'4'-DDD(P,P'-DDD)	4.1U	--	12	6.7N
Extractable Organic Compounds				
Phenanthrene	59J	--	--	1,200
Fluoranthene	300J	--	--	2,000
Benzo(b and/or k)fluoranthene	170J	--	--	780J
Benzo(a)anthracene	170J	--	--	790
Benzo(a)pyrene	91J	--	--	400J
Indeno(1,2,3-cd)pyrene	44J	--	--	230J
Pyrene	240J	--	--	1,500J
Carbazole	410UJ	--	--	100J

SUMMARY OF ORGANIC SEDIMENT ANALYTICAL RESULTS
BROWNS DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

ANALYTE (µg/kg)	SAMPLE NUMBER			
	Background	Downgradient		
	BDSD01	BDSD02	BDSD03	BDSD04
Extractable Organic Compounds (Continued)				
Anthracene	410UJ	--	--	200J
Dibenz(a,h)anthracene	410UJ	--	--	93J
Benzo(g,h,i)perylene	410UJ	--	--	230J
Chrysene	150J	--	--	680
Methylanthracene (2 Isomers)	NA	NA	NA	300JN
Dimthylphenanthrene	NA	NA	NA	100JN
Benzopyrene (Not A, 2 Isomers)	NA	NA	NA	400JN
1 Unidentified Compound	NA	NA	NA	500J

Notes:

µg/kg	Micrograms per kilogram
PCB	Polychlorinated Biphenyls
J	Estimated value
N	Presumptive evidence of material
R	Rejected data
U	Material was analyzed for, but not detected. Number shown is the sample quantitation limit.
NA	Not analyzed for analytes
--	Material analyzed for, but not detected.

Shaded areas indicate elevated concentrations of constituents.

Parcel-by-Parcel Soil Sampling Procedure

Brown's Dump Site, Remedial Investigation Report, Revision 2, March 2003

Step	Description
1	Take surface XRF readings at center and four corners of the parcel. If XRF lead is between 200 mg/kg and 400 mg/kg, collect surface sample for laboratory analysis of lead and arsenic.
2	Use a hand auger to collect soil samples from 0 - 6 inches below ground surface at the center and four corner locations. For each sample, make determinations of visual ash by field team leader. If ash is present, take XRF reading. No confirmation sampling for lead and arsenic on these samples.
3	Composite the five 0 - 6 -inch soil samples, determine visual ash and XRF lead (field team leader), and send to laboratory as appropriate (20% for TAL, 10% for PAH and Dioxin; confirmation analysis for lead & arsenic if XRF lead is between 200 mg/kg and 400 mg/kg).
4	All Borings: Collect samples in bags at 6 - 12 inches, 12 - 18 inches, and at 18 - 24 inches below ground surface. For the samples from 6 - 12 inches and 18 - 24 inches, examine by field team leader for visual ash and XRF lead. For the 6 - 12 inch and 18 - 24 inch samples, if the XRF reading is between 200 mg/kg and 400 mg/kg, then collect a new sample and send the sample to the laboratory for analysis of lead and arsenic (see 5 below). For the 12 - 18 inch sample, examine by the field team leader for visual ash. If ash is present, take an XRF lead measurement. No need for laboratory analysis of the 12 - 18 inch sample.
5	Use one auger bucket per boring. Decontaminate auger buckets between borings. If a sample has an XRF lead measurement between 200 mg/kg and 400 mg/kg, use two new decontaminated auger buckets to collect a sample for the laboratory for analysis of lead and arsenic. The sample should be collected from a borehole located within 12 inches of the original borehole. A new decontaminated auger bucket should be used to auger to a depth just above where the sample is to be collected. A second decontaminated auger bucket should be used to collect the sample. The sample in the new borehole should be examined for ash by the field team leader. The XRF measurement should be taken on the sample collected in the new borehole for comparison to laboratory results and as a comparison to the original borehole XRF measurement. This procedure is being done because of the low State SCTL for arsenic to prevent the potential for false positive arsenic values.
6	Center Boring: Sample collection from the surface to 24 inches will be the same as for the four corner borings (see 4 above). Below 24 inches, continue the boring to the water table and bag samples at 1 foot intervals. If clay is encountered, auger 1 foot into the clay and discontinue. Examine all samples by field team leader for visual ash. If ash is present, take XRF lead measurement. If XRF lead is between 200 mg/kg and 400 mg/kg, collect a sample for laboratory analysis of lead and arsenic by re-augering a new borehole within 12 inches from the original borehole and collect a new sample with a decontaminated auger bucket (see 5 above).
7	Decontamination for TAL/lead & arsenic: Eliminate the alcohol rinse step only for samples sent to the laboratory for metals analysis. The alcohol rinse step must be included for samples being sent to the laboratory for organics analysis .

Notes: "XRF" indicates X-Ray Flourescence

"SCTL" indicates Soil Cleanup Target Levels

"PAH" indicates Polynuclear Aromatic Hydrocarbons

"TAL" indicates Target Analyte List

Table 2-5
Sediment Sample Results and Selection of PCOPEC and COPEC
Browns Dump Superfund Site
Page 1 of 1

Parameter Name	Upgradient (Background) Samples: BKBDSW001 Result	Q	BKBDSW002 Result	Q	BKBDSW003 Result	Q	BKBDSW004 Result	Q	BKBDSW005 Result	Q	Samples Collected at or Downgradient of Site: BDSW001 Result	Q	BDSW002 Result	Q	BDSW003 Result	Q	BDSW004 Result	Q	BDSW005 Result	Q	BDSW006 Result	Q	BDSW007 Result	Q	BDSW008 Result	Q
Dioxins (ng/KG)																										
TEQ OF 2,3,7,8-TCDD									[illegible]	J					0.016	J					0.29	J				
Inorganics (mg/KG)																										
ALUMINUM	900	=	280	=	1400	=	1600	=	900	=	410	=	520	J	210	J	260	J	600	J	65	J	470	=	660	=
ANTIMONY		UJ		UJ		UJ		UJ		UJ		UJ		U		U		U		U		U		UJ	1.2	J
ARSENIC		U		U	3.3	=	2.7	J	3.9	=		U		U		U		U	1.3	J	1.1	J	3	=	1.1	J
BARIUM	6	J	2.6	J	18	J	22	J	13	J	8.1	J	9.4	J	2.7	J	4.9	J	8.9	J	17	J	19	J	13	J
CADMIUM		U		U	0.16	J	0.18	J		U		U		U		U		U	0.14	J	0.29	J		U	0.18	J
CALCIUM	1600	J	73	J	23000	=	47000	=	6700	=	16000	=	4600	=	3600	=	1900	J	7700	=	10000	=	2000	=	4700	=
CHROMIUM, TOTAL	2	J	0.84	J	13	J	9.2	J	11	J	3.9	J	4.3	=	3.1	=	3.7	=	6.6	=	6	=	3.6	J	5.4	J
COBALT	0.32	J		U	0.39	J	0.80	J	0.8	J		U		U		U		U	0.4	J	0.36	J		U		U
COPPER	2	J		U	6.4	J	14	=	9.5	=	2.6	J	2.3	J	1.6	J	2.1	J	8.2	J	12	=	10	=	11	=
IRON	1600	=	200	=	14000	=	8000	=	2900	=	860	=	1000	J	390	J	1100	=	3100	=	2100	=	1400	=	1600	=
LEAD	6.6	=	3.8	=	16	=	12	=	21	=	7.7	=	7	=	4.9	=	7.9	J	14	J	40	J	44	=	46	=
MAGNESIUM	130	J	20	J	770	J	1000	J	240	J	160	J	100	J	67	J	73	J	160	J	290	J	180	J	170	J
MANGANESE	7.7	J	1.2	J	77	J	740	J	16	J	7.6	J	11	=	2.8	J	6.6	=	34	=	22	=	12	=	87	=
NICKEL	0.67	J		U	0.96	J	2.8	J	1.6	J		U		U		U		U	0.89	J	2.2	J	0.93	J	2.4	J
POTASSIUM	69	J		U	46	J	110	J	69	J	33	J	31	J		U	29	J	79	J	58	J	41	J	35	J
VANADIUM	3.3	J	1.1	J	8.7	J	9.3	J	4.2	J	1.4	J	1.2	J	0.76	J	1	J	2	J	2.7	J	1.6	J	3	J
ZINC	27	=	7.6	=	36	=	46	=	67	=	19	=	23	=	19	=	27	=	52	=	120	=	67	=	77	=
MERCURY	0.012	J		U	0.014	J	0.016	J	0.018	J	0.008	J	0.0068	J	0.0033	J	0.0049	J	0.011	J	0.056	J	0.046	J	0.0077	J
Pesticides (ug/KG)																										
ALPHA CHLORDANE		U		U	0.47	J	1.9	J	1.1	J	0.43	J		U		U		U	0.40	J		U	0.78	J		U
ENDRIN ALDEHYDE		U		U		U		U		U		U		U		U		U		U		U		U	0.76	J
GAMMA CHLORDANE		U		U	0.6	J	1	J	1.2	J	0.44	J		U		U		U	1.4	J		U	1.6	J		U
p,p'-DDD		U		U		U		U		U		U		U		U		U		U	0.88	J		U		U
p,p'-DDE		U		U		U		U		U		U		U		U		U		U	2.1	J	0.42	J		U
p,p'-DDT		UJ		U		UJ		UJ		U		UJ		U		U		U		U	6	=		U		U
PCBs (ug/KG)																										
PCB-1260 (AROCHLOR 1260)		U		U		U		U		U		U		U		U		U		U	22	J		U		U
Volatile Organic Compounds (ug/KG)																										
ACETONE									68	=						U					65	=				
METHYL ETHYL KETONE (2-BUTANONE)									23	=						U					26	=				
Semivolatile Organic Compounds (ug/KG)																										
BENZO(a)ANTHRACENE		U		U		U		U	48	J	32	J		U		U		U		U	76	J		U	39	J
BENZO(a)PYRENE		U		U		U		U	54	J	44	J	67	J	43	J		U		U	80	J		U		U
BENZO(b)FLUORANTHENE		U		U		U		U	72	J	40	J	34	J		U		U	41	J	82	J		U		U
BENZO(g,h,i)PERYLENE		U		U		U		U	57	J	34	J	35	J		U		U		U	82	J		U		U
BENZO(k)FLUORANTHENE		U		U		U		U	44	J	36	J		U		U		U		U	69	J		U		U
bis(2-ETHYLHEXYL) PHTHALATE	180	J		U	92	J		U	98	J	64	J		U		U		U		U		U		U	84	J
CHRYSENE		U		U		U		U	61	J	44	J	32	J		U		U	45	J	82	J		U	57	J
DI-n-BUTYL PHTHALATE		U		U		U		U		U		U		U		U		U	43	J		U		U		U
FLUORANTHENE		U		U		U		U	61	J	46	J		U		U		U	50	J	78	J		U	66	J
PHENANTHRENE		U		U		U		U		U		U		U		U		U		U	24	J		U		U
PYRENE		U		U		U		U	96	J	60	J		U		U		U		U	180	J		U		U

Parameter Name	AOC Samples: Total Samples	Total Detections	Minimum Detected	Average Detected	Maximum Detected	Screening for PCOPEC Selection: Approved Screening Value	Total Detections > Screening Value	AOC Screening HQ Based on Maximum	Selected as PCOPC?	Refinement for Direct Exposure COPEC Selection: Approved Refinement Value	Total Detections > Refinement Value	AOC Refinement HQ Based on Maximum	Selected as COPC?	Rationale for selection as COPEC
Dioxins (ng/KG)														
TEQ OF 2,3,7,8-TCDD	3	3	0.016	0.153	0.29	2.8	0	0.12	No	[redacted]				
Inorganics (mg/KG)														
ALUMINUM	13	13	212	423.9	840	-	-	-	Yes	600 (a)	1	1.87	No	HQ was below 1
ANTIMONY	13	1	1.2	1.2	1.2	2	0	0.60	No	[redacted]				
ARSENIC	13	7	1.1	1.6	3	7.24	0	0.41	No	[redacted]				
BARIUM	13	13	2.7	9.0	17	-	-	-	Yes	200	0	0.09	No	HQ was below 1
CADMIUM	13	8	0.14	0.2	0.29	0.675	0	0.43	No	[redacted]				
CALCIUM	13	13	1900	8125.0	16000	-	-	-	Yes	-	-	-	No	Essential nutrient
CHROMIUM, TOTAL	13	13	3.1	4.4	6	82.3	0	0.11	No	[redacted]				
COBALT	13	6	0.36	0.4	0.4	60	0	0.01	No	[redacted]				
COPPER	13	12	1.6	8.0	12	18.7	0	0.64	No	[redacted]				
IRON	13	13	390	1618.3	3100	-	-	-	Yes	20000	0	0.15	No	HQ was below 1
LEAD	13	13	4.9	21.4	46	30.2	3	1.52	Yes	91.3	0	0.50	No	HQ was below 1
MAGNESIUM	13	13	73	160.4	290	-	-	-	Yes	-	-	-	No	Essential nutrient
MANGANESE	13	13	2.8	13.0	34	-	-	-	Yes	460	0	0.07	No	HQ was below 1
NICKEL	13	8	0.89	1.6	2.4	15.9	0	0.15	No	[redacted]				
POTASSIUM	13	11	29	43.4	79	-	-		Yes		-	-	No	Essential nutrient
VANADIUM	13	13	0.76	1.7	3	-	-	-	Yes	130	0	0.02	No	HQ was below 1
ZINC	13	13	19	60.1	120	174	0	0.67	No	[redacted]				
MERCURY	13	12	0.0033	0.0	0.056	0.13	0	0.42	No	[redacted]				
Pesticides (ug/KG)														
ALPHA CHLORDANE	13	8	0.4	0.64	0.78	0.5	1	1.56	Yes	4.79	0	0.16	No	HQ was below 1
ENDRIN ALDEHYDE	13	1	0.76	0.76	0.76	3200	0	0.00	No	[redacted]				
GAMMA CHLORDANE	13	6	0.44	1.11	1.6	0.5	2	3.20	Yes	4.79	0	0.33	No	HQ was below 1
p,p'-DDD	13	1	0.88	0.88	0.88	1.22	0	0.72	No	[redacted]				
p,p'-DDE	13	2	0.42	1.26	2.1	2.07	1	1.01	Yes	6.75	0	0.31	No	HQ was below 1
p,p'-DDT	13	1	6	6.00	6	1.19	1	4.20	Yes	4.77	1	1.26	No	Low magnitude and frequency of exceedance
PCBs (ug/KG)														
PCB-1260 (AROCHLOR 1260)	13	1	22	22	22	34.1	0	0.65	No	[redacted]				
Volatile Organic Compounds (ug/KG)														
ACETONE	3	2	65	67	68	453.37	0	0.15	No	[redacted]				
METHYL ETHYL KETONE (2-BUTANONE)	3	2	25	25	25	136.98	0	0.18	No	[redacted]				
Semivolatile Organic Compounds (ug/KG)														
BENZO(a)ANTHRACENE	13	4	32	49	76	74.8	1	1.02	Yes	385	0	0.19	No	HQ was below 1
BENZO(a)PYRENE	13	5	43	57	80	88.8	0	0.90	No	[redacted]				
BENZO(b)FLUORANTHENE	13	5	34	63	82	10400	0	0.01	No	[redacted]				
BENZO(g,h,i)PERYLENE	13	4	34	61	82	170	0	0.48	No	[redacted]				
BENZO(k)FLUORANTHENE	13	3	36	50	69	240	0	0.29	No	[redacted]				
bis(2-ETHYLHEXYL) PHTHALATE	13	5	64	74	84	182	0	0.46	No	[redacted]				
CHRYSENE	13	6	32	61	82	108	0	0.76	No	[redacted]				
DI-n-BUTYL PHTHALATE	13	1	43	43	43	110.5	0	0.39	No	[redacted]				
FLUORANTHENE	13	6	46	60	78	113	0	0.69	No	[redacted]				
PHENANTHRENE	13	1	24	24	24	85.7	0	0.28	No	[redacted]				
PYRENE	13	3	69	136	180	153	1	1.18	Yes	875	0	0.21	No	HQ was below 1

Notes:
(a) ... value used
- Unquantified
U- Undetected
J- Estimated value
R- Data was rejected
Samples shown in yellow exceed screening value
Samples shown in orange exceed refinement value
Screened out COPEC are blacked out

6/16/2006

Brown's Dump Record of Decision - Table 11 Continued

Table 2-6
Sediment Sample Results and Selection of PCOPEC and COPEC
Browns Dump Superfund Site
Page 1 of 1

ParameterName	Upgradient (Background) Samples: BKBDSW001 Result	Q	BKBDSW002 Result	Q	BKBDSW003 Result	Q	BKBDSW004 Result	Q	BKBDSW005 Result	Q
Dioxins (ng/KG)										
TEQ OF 2,3,7,8-TCDD									3.361	J
Inorganics (mg/KG)										
ALUMINUM	900	=	280	=	1400	=	1600	=	830	=
ANTIMONY		UJ		UJ		UJ		UJ		UJ
ARSENIC		U		U	3.3	=	2.7	J	3.9	=
BARIUM	6	J	2.6	J	18	J	22	J	13	J
CADMIUM		U		U	0.16	J	0.18	J		U
CALCIUM	1500	J	73	J	23000	=	42000	=	5200	=
CHROMIUM, TOTAL	2	J	0.84	J	11	J	82	J	11	J
COBALT	0.32	J		U	0.39	J	0.83	J	0.8	J
COPPER	2	J		U	5.4	J	14	=	9.5	=
IRON	1600	=	280	=	14000	=	9300	=	2500	=
LEAD	5.5	=	3.8	=	16	=	12	=	21	=
MAGNESIUM	130	J	20	J	770	J	1000	J	240	J
MANGANESE	7.7	J	1.2	J	77	J	740	=	15	J
NICKEL	0.67	J		U	0.9	J	2.8	J	1.9	J
POTASSIUM	69	J		U	46	J	110	J	69	J
VANADIUM	3.3	J	1.1	J	8.7	J	9.3	J	4.2	J
ZINC	27	=	7.5	=	36	=	45	=	53	=
MERCURY	0.012	=		U	0.014	J	0.015	J	0.018	J
Pesticides (ug/KG)										
ALPHA-CHLORDANE		U		U	0.47	J	1.3	J	1.1	J
ENDRIN ALDEHYDE		U		U		U		U		U
GAMMA-CHLORDANE		U		U	0.5	J	1	J	1.2	J
p,p-DDD		U		U		U		U		U
p,p-DDE		U		U		U		U		U
p,p-DDT		UJ		U		UJ		UJ		U
PCBs (ug/KG)										
PCB-1260 (AROCHLOR 1260)		U		U		U		U		U
Volatile Organic Compounds (ug/KG)										
ACETONE									58	=
METHYL ETHYL KETONE (2-BUTANONE)									74	=
Semivolatile Organic Compounds (ug/KG)										
BENZO(a)ANTHRACENE		U		U		U		U	45	J
BENZO(a)PYRENE		U		U		U		U	54	J
BENZO(b)FLUORANTHENE		U		U		U		U	72	J
BENZO(g,h,i)PERYLENE		U		U		U		U	57	J
BENZO(k)FLUORANTHENE		U		U		U		U	46	J
bis(2-ETHYLHEXYL) PHTHALATE	180	J		U	92	J		U	98	J
CHRYSENE		U		U		U		U	51	J
Di-n-BUTYL PHTHALATE		U		U		U		U		U
FLUORANTHENE		U		U		U		U	51	J
PHENANTHRENE		U		U		U		U		U
PYRENE		U		U		U		U	95	J

ParameterName	Samples Collected at or Downgradient of Site: BDSW001 Result	Q	BDSW002 Result	Q	BDSW003 Result	Q	BDSW004 Result	Q	BDSW005 Result	Q	BDSW006 Result	Q	BDSW007 Result	Q	BDSW008 Result	Q
Dioxins (ng/KG)																
TEQ OF 2,3,7,8-TCDD					0.015	J					0.29	J				
Inorganics (mg/KG)																
ALUMINUM	410	J	370	J	210	J	250	J	500	J	640	J	470	=	580	=
ANTIMONY		UJ		U		U		U		U		U		UJ	1.2	J
ARSENIC		U		U		U		U	1.3	J	1.1	J	3	=	1.1	J
BARIUM	5.1	J	5.4	J	2.7	J	4.9	J	9.9	J	17	J	10	J	13	=
CADMIUM		U		U		U		U	0.14	J	0.29	J		U	0.18	=
CALCIUM	17000	=	4500	=	3600	=	1900	J	7700	=	10000	=	2000	=	4300	=
CHROMIUM, TOTAL	3.9	J	4.3	=	3.1	=	3.2	=	5.6	=	6	=	3.5	J	5.4	=
COBALT		U		U		U		U	0.4	J	0.36	J		U		U
COPPER	2.5	J	2.3	J	1.5	J	2.1	J	6.7	J	12	=	10	=	11	=
IRON	850	=	1000	J	390	J	1100	=	3100	=	2600	=	1400	=	1500	=
LEAD	7.7	=	7	=	4.9	=	7.9	J	14	J	48	J	44	=	46	=
MAGNESIUM	160	J	100	J	80	J	73	J	150	J	290	J	180	J	170	J
MANGANESE	7.5	J	11	=	2.8	=	5.6	=	34	=	22	=	12	=	8.7	=
NICKEL		U		U		U		U	0.89	J	2.3	J	0.91	=	2.4	J
POTASSIUM	37	J	31	J		U	29	J	74	J	56	J	41	J	39	J
VANADIUM	1.4	J	1.2	J	0.75	J	1	J	2	J	2.7	J	1.6	J	3	J
ZINC	19	=	21	=	16	=	27	=	52	=	120	=	67	=	77	=
MERCURY	0.008	J	0.0044	J	0.0033	J	0.0046	J	0.011	J	0.055	J	0.045	J	0.0077	J
Pesticides (ug/KG)																
ALPHA-CHLORDANE	0.43	J		U		U		U	0.42	J		U	0.78	J		U
ENDRIN ALDEHYDE		U		U		U		U		U		U		U	0.75	J
GAMMA-CHLORDANE	0.44	J		U		U		U	1.4	J		U	1.5	J		U
p,p-DDD		U		U		U		U		U	0.88	J		U		U
p,p-DDE		U		U		U		U		U	2.1	J	0.42	J		U
p,p-DDT		UJ		U		U		U		U	5	=		U		U
PCBs (ug/KG)																
PCB-1260 (AROCHLOR 1260)		U		U		U		U		U	22	J		U		U
Volatile Organic Compounds (ug/KG)																
ACETONE						U					69	=				
METHYL ETHYL KETONE (2-BUTANONE)						U					25	=				
Semivolatile Organic Compounds (ug/KG)																
BENZO(a)ANTHRACENE	32	J		U		U		U		U	75	J		U	39	J
BENZO(a)PYRENE	44	J	67	J	43	J		U		U	80	J		U		U
BENZO(b)FLUORANTHENE	42	J	34	J		U		U	41	J	82	J		U		U
BENZO(g,h,i)PERYLENE	34	J	36	J		U		U		U	82	J		U		U
BENZO(k)FLUORANTHENE	36	J		U		U		U		U	63	J		U		U
bis(2-ETHYLHEXYL) PHTHALATE	64	J		U		U		U		U		U		U	84	J
CHRYSENE	44	J	32	J		U		U	45	J	82	J		U	53	J
Di-n-BUTYL PHTHALATE		U		U		U		U	43	J		U		U		U
FLUORANTHENE	46	J		U		U		U	50	J	78	J		U	54	J
PHENANTHRENE		U		U		U		U		U	24	J		U		U
PYRENE	89	J		U		U		U		U	180	J		U		U

ParameterName	AOC Samples: Total Samples	Total Detections	Minimum Detected	Average Detected	Maximum Detected	Screening for PCOPEC Selection: Approved Screening Value	Total Detections > Screening Value	AOC Screening HQ Based on Maximum	Selected as PCOPC?	Refinement for Direct Exposure COPEC Selection: Approved Refinement Value	Total Detections > Refinement Value	AOC Refinement HQ Based on Maximum	Selected as COPC?	Rationale for selection as COPEC
Dioxins (ng/KG)														
TEQ OF 2,3,7,8-TCDD	3	3	0.015	0.153	0.29	2.5	0	0.12	No	[redacted]				
Inorganics (mg/KG)														
ALUMINUM	13	13	210	423.8	640	-	-	-	Yes	600 (a)	1	1.07	No	HQ was below 1
ANTIMONY	13	1	1.2	1.2	1.2	2	0	0.60	No	[redacted]				
ARSENIC	13	7	1.1	1.6	3	7.24	0	0.41	No	[redacted]				
BARIUM	13	13	2.7	9.0	17	-	-	-	Yes	200	0	0.09	No	HQ was below 1
CADMIUM	13	5	0.14	0.2	0.29	0.676	0	0.43	No	[redacted]				
CALCIUM	13	13	1900	6125.0	15000	-	-	-	Yes	-	-	-	No	Essential nutrient
CHROMIUM, TOTAL	13	13	3.1	4.4	6	52.3	0	0.11	No	[redacted]				
COBALT	13	6	0.36	0.4	0.4	50	0	0.01	No	[redacted]				
COPPER	13	12	1.5	6.0	12	18.7	0	0.64	No	[redacted]				
IRON	13	13	380	1516.3	3100	-	-	-	Yes	20000	0	0.16	No	HQ was below 1
LEAD	13	13	4.9	21.4	46	30.2	3	1.52	Yes	91.3	0	0.50	No	HQ was below 1
MAGNESIUM	13	13	73	150.4	290	-	-	-	Yes	-	-	-	No	Essential nutrient
MANGANESE	13	13	2.8	13.0	34	-		-	Yes	460	0	0.07	No	HQ was below 1
NICKEL	13	8	0.89	1.6	2.4	15.9	0	0.15	No	[redacted]				
POTASSIUM	13	11	29	43.4	79	-		-	Yes	-	-	-	No	Essential nutrient
VANADIUM	13	13	0.75	1.7	3		-		Yes	130	0	0.02	No	HQ was below 1
ZINC	13	13	16	50.1	120	124	0	0.97	No	[redacted]				
MERCURY	13	12	0.0011	0.0	0.055	0.13	0	0.42	No	[redacted]				
Pesticides (ug/KG)														
ALPHA-CHLORDANE	13	6	0.42	0.54	0.78	0.5	1	1.56	Yes	4.79	0	0.16	No	HQ was below 1
ENDRIN ALDEHYDE	13	1	0.75	0.75	0.75	3200	0	0.00	No	[redacted]				
GAMMA-CHLORDANE	13	6	0.44	1.11	1.5	0.5	2	3.00	Yes	4.79	0	0.31	No	HQ was below 1
p,p-DDD	13	1	0.88	0.88	0.88	1.22	0	0.72	No	[redacted]				
p,p-DDE	13	2	0.42	1.26	2.1	2.07	1	1.01	Yes	6.75	0	0.31	No	HQ was below 1
p,p-DDT	13	1	5	5.00	5	1.19	1	4.20	Yes	4.77	1	1.05	No	Low magnitude and frquency of exceedance
PCBs (ug/KG)														
PCB-1260 (AROCHLOR 1260)	13	1	22	22	22	34.1	0	0.65	No	[redacted]				
Volatile Organic Compounds (ug/KG)														
ACETONE	3	2	69	69	69	453.37	0	0.15	No	[redacted]				
METHYL ETHYL KETONE (2-BUTANONE)	3	2	25	25	25	136.95	0	0.18	No	[redacted]				
Semivolatile Organic Compounds (ug/KG)														
BENZO(a)ANTHRACENE	13	4	32	49	75	74.8	1	1.00	Yes	385	0	0.19	No	HQ was below 1
BENZO(a)PYRENE	13	5	43	57	80	88.8	0	0.90	No	[redacted]				
BENZO(b)FLUORANTHENE	13	5	34	50	82	10400	0	0.01	No	[redacted]				
BENZO(g,h,i)PERYLENE	13	4	34	51	82	170	0	0.48	No	[redacted]				
BENZO(k)FLUORANTHENE	13	3	36	50	63	240	0	0.26	No	[redacted]				
bis(2-ETHYLHEXYL) PHTHALATE	13	5	64	74	84	187	0	0.46	No	[redacted]				
CHRYSENE	13	6	32	51	82	108	0	0.76	No	[redacted]				
Di-n-BUTYL PHTHALATE	13	1	43	43	43	110.5	0	0.39	No	[redacted]				
FLUORANTHENE	13	5	46	58	78	113	0	0.69	No	[redacted]				
PHENANTHRENE	13	1	24	24	24	85.7	0	0.28	No	[redacted]				
PYRENE	13	3	89	135	180	153	1	1.18	Yes	875	0	0.21	No	HQ was below 1

Notes:
(a) soil value used
=, Unqualified
U, Undetected
J, Estimated value
R, Data was rejected
Samples shown in yellow exceed screening value.
Samples shown in orange exceed refinement value.
Screened COPEC are blacked out.

Brown's Dump Record of Decision - Table 12

Table 2-6
Surface Water Sample Results and Selection of PCOPEC and COPEC
Browns Dump Superfund Site
Page 1 of 1

Parameter Name	Upgradient (Background) Samples: BKBDSW001 Result	Q	BKBDSW002 Result	Q	BKBDSW003 Result	Q	BKBDSW004 Result	Q	BKBDSW005 Result	Q	Samples Collected at or Downgradient of Site: BDSW001 Result	Q	BDSW002 Result	Q	BDSW003 Result	Q	BDSW004 Result	Q	BDSW005 Result	Q	BDSW006 Result	Q	BDSW007 Result	Q	BDSW008 Result	Q
Inorganics (mg/L)																										
ALUMINUM	0.27	=	0.14	J	0.074	J	0.14	J		U	0.037	J		U		U	0.045	J	0.03	J	0.033	J		U	0.043	J
Arsenic, Dissolved		U		U		U		U		U		U		U		U	0.0036	J		U		U		U		U
BARIUM	0.016	J	0.069	J	0.045	J	0.04	J	0.034	J	0.043	J	0.044	J	0.045	J	0.047	J	0.06	J	0.051	J	0.041	J	0.045	J
Barium, Dissolved	0.017	J	0.044	J	0.039	J	0.039	J	0.031	J	0.045	J	0.043	J	0.044	J	0.047	J	0.06	J	0.051	J	0.041	J	0.043	J
CALCIUM	64	=	10	=	66	=	65	=	61	=	66	=	67	=	66	=	67	=	67	=	69	=	67	=	68	=
Calcium, Dissolved	64	=	10	=	64	=	64	=	65	=	66	=	66	=	67	=	67	=	69	=	71	=	69	=	66	=
Chromium, Dissolved		U		U		U		U		U		U		U		U		U	0.002	J		U		U		U
IRON		U	4.8	=		U		U		U		U	0.29	=	0.42	=	0.29	=	0.38	=	0.37	=	0.37	=	0.47	=
Iron, Dissolved	0.08	J	3.2	=	0.053	J	0.043	J	0.15	=	0.069	J		UJ		UJ		UJ		UJ		UJ		UJ		UJ
MAGNESIUM	11	=	3.1	J	21	=	20	=	20	=	20	=	20	=	20	=	20	=	19	=	19	=	20	=	20	=
Magnesium, Dissolved	11	=	3.2	J	20	=	20	=	20	=	20	=	20	=	20	=	21	=	20	=	20	=	20	=	20	=
MANGANESE	0.079	=	0.045	=	0.047	=	0.036	=		U	0.036	=	0.039	=	0.04	=	0.021	=	0.031	=	0.035	=	0.022	=	0.025	=
Manganese, Dissolved		U	0.036	=	0.037	=	0.032	=		U	0.035	=	0.035	=	0.036	=	0.02	=	0.031	=	0.028	=	0.019	=	0.019	=
POTASSIUM	2.9	J	1.6	J	2.4	J	2.3	J	2.3	J	2.4	J	2.6	J	2.6	J	2.6	J	2.6	J	2.8	J	2.6	J	2.6	J
Potassium, Dissolved	2.9	J	1.6	J	2.3	J	2.4	J	2.2	J	2.4	J	2.6	J	2.5	J	2.6	J	2.6	J	2.8	J	2.6	J	2.6	J
SODIUM	21	=	9.6	=	13	=	13	=	13	=	14	=	14	=	15	=	14	=	15	=	15	=	15	=	16	=
Sodium, Dissolved	21	=	9.7	=	13	=	13	=	13	=	14	=	14	=	15	=	15	=	15	=	15	=	15	=	15	=
CYANIDE	0.0061	J		U		U		U	0.0054	J		U	0.013	=	0.0066	J		U		U		U		U	0.0061	J

Parameter Name	AOC Samples: Total Samples	Total Detections	Minimum Detected	Average Detected	Maximum Detected	Screening for PCOPEC Selection: Approved Screening Value	Total Detections > Screening	AOC Screening HQ Based on	Selected as PCOPC?	Refinement for Direct Exposure COPEC Selection: Approved Refinement Value	Total Detections > Refinement Value	AOC Refinement HQ Based on Maximum	Selected as COPC?	Rationale for selection as COPEC
Inorganics (mg/L)														
ALUMINUM	13	9	0.03	0.037	0.047	0.087	0	0.43	No	[redacted]				
Arsenic, Dissolved	13	1	0.0036	0.0036	0.0036	0.19	0	0.02	No	[redacted]				
BARIUM	13	13	0.041	0.04575	0.061	6	0	0.01	No	[redacted]				
Barium, Dissolved	13	13	0.041	0.046125	0.051	6	0	0.01	No	[redacted]				
CALCIUM	13	13	65	66.875	68	-	-	-	Yes	116	0	0.59	No	HQ was below 1
Calcium, Dissolved	13	13	66	68.375	71	-	-	-	Yes	116	0	0.61	No	HQ was below 1
Chromium, Dissolved	13	1	0.002	0.002	0.002	0.011	0	0.18	No	[redacted]				
IRON	13	8	0.29	0.342857	0.47	1	0	0.47	No	[redacted]				
Iron, Dissolved	13	6	0.069	0.069	0.069	1	0	0.07	No	[redacted]				
MAGNESIUM	13	13	19	19.75	20	-	-	-	Yes	82	0	0.24	No	HQ was below 1
Magnesium, Dissolved	13	13	20	20.125	21				Yes	82	0	0.26	No	HQ was below 1
MANGANESE	13	12	0.021	0.03025	0.04	-	-	-	Yes	1.1	0	0.04	No	HQ was below 1
Manganese, Dissolved	13	11	0.019	0.028	0.036	-	-	-	Yes	1.1	0	0.03	No	HQ was below 1
POTASSIUM	13	13	2.4	2.6625	2.8	-	-	-	Yes	53	0	0.05	No	HQ was below 1
Potassium, Dissolved	13	13	2.4	2.6875	2.8	-	-	-	Yes	53	0	0.05	No	HQ was below 1
SODIUM	13	13	14	14.625	16	-	-	-	Yes	680	0	0.02	No	HQ was below 1
Sodium, Dissolved	13	13	14	14.75	15	-	-	-	Yes	680	0	0.02	No	HQ was below 1
CYANIDE	13	6	0.0056	0.008467	0.013	0.0052	3	2.50	Yes	0.0078	1	1.67	No	Low magnitude and frequency of exceedance

Notes:
=, Unqualified
U, Undetected
J, Estimated value
R, Data was rejected
Samples shown in yellow exceed screening value.
Samples shown in orange exceed refinement value.
Screened COPEC are blacked out.

Brown's Dump Record of Decision - Table 12 Continued

Table 2-8
Surface Water Sample Results and Selection of PCOPEC and COPEC
Browns Dump Superfund Site
Page 1 of 1

Parameter Name	Upgradient (Background) Samples									
	BKBDSW001		BKBDSW002		BKBDSW003		BKBDSW004		BKBDSW005	
	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Inorganics (mg/L)										
ALUMINUM	0.27	=	0.14	J	0.074	J	0.14	J		U
Arsenic, Dissolved		U		U		U		U		U
BARIUM	0.018	J	0.069	J	0.042	J	0.04	J	0.034	J
Barium, Dissolved	0.017	J	0.044	J	0.039	J	0.034	J	0.031	J
CALCIUM	54	=	10	=	66	=	63	=	61	=
Calcium, Dissolved	54	=	10	=	64	=	64	=	60	=
Chromium, Dissolved		U		U		U		U		U
IRON		U	4.6	=		U		U		U
Iron, Dissolved	0.08	J	1.2	=	0.053	J	0.041	J	0.15	=
MAGNESIUM	11	=	3.1	J	21	=	20	=	20	=
Magnesium, Dissolved	11	=	3.2	J	20	=	20	=	20	=
MANGANESE	0.029	=	0.042	=	0.043	=	0.036	=		U
Manganese, Dissolved		U	0.038	=	0.034	=	0.032	=		U
POTASSIUM	2.9	J	1.5	J	2.4	J	2.3	J	2.3	J
Potassium, Dissolved	2.9	J	1.5	J	2.3	J	2.4	J	2.3	J
SODIUM	21	=	9.5	=	13	=	13	=	13	=
Sodium, Dissolved	21	=	9.7	=	13	=	13	=	13	=
CYANIDE	0.0051	J		U		U		U	0.0054	J

Parameter Name	Samples Collected at or Downgradient of Site															
	BDSW001		BDSW002		BDSW003		BDSW004		BDSW005		BDSW006		BDSW007		BDSW008	
	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Inorganics (mg/L)																
ALUMINUM	0.037	J		U		U	0.042	J	0.03	J	0.033	J		U	0.043	J
Arsenic, Dissolved		U		U		U	0.0035	J		U		U		U		U
BARIUM	0.041	J	0.044	J	0.045	J	0.047	J	0.05	J	0.051	J	0.041	J	0.045	J
Barium, Dissolved	0.042	J	0.04	J	0.044	J	0.047	J	0.05	J	0.051	J	0.041	J	0.043	J
CALCIUM	67	=	67	=	66	=	67	=	65	=	68	=	67	=	68	=
Calcium, Dissolved	68	=	68	=	67	=	69	=	69	=	71	=	69	=	68	=
Chromium, Dissolved		U		U		U		U	0.002	J		U		U		U
IRON		U	0.29	=	0.42	=	0.29	=	0.33	=	0.37	=	0.37	=	0.47	=
Iron, Dissolved	0.069	J		UJ		UJ		UJ		UJ		UJ		UJ		UJ
MAGNESIUM	20	=	20	=	20	=	20	=	19	=	19	=	20	=	20	=
Magnesium, Dissolved	20	=	20	=	20	=	21	=	20	=	20	=	20	=	20	=
MANGANESE	0.036	=	0.033		0.04	=	0.021	=	0.031	=	0.034	=	0.022	=	0.025	=
Manganese, Dissolved	0.032	=	0.032	=	0.038	=	0.02	=	0.031	=	0.033	=	0.019	=	0.019	=
POTASSIUM	2.4	J	2.5	J	2.6	J	2.5	J	2.6	J	2.8	J	2.5	J	2.6	J
Potassium, Dissolved	2.4	J	2.5	J	2.6	J	2.5	J	2.6	J	2.9	J	2.6	J	2.6	J
SODIUM	14	=	14	=	15	=	14	=	15	=	15	=	15	=	15	=
Sodium, Dissolved	14	=	14	=	15	=	15	=	15	=	15	=	15	=	15	=
CYANIDE		U	0.013	=	0.0055	J		U		U		U		U	0.0069	J

Parameter Name	AOC Samples					Screening for PCOPEC Selection				Refinement for Direct Exposure COPEC Selection				
	Total Samples	Total Detections	Minimum Detected	Average Detected	Maximum Detected	Approved Screening Value	Total Detections > Screening Value	AOC Screening HQ Based on Maximum	Selected as PCOPC?	Approved Refinement Value	Total Detections > Refinement Value	AOC Refinement HQ Based on Maximum	Selected as COPC?	Rationale for selection as COPEC
Inorganics (mg/L)														
ALUMINUM	13	9	0.03	0.037	0.043	0.087	0	0.49	No	[redacted]				
Arsenic, Dissolved	13	1	0.0035	0.0035	0.0035	0.19	0	0.02	No					
BARIUM	13	13	0.041	0.04575	0.051	5	0	0.01	No					
Barium, Dissolved	13	13	0.041	0.045125	0.051	5	0	0.01	No					
CALCIUM	13	13	65	66.875	68	-	-	-	Yes	116	0	0.59	No	HQ was below 1
Calcium, Dissolved	13	13	66	68.375	71	-	-	-	Yes	116	0	0.61	No	HQ was below 1
Chromium, Dissolved	13	1	0.002	0.002	0.002	0.011	0	0.18	No	[redacted]				
IRON	13	8	0.29	0.362857	0.47	1	0	0.47	No					
Iron, Dissolved	13	6	0.069	0.069	0.069	1	0	0.07	No					
MAGNESIUM	13	13	19	19.75	20	-	-	-	Yes	82	0	0.24	No	HQ was below 1
Magnesium, Dissolved	13	13	20	20.125	21	-	-	-	Yes	82	0	0.26	No	HQ was below 1
MANGANESE	13	12	0.021	0.03025	0.04	-	-	-	Yes	1.1	0	0.04	No	HQ was below 1
Manganese, Dissolved	13	11	0.019	0.028	0.038	-	-	-	Yes	1.1	0	0.03	No	HQ was below 1
POTASSIUM	13	13	2.4	2.5625	2.8	-	-	-	Yes	53	0	0.05	No	HQ was below 1
Potassium, Dissolved	13	13	2.4	2.5875	2.9	-	-	-	Yes	53	0	0.05	No	HQ was below 1
SODIUM	13	13	14	14.625	15	-	-	-	Yes	680	0	0.02	No	HQ was below 1
Sodium, Dissolved	13	13	14	14.75	15	-	-	-	Yes	680	0	0.02	No	HQ was below 1
CYANIDE	13	5	0.0055	0.008457	0.013	0.0052	3	2.50	Yes	0.0078	1	1.67	No	Low magnitude and frequency of exceedanc

Notes:
-, Unqualified
U, Undetected
J, Estimated value
R, Data was rejected
Samples shown in yellow exceed screening value
Samples shown in orange exceed refinement value
Screened COPEC are blacked out

TABLE 13: CONSTITUENTS DETECTED IN GROUNDWATER ABOVE SCREENING LEVEL				
Inorganic Constituent	**2002 (mg/L)[a]**	**2000 (mg/L)[a]**	**Screening Level (mg/l)[f]**	**Basis of Screening Level[f]**
Cadmium (total)[d]	0.0053	NA[h]	0.005	Primary MCL[g]
Organic Constituent	**2002 (ug/L)**	**2000 (ug/L)**	**Screening Level (ug/l)**	**Basis of Screening Level**
Aldrin	0.05U	0.015J 0.22/0.05U[e]	0.004	PRG
Alpha BHC	0.011J (Background well)	0.09J (Background well)	0.006	Florida Minimum Criteria
Beta BHC	0.48 (Background well)	0.47J (Background well)	0.02	Florida Minimum Criteria
Dieldrin	0.045J	NA	0.0042	Region 9 PRG
Heptachlor	0.05U	0.032J 0.13	0.4	Federal MCL
Heptachlor Epoxide	0.05U	0.39/(0.05U)[e]	0.2	State Primary MCL
p,p-DDE	0.10U	0.2/(0.1U)[e]	0.1	Florida minimum Criteria
p,p-DDT	0.10U	0.33/(0.1UJ)[e]	0.1	Florida Minimum Criteria
PCB-1016	1.0U	3/(1U)[e] 1.5/(1U)[e]	0.5	Federal MCL
Tetrachloroethene	17/(10U)[e]	NA	3	State Primary MCL

TABLE 13: CONSTITUENTS DETECTED IN GROUNDWATER ABOVE SCREENING LEVEL

Notes:

a. 2002 - 14 wells sampled for target analyte list, 13 wells sampled for target compound list, three wells sampled for volatile organics, four wells analyzed for dioxin.
   2000 - 15 wells sampled for 10 metals (arsenic, barium, beryllium, cobalt, lead, mercury, nickel, selenium, vanadium, zinc; 15 wells sampled for target compound list,

b. U means the constituent was analyzed for but not detected.

c. J (organic), B (inorganic) means the constituent was detected above the method detection limit but below the reporting limit

d. 0.0046B is the dissolved cadmium concentration

e. The well was re-sampled.

f. Screening Criteria is the Drinking Water Standard, if available. If a Drinking Water Standard is not available, then the Screening Criteria is the lower of the Region 9 Preliminary Remediation Goal (PRG - 10/01/02) and the Florida Groundwater Concentration Level (May 1999).

g. MCL means Maximum Contaminant Level

h. NA means not analyzed.

Brown's Dump Record of Decision - Table 14

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

BROWN'S DUMP

JACKSONVILLE, FLORIDA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Onsite/ Offsite	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface soil	Surface soil	Unrestricted School Property	Resident	Adult	Ingestion Dermal	Onsite	Quant Quant	Hypothetical adult residents may be exposed to contaminants in surface soil.
						Ingestion			
					Child	Ingestion Dermal	Onsite	Quant Quant	Hypothetical child residents may be exposed to contaminants in surface soil.
			Restricted Area North of School	Resident	Adult	Ingestion Dermal	Onsite	Quant Quant	Hypothetical adult residents may be exposed to contaminants in surface soil.
					Child	Ingestion Dermal	Onsite	Quant Quant	Hypothetical child residents may be exposed to contaminants in surface soil.
		Air	Unrestricted School Property	Resident	Adult	Inhalation	Onsite	Qual	Hypothetical adult residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions.
					Child	Inhalation	Onsite	Qual	Hypothetical child residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions.
			Restricted Area North of School	Resident	Adult	Inhalation	Onsite	Qual	Hypothetical adult residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions.
					Child	Inhalation	Onsite	Qual	Hypothetical child residents may be exposed to airborne contaminants via inhalation of VOCs or fugitive dust emissions.
	Surface water	Surface water	Moncrief Creek	Resident	Adult	Dermal Ingestion	Onsite	Quant Quant	Hypothetical adult residents may be exposed to contaminants in Moncrief Creek while using it for recreational purposes.
					Child	Dermal Ingestion	Onsite	Quant Quant	Hypothetical child residents may be exposed to contaminants in Moncrief Creek while using it for recreational purposes.
Future	Soil	Surface soil	Unrestricted School Property	Resident	Adult	Dermal Ingestion	Onsite	Quant Quant	Hypothetical adult residents may be exposed to contaminants in surface soil.
					Child	Dermal Ingestion	Onsite	Quant Quant	Hypothetical child residents may be exposed to contaminants in surface soil.
			Restricted Area North of School	Resident	Adult	Dermal Ingestion	Onsite	Quant Quant	Hypothetical adult residents may be exposed to contaminants in surface soil.
					Child	Dermal Ingestion	Onsite	Quant Quant	Hypothetical child residents may be exposed to contaminants in surface soil.
		Subsurface soil	Unrestricted School Property	Resident	Adult	Dermal Ingestion	Onsite	Quant Quant	Hypothetical adult residents may be exposed to contaminants in subsurface soil brought to the surface during construction activities.
					Child	Dermal Ingestion	Onsite	Quant Quant	Hypothetical child residents may be exposed to contaminants in subsurface soil brought to the surface during construction activities.
			Restricted Area North of School	Resident	Adult	Dermal Ingestion	Onsite	Quant Quant	Hypothetical adult residents may be exposed to contaminants in subsurface soil brought to the surface during construction activities.
						Ingestion		Quant	

TABLE 15: COPCs IDENTIFIED IN THE BHHRA FOR THE NORTHERN AND SOUTHERN SCHOOL PROPERTY (I.E., AREA 1[a])

Soil	Surface Water	Groundwater
aluminum	aluminum	aldrin
antimony	arsenic	aroclor 1016
aroclor 1260	barium	arsenic
arsenic	chromium	gamma-chlordane
barium	iron	DDE
cadmium	manganese	heptachlor
carcinogenic PAHs		heptachlor epoxide
chromium		iron
copper		manganese
pesticides		
dioxins		
iron		
lead		
manganese		
vanadium		
zinc		

TABLE 15: COPCs IDENTIFIED IN THE BHHRA FOR THE NORTHERN AND SOUTHERN SCHOOL PROPERTY (I.E., AREA 1[a])		
Soil	**Surface Water**	**Groundwater**

NOTE:

a. Area 1 is comprised of the Northern (Exposure Unit 1) and Southern (Exposure Unit 2) School Properties.

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
BROWN'S DUMP

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source Target Organ	Date (2) (MM/DD/YY)
Chloroform	6.1E-03	80%	7.6E-03	(mg/kg-day)-1	B2	IRIS	11/26/00
Benzo(a)pyrene	7.3E+00	58%	1.26E+01	(mg/kg-day)-1	B2	IRIS	11/26/00
Aldrin	1.7E+01	50%	3 4E+01	(mg/kg-day)-1	B2	IRIS	11/26/00
Dieldrin	1.6E+01	50%	3.2E+01	(mg/kg-day)-1	B2	IRIS	11/26/00
Arsenic	1.5E+00	95%	1.6E+00	(mg/kg-day)-1	A	IRIS	11/26/00
Beryllium	N/A	N/A	N/A	N/A	B1	IRIS	11/26/00
Cadmium	N/A	N/A	N/A	N/A	B1	IRIS	11/26/00
Chromium VI	N/A	N/A	N/A	N/A	A	IRIS	11/26/00
1,1-Dichloroethene	6.0E-01	80%	7.5E+01	(mg/kg-day)-1	C	IRIS	11/26/00
1,4-Dichlorobenzene	2.4E-02	80%	3.0E-02	(mg/kg-day)-1	C	IRIS	11/26/00
Alpha BHC	6.3E+00	50%	1.2E+01	(mg/kg-day)-1	B2	IRIS	11/26/00
Benzene	1.5E-02 to 5.5E-02	97%	1.5E-02 to 5.5E-02	(mg/kg-day)-1	A	IRIS	11/26/00
Beta BHC	1.8E+00	91%	2.0E+00	(mg/kg-day)-1	C	IRIS	11/26/00
bis (2-Ethylhexyl)Phthalate	1.4E-02	55%	2.5E-02	(mg/kg-day)-1	B2	IRIS	11/26/00
Carbazole	2E-02	50%	4E-02	(mg/kg-day)-1	B2	HEAST	07/01/97
Chloroform	6.1E-03	80%	7.6E-03	(mg/kg-day)-1	B2	IRIS	11/26/00
Chloromethane	1.3E-02	100%	1.3E-02	(mg/kg-day)-1	C	HEAST	07/01/97
Gamma BHC (Lindane)	1.3E+00	50%	2.6E+00	(mg/kg-day)-1	B2/C	HEAST	07/01/97
Chlordane	3.5E-01	50%	7.0E+01	(mg/kg-day)-1	B2	IRIS	11/26/00
Heptachlor	4.5E+00	50%	9 0E+00	(mg/kg-day)-1	B2	IRIS	11/26/00
Heptachlor Epoxide	9.1E+00	50%	1.82E+01	(mg/kg-day)-1	B2	IRIS	11/26/00
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Methylene Chloride	7.5E-03	80%	9.4E-03	(mg/kg-day)-1	B2	IRIS	11/26/00
p,p' - DDD	2.4E-01	50%	4.8E-01	(mg/kg-day)-1	B2	IRIS	11/26/00
p,p' - DDE	3.4E-01	50%	6.8E-01	(mg/kg-day)-1	B2	IRIS	11/26/00
p,p' - DDT	3.4E-01	50%	6.8E-01	(mg/kg-day)-1	B2	IRIS	11/26/00
PCB - 1016 (Aroclor 1016)	7E-02	50%	1.4E-01	(mg/kg-day)-1	B2	IRIS	11/26/00
Pentachlorophenol	1.2E-01	50%	2.4E-01	(mg/kg-day)-1	B2	IRIS	11/26/00
TEQ of 2,3,7,8 - TCDD	1.5E+05	50%	3.0E+05	(mg/kg-day)-1	B2	HEAST	07/01/97
Trichloroethylene (TCE)	1.1E-02	100%	1.1E-02	(mg/kg-day)-1		NCEA	04/13/00
PCB-1260 (Aroclor 1260)	2.0E+00	50%	4E+00	(mg/kg-day)-1	B2	IRIS	11/26/00

N/A = Not Available

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables
NCEA= National Center for Environmental Assessment

(1) Explanation of derivation provided in Section 4.2.2.2 of the text.
(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
NCEA values obtained from Region III RBC Table, dated 04/13/00.

EPA Group:
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen
- E - Evidence of noncarcinogenicity

Weight of Evidence:
- Known/Likely
- Cannot be Determined
- Not Likely

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
BROWN'S DUMP

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (2) (MM/DD/YY)
Aldrin	4.9E-03	(ug/m3)-1	3,500	1.7E+01	(mg/kg-day)-1	B2	IRIS	11/26/00
Chloroform	2.3E-05	(ug/m3)-1	3,500	8.1E-02	(mg/kg-day)-1	B2	IRIS	11/26/00
Benzo(a)pyrene						B2	IRIS	11/26/00
Dieldrin	4.6E-03	(ug/m3)-1	3,500	1.6E+01	(mg/kg-day)-1	B2	IRIS	11/26/00
Arsenic	4.3E-03	(ug/m3)-1	3,500	1.5E+01	(mg/kg-day)-1	A	IRIS	11/26/00
Beryllium	2.4E-03	(ug/m3)-1	3,500	8.4E+00	(mg/kg-day)-1	B1	IRIS	11/26/00
Cadmium	1.8E-03	(ug/m3)-1	3,500	6.3E+00	(mg/kg-day)-1	B1	IRIS	11/26/00
Chromium VI	1.2E-02	(ug/m3)-1	3,500	4.2E+01	(mg/kg-day)-1	A	IRIS/HEAST	11/26/00
1,1-Dichloroethene	5.0E-05	(ug/m3)-1	3,500	1.8E-001	(mg/kg-day)-1	C	IRIS	11/26/00
1,4-Dichlorobenzene	N/A	N/A	N/A	N/A	N/A	C	HEAST	07/01/97
Alpha BHC	1.8E-03	(ug/m3)-1	3,500	6.3E+00	(mg/kg-day)-1	B2	IRIS	11/26/00
Benzene	2.2E-06 to 7.8E-06	(ug/m3)-1	3,500	7.7E-03 to 2.7E-02	(mg/kg-day)-1	A	IRIS	11/26/00
Carbazole	5.7E-07	(ug/m3)-1	3,500	2.0E-03	(mg/kg-day)-1	B2	HEAST	07/01/97
Benzo(a)anthracene	N/A	N/A	N/A	N/A	N/A	B2	IRIS	11/26/00
Beta BHC	5.3E-04	(ug/m3)-1	3,500	1.9E+00	(mg/kg-day)-1	C	IRIS	11/26/00
Chloromethane	1.8E-06	(ug/m3)-1	3,500	6.3E-03	(mg/kg-day)-1	C	HEAST	07/01/97
Chloroform	2.3E-05	(ug/m3)-1	3,500	8.1E-02	(mg/kg-day)-1	B2	IRIS	11/26/00
Chlordane	1.0E-04	(ug/m3)-1	3,500	3.5E-01	(mg/kg-day)-1	B2	IRIS	11/26/00
Heptachlor	1.3E-03	(ug/m3)-1	3,500	4.6E+00	(mg/kg-day)-1	B2	IRIS	11/26/00
Heptachlor Epoxide	2.6E-03	(ug/m3)-1	3,500	9.1E+00	(mg/kg-day)-1	B2	IRIS	11/26/00
Lead	N/A	N/A	N/A	N/A	N/A	B2	IRIS	11/26/00
p,p'-DDD	N/A	N/A	N/A	N/A	N/A	B2	IRIS	11/26/00
p,p'-DDE	N/A	N/A	N/A	N/A	N/A	B2	IRIS	11/26/00
p,p'-DDT	N/A	N/A	N/A	N/A	N/A	B2	IRIS	11/26/00
Pentachlorophenol	N/A	N/A	N/A	N/A	N/A	B2	IRIS	11/26/00
TEQ of 2,3,7,8 - TCDD	3.3E-11	(ug/m3)-1	3,500	1.2E-07	(mg/kg-day)-1	B2	HEAST	07/01/97

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables
NCEA= National Center for Environmental Assessment

(1) Explanation of derivation provided in Section 4.2.2.2 of the text.
(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.

EPA Group:
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen
- E - Evidence of noncarcinogenicity

Weight of Evidence:
- Known/Likely
- Cannot be Determined
- Not Likely

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
BROWN'S DUMP

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Acenaphthene	Chronic	6E-02	mg/kg-day	50%	3.0E-02	mg/kg-day	Liver	3000	IRIS	11/20/2000
Acenaphthylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acetone	Chronic	1E-01	mg/kg-day	83%	8.3E-02	mg/kg-day	Liver, Kidney	1000	IRIS	11/20/2000
Aldrin	Chronic	3E-05	mg/kg-day	50%	1.5E-05	mg/kg-day	Liver	1000	IRIS	11/20/2000
Alpha BHC (Alpha Hexachlorocyclohexane)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Alpha Endosulfan (Endosulfan I)	Chronic	6E-03	mg/kg-day	50%	3.0E-003	mg/kg-day	Kidney	100	IRIS	11/20/2000
Aluminum	Chronic	1E+00	mg/kg-day	10%	1.0E-01	mg/kg-day			NCEA	04/13/2000
Anthracene	Chronic	3E-01	mg/kg-day	50%	1.5E-002	mg/kg-day	N/A	3000	IRIS	11/20/2000
Antimony	Chronic	4E-04	mg/kg-day	1%	4.0E-06	mg/kg-day	Blood	1000	IRIS	11/20/2000
Arsenic	Chronic	3E-04	mg/kg-day	95%	2.9E-004	mg/kg-day	Skin	3	IRIS	11/20/2000
Barium	Chronic	7E-02	mg/kg-day	7%	4.9E-03	mg/kg-day	Kidney	3	IRIS	11/20/2000
Benzene	Chronic	3E-03	mg/kg-day	97%	3E-03	mg/kg-day			NCEA	04/13/2000
Benzo(a)Anthracene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)Pyrene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(b)Fluoranthene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(g,h,i)Perylene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(k)Fluoranthene	Chronic	1E-02	mg/kg-day	80%	8.0E-03	mg/kg-day	Liver	1000	IRIS	11/20/2000
Benzyl Butyl Phthalate	Chronic	2E-01	mg/kg-day	50%	1E-01	mg/kg-day	Liver	1000	IRIS	11/20/2000
Beryllium	Chronic	2E-03	mg/kg-day	20%	4.0E-004	mg/kg-day	Small Intestine	300	IRIS	11/20/2000
Beta BHC (Beta Hexachlorocyclohexane)	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)Phthalate	Chronic	2E-02	mg/kg-day	55%	1.1E-02	mg/kg-day	Liver	1000	IRIS	11/20/2000
Cadmium	Chronic	5E-04	mg/kg-day	5%	2.5E-05	mg/kg-day	Kidney	10	IRIS	11/20/2000
Carbazole	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Carbon Disulfide	Chronic	1E-01	mg/kg-day	80%	8.0E-002	mg/kg-day	Fetus	100	IRIS	11/20/2000
Chlorobenzene	Chronic	2E-02	mg/kg-day	31%	6.2E-003	mg/kg-day	Liver	1000	IRIS	11/20/2000
Chlordane	Chronic	5.0E-004	mg/kg-day	50%	2.5E-004	mg/kg-day	N/A	300	IRIS	11/20/2000
Chloroethane	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chloroform	Chronic	1E-02	mg/kg-day	80%	8.0E-003	mg/kg-day	Liver	1000	IRIS	11/20/2000
Chloromethane	Chronic	1.6E+00	ug/l	100%			Lungs	1000	IRIS	11/20/2000
Chromium VI	Chronic	3E-03	mg/kg-day	2%	6.0E-05	mg/kg-day	Skin	900	IRIS	11/20/2000
Chrysene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	Chronic	6E-02	mg/kg-day	20%	1.2E-02	mg/kg-day			NCEA	04/13/2000
Copper	Chronic	1E+000	mg/kg-day	20%	2.6E-001	mg/kg-day	GI Tract	20	HEAST	07/01/1997
Cyanide	Chronic	2E-02	mg/kg-day	20%	4.0E-003	mg/kg-day	Whole Body	500	IRIS	11/20/2000
p,p'-DDD	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
p,p'-DDE	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
p,p'-DDT	Chronic	5E-04	mg/kg-day	50%	2.5E-004	mg/kg-day	Liver	100	IRIS	11/20/2000

TABLE 5.1
NON-CANCER TOXICITY DATA – ORAL/DERMAL
BROWN'S DUMP

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Dibenz(a,h)Anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dibenzofuran	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,1-Dichloroethene	Chronic	1E-01	mg/kg-day	80%	8.0E-02	mg/kg-day	None Observed	1000	HEAST	07/01/1997
Dieldrin	Chronic	5E-05	mg/kg-day	50%	2.5E-05	mg/kg-day	Liver	100	IRIS	11/20/2000
Di-n-Octylphthalate	Chronic	2E-02	mg/kg-day	50%	1E-02	mg/kg-day	Kidney/Liver	1000	HEAST	07/01/1997
Endrin	Chronic	3E-04	mg/kg-day	50%	1.5E-04	mg/kg-day	Liver	100	IRIS	11/20/2000
Endrin Aldehyde	Chronic	3E-04	mg/kg-day	50%	1.5E-05	mg/kg-day	Liver	100	IRIS	11/20/2000
Ethylbenzene	Chronic	1E-01	mg/kg-day	80%	8.0E-02	mg/kg-day	Liver/Kidney	1000	IRIS	11/20/2000
Fluoranthene	Chronic	4E-02	mg/kg-day	50%	2.0E-02	mg/kg-day	Liver	3000	IRIS	11/20/2000
Fluorene	Chronic	4E-02	mg/kg-day	58%	2.3E-02	mg/kg-day	Deceased Cell Count	3000	IRIS	11/20/2000
gamma BHC (Lindane)	Chronic	3E-04	mg/kg-day	50%	1.5E-04	mg/kg-day	Liver/Kidney	1000	IRIS	11/20/2000
Heptachlor	Chronic	5E-04	mg/kg-day	50%	2.5E-04	mg/kg-day	Liver	300	IRIS	11/20/2000
Heptachlor Epoxide	Chronic	1.3E-05	mg/kg-day	50%	6.5E-06	mg/kg-day	Liver	1000	IRIS	11/20/2000
Indeno(1,2,3-c,d)Pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	Chronic	3E-01	mg/kg-day	15%	4.5E-02	mg/kg-day			NCEA	04/13/2000
Isopropylbenzene (Cumene)	Subchronic	4E-01	mg/kg-day	80%	3.2E-01	mg/kg-day	Kidney	300	HEAST	07/01/1997
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M, P-Xylene	Chronic	2E+00	mg/kg-day	80%	1.6E+00	mg/kg-day	Body Weight	100	IRIS	11/20/2000
Manganese (water)	Chronic	2E-02	mg/kg-day	5%	1.0E-03	mg/kg-day	CNS	3	IRIS	11/20/2000
Manganese (soil)	Chronic	7E-02	mg/kg-day	5%	3.5E-03	mg/kg-day	CNS	1	N/A	N/A
Mercury (elemental)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Methyl Mercury	Chronic	1E-04	mg/kg-day	20%	2E-05	mg/kg-day	Nervous System	10	IRIS	11/20/2000
Methyl Ethyl Ketone (2-Butanone)	Chronic	6E-01	mg/kg-day	80%	4.8E-001	mg/kg-day	Fetus	3000	IRIS	11/20/2000
Methylene Chloride	Chronic	6E-02	mg/kg-day	80%	4.8E-002	mg/kg-day	Liver	100	IRIS	11/20/2000
Naphthalene	Chronic	2E-02	mg/kg-day	50%	1.0E-02	mg/kg-day	Body Weight	3000	IRIS	11/20/2000
Nickel	Chronic	2E-02	mg/kg-day	27%	5.4E-03	mg/kg-day	Body Weight	300	IRIS	11/20/2000
O-Xylene	Chronic	2E+00	mg/kg-day	80%	1.6E+000	mg/kg-day	Whole Body	100	IRIS	11/20/2000
PCB-1016 (Aroclor 1016)	Chronic	7E-05	mg/kg-day	50%	2.5E-007	mg/kg-day	Fetus	100	IRIS	11/20/2000
PCB-1260 (Aroclor 1260)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pentachlorophenol	Chronic	3E-02	mg/kg-day	50%	1.5E-002	mg/kg-day	Liver/Kidney	100	IRIS	11/20/2000
Phenanthrene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pyrene	Chronic	3E-02	mg/kg-day	87%	2.6E-002	mg/kg-day	Kidney	3000	IRIS	11/20/2000
Selenium	Chronic	5E-03	mg/kg-day	20%	1.0E-003	mg/kg-day	Whole Body	3	IRIS	11/20/2000
Silver	Chronic	5E-03	mg/kg-day	20%	1.0E-03	mg/kg-day	Skin	3	IRIS	11/20/2000
TEQ of 2,3,7,8-TCDD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	Chronic	8E-05	mg/kg-day	15%	1.2E-05	mg/kg-day	NOAEL	3000	IRIS	11/20/2000
Toluene	Chronic	2E-01	mg/kg-day	80%	1.6E-001	mg/kg-day	Liver/Kidney	1000	IRIS	11/20/2000
Trichloroethylene (TCE)	Chronic	6E-03	mg/kg-day	100%	6E-03	mg/kg-day			NCEA	04/13/2000

TABLE 5.1
NON-CANCER TOXICITY DATA – ORAL/DERMAL
BROWN'S DUMP

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Trichlorofluoromethane	Chronic	3E-01	mg/kg-day	80%	2.4E-001	mg/kg-day	Whole Body	1000	IRIS	11/20/2000
Vanadium	Chronic	7E-03	mg/kg-day	20%	1.4E-03	mg/kg-day	N/A	100	HEAST	11/20/2000
Xylenes, Total	Chronic	2E+00	mg/kg-day	80%	1.6E+00	mg/kg-day	Body Weight	100	IRIS	11/20/2000
Zinc	Chronic	3E-01	mg/kg-day	20%	6.0E-02	mg/kg-day	Blood	3	IRIS	11/20/2000

N/A = Not Applicable
CNS = Central nervous system
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
NCEA = National Center for Environmental Assessment
Other = Region III Risk-Based Concentration Table
(1) Refer to RAGS, Part A and text for an explanation.
(2) Provide equation used for derivation.
(3) For IRIS values, provided the date IRIS was searched.
For HEAST values, provided the date of HEAST.
NCEA values obtained from Region III RBC Table, dated 04/13/00.

TABLE 5.2
NON-CANCER TOXICITY DATA – INHALATION
BROWN'S DUMP

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (2) (MM/DD/YY)
Chloroform	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ethylbenzene	Chronic	1E+00	mg/m3	**2.9E-01**	mg/kg-day	Developmental	300	IRIS	11/20/2000
(3- and/or 4-)Methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Xylene (Total)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Napthalene	Chronic	3E-03	mg/m3	**9.0E-04**	mg/kg-day	Respiratory Tract	3000	IRIS	11/20/2000
Aldrin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dieldrin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Barium	Chronic	N/A	N/A	**1.4E-04**	mg/kg-day	N/A	N/A	N/A	N/A
Beryllium	Chronic	2E-02	ug/m3	**5.7E-06**	mg/kg-day	Respiratory Tract	10	IRIS	11/20/2000
Cadmium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chloroethane	Chronic	1E+01	mg/m3	2.9E+00	mg/kg-day	Fetus	300	IRIS	11/20/2000
Chromium VI	Chronic	1E-04	mg/m3	**2.9E-05**	mg/kg-day	Respiratory Tract	300	IRIS	11/20/2000
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,4-Dichlorobenzene	Chronic	8E-01	mg/m3	2.3E-01	mg/kg-day	Liver	100	IRIS	11/20/2000
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese (soil)	Chronic	5E-05	mg/m3	**1.4E-05**	mg/kg-day	CNS	1,000	IRIS	11/20/2000
Manganese (water)	Chronic	5E-05	mg/m3	**1.4E-05**	mg/kg-day	CNS	1,000	IRIS	11/20/2000
Mercury Chloride	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mercury (elemental)	Chronic	3E-04	mg/m3	**8.6E-05**	mg/kg-day	Nervous System	30	IRIS	11/20/2000
Methyl Mercury	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A = Not Applicable
CNS = Central nervous system
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessment Summary Tables
NCEA = National Center for Environmental Assessment
(1) Explanation of derivation provided in text.
(2) For IRIS values, provided the date IRIS was searched.
For HEAST values, provided the date of HEAST.

TABLE 10.4.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Exposure Unit 1 (Unrestricted School Property)											
			CPAHs	1.1E-005		8.7E-006	2.0E-005						
			2,3,7,8-TCDD (TEQ) Dioxin	1.4E-006		1.4E-006	2.8E-006						
			Arsenic	4.3E-006		2.2E-007	4.5E-006						
			(Total)	1.7E-005		1.0E-005	3E-005						
Groundwater	Groundwater	Tap											
			Aldrin	4.9E-006			4.9E-006						
			Heptachlor	2.4E-006			2.4E-006						
			Heptachlor Epoxide	2.8E-006			2.8E-006						
			Arsenic	3.3E-005			3.3E-005						
			(Total)	4.3E-005			4E-005						
			Total Risk Across All Media and All Exposure Routes				7E-005		Total Hazard Index Across All Media and All Exposure Routes				

TABLE 10.5.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Exposure Unit 2 (Restricted Area North of the School)	CPAHs	4.6E-006		3.8E-006	8.4E-006						
			PCB-1260 (Aroclor 1260)	1.6E-006		1.5E-006	3.1E-006						
			2,3,7,8-TCDD (TEQ) - (Dioxin)	7.4E-006		7.1E-006	1.5E-005						
			Arsenic	2.9E-005		1.5E-006	3.1E-005						
			(Total)	4.3E-005		1.4E-005	6E-005						
Groundwater	Groundwater	Tap	Aldrin	4.9E-006			4.9E-006						
			Heptachlor	2.4E-006			2.4E-006						
			Heptachlor Epoxide	2.8E-006			2.8E-006						
			Arsenic	3.3E-005			3.3E-005						
			(Total)	4.3E-005			4E-005						

Total Risk Across All Media and All Exposure Routes: 1E-004

Total Hazard Index Across All Media and All Exposure Routes:

TABLE 10.6.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Subsurface Soil	Exposure Unit 2 (Restricted Area North of the School)	CPAHs	5.6E-006		5.5E-006	1.1E-005						
			2,3,7,8-TCDD (TEQ) - (Dioxin)	8.0E-006		7.7E-006	1.6E-005						
			Arsenic	7.4E-005		3.8E-006	7.8E-005						
			(Total)	8.8E-005		1.7E-005	1E-004						
Groundwater	Groundwater	Tap	Aldrin	4.9E-006			4.9E-006						
			Heptachlor	2.4E-006			2.4E-006						
			Heptachlor Epoxide	2.8E-006			2.8E-006						
			Arsenic	3.3E-005			3.3E-005						
			(Total)	4.3E-005			4E-005						
			Total Risk Across All Media and All Exposure Routes				2E-004		Total Hazard Index Across All Media and All Exposure Routes				

TABLE 10.1.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Exposure Unit 1 (Unrestricted School Property)	CPAHs	2.0E-005		6.8E-006	2.7E-005	Antimony	Blood	1.1E-001		2.1E-001	3.2E-001
			PCB-1260 (Aroclor 1260)	7.7E-007		2.9E-007	1.1E-006	Arsenic	Skin	2.2E-001		4.6E-003	2.2E-001
			2,3,7,8-TCDD (TEQ) Dioxin	2.8E-006		1.1E-006	3.9E-006						
			Arsenic	8.4E-006		1.7E-007	8.6E-006						
			(Total)	3.2E-005		9.6E-006	4E-005	(Total)		0.3		0.09	0.4
Groundwater	Groundwater	Tap	Aldrin	2.4E-006			2.4E-006	Heptachlor Epoxide	Liver	1.4E-001			1.4E-001
			Heptachlor	1.2E-006			1.2E-006	PCB-1016 (Aroclor 1016)	Fetus	1.2E+000			1.2E+000
			Heptachlor Epoxide	1.4E-006			1.4E-006	Arsenic	Skin	4.3E-001			4.3E-001
			Arsenic	1.7E-005			1.7E-005	Manganese	CNS	2.5E-001			2.5E-001
			(Total)	2.2E-005			2E-005	(Total)		2			2
			Total Risk Across All Media and All Exposure Routes				6E-005	Total Hazard Index Across All Media and All Exposure Routes					2

Total Skin HI =	1
Total Blood HI =	0.3
Total Kidney HI =	0.3
Total CNS HI =	0.25
Total Liver HI =	0.1
Total Fetus HI =	1.2

TABLE 10.2.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Exposure Unit 2 (Resrricted Area North of the School)	CPAHs	9.1E-006		3.0E-006	1.2E-005	Antimony	Blood	6.2E-001		1.2E+000	1.8E+000
			Dieldrin	1.0E-006		4.0E-007	1.4E-006	Arsenic	Skin	1.5E+000		3.1E-002	1.5E+000
			PCB-1260 (Aroclor 1260)	3.1E-006		1.2E-006	4.3E-006	Barium	CVS	2.2E-001		6.4E-002	2.8E-001
			2,3,7,8-TCDD (TEQ) - (Dioxin)	1.5E-005		5.5E-006	2.1E-005	Cadmium	Kidney	2.1E-001		8.3E-002	2.9E-001
			Arsenic	5.8E-005		1.2E-006	5.9E-005	Chromium	Skin	3.4E-001		3.4E-001	6.8E-001
								Copper	Skin	1.3E+000		1.3E-001	1.4E+000
								Manganese	CNS	1.5E-001		5.9E-002	2.1E-001
								Zinc	Blood	1.2E-001		1.2E-002	1.3E-001
								Iron	Unknown	4.8E+000		6.4E-001	5.4E+000
								Lead	Unknown	--		--	--
			(Total)	8.6E-005		1.1E-005	1E-004	(Total)		9.3		3	12
Groundwater	Groundwater	Tap	Aldrin	2.4E-006			2.4E-006	Heptachlor Epoxide	Liver	1.4E-001			1.4E-001
			Heptachlor	1.2E-006			1.2E-006	PCB-1016 (Aroclor 1016)	Fetus	1.2E+000			1.2E+000
			Heptachlor Epoxide	1.4E-006			1.4E-006	Arsenic	Skin	4.3E-001			4.3E-001
			Arsenic	1.7E-005			1.7E-005	Manganese	CNS	2.5E-001			2.5E-001
								Iron	Unknown	1.7E-004			1.7E-004
			(Total)	2.2E-005			2E-005	(Total)		2			2
			Total Risk Across All Media and All Exposure Routes				1E-004	Total Hazard Index Across All Media and All Exposure Routes					14

Total Blood HI =	7
Total Skin HI =	4
Total CVS HI =	0.3
Total Kidney HI =	0.5
Total CNS HI =	0.1
Total Liver HI =	0.1
Total Fetus HI =	1.2

TABLE 10.3.RME
RISK ASSESSMENT SUMMARY
REASONABLE MAXIMUM EXPOSURE
BROWN'S DUMP SITE

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Subsurface Soil	Exposure Unit 2 (Resrricted Area North of the School)											
			CPAHs	1.1E-005		4.3E-006	1.5E-005	Aluminum		1.3E-001		2 6E-002	1.6E-001
			Arsenic	1.5E-004		3.0E-006	1 5E-004	Antimony	Blood	1.3E+000		2.7E+000	4.0E+000
			2,3,7,8-TCDD (TEQ) - (Dioxin)	1.6E-005		6.0E-005	2.2E-005	Arsenic	Skin	3.8E+000		7.9E-002	3 9E+000
								Barium	CVS	2.2E-001		6.4E-002	2.8E-001
								Cadmium	Kidney	3.4E-001		1.4E-001	4.8E-001
								Chromium	Skin	5.6E-001		5.6E-001	1.1E+000
								Copper	Skin	4.2E-001		4 2E-002	4.6E-001
								Lead		--		--	--
								Manganese	CNS	2.6E-001		1.0E-001	3.6E-001
								Iron	Unknown	4.8E+000		6.4E-001	5.4E+000
			(Total)	1 8E-004		6.7E-005	2E-004	(Total)		12		4	16
Groundwater	Groundwater	Tap											
			Aldrin	2.4E-006			2.4E-006	Heptachlor Epoxide	Liver	1.4E-001			1.4E-001
			Heptachlor	1.2E-006			1.2E-006	PCB-1016 (Aroclor 1016)	Fetus	1.2E+000			1.2E+000
			Heptachlor Epoxide	1.4E-006			1.4E-006	Arsenic	Skin	4.3E-001			4.3E-001
			Arsenic	1.7E-005			1.7E-005	Manganese	CNS	2.5E-001			2 5E-001
			(Total)	2.2E-005			2E-005	(Total)		2			2
			Total Risk Across All Media and All Exposure Routes				3E-004	Total Hazard Index Across All Media and All Exposure Routes					18

Total Blood HI =	4
Total Skin HI =	2
Total CVS HI =	0.3
Total Kidney HI =	0.7
Total CNS HI =	1
Total Liver HI =	0.1
Total Fetus HI =	1.2

TABLE 20: COCs IDENTIFIED IN THE BHHRA FOR THE NORTHERN AND SOUTHERN SCHOOL PROPERTIES (I.E., AREA 1[a])

Soil	Groundwater
aluminum	aldrin
antimony	aroclor 1016
aroclor 1260	arsenic
arsenic	heptachlor
barium	heptachlor epoxide
cadmium	iron
carcinogenic PAHs	manganese
chromium	
copper	
dieldrin	
iron	
lead	
manganese	
2,3,7,8-TCDD (dioxin)	
zinc	

NOTE:

a. Area 1 is comprised of the Northern (Exposure Unit 1) and Southern (Exposure Unit 2) School Properties.

TABLE 21: REFINED LIST OF COCs FROM THE BHHRA FOR THE NORTHERN AND SOUTHERN SCHOOL PROPERTIES (I.E., AREA 1[a])

Soil	Groundwater
antimony	aroclor 1016
PCB 1260 (Aroclor 1260)	manganese
arsenic	
barium	
cadmium	
carcinogenic PAHs (benzo(a)pyrene)	
copper	
lead	
manganese	
zinc	
2,3,7,8-TCDD (dioxin)	

NOTE:

a. Area 1 is comprised of the Northern (Exposure Unit 1) and Southern (Exposure Unit 2) School Properties.

Brown's Dump Record of Decision - Table 22

TABLE 6.13.1
SURFACE SOIL SAMPLES COLLECTED IN YARDS
CANCER RISK AND HAZARD CALCULATIONS
CHILD AND ADULT
BROWN'S DUMP

Station ID	Compound	Final Result Used	Units	EPC	Units	CPAHs -TEF	Child - Intake - Ingestion - Noncancer	Child - Intake - Dermal - Noncancer	Child - Intake - Ingestion - Cancer	Child - Intake -Dermal - Cancer	Adult - Intake - Ingestion - Cancer	Adult - Intake - Dermal - Cancer	Reference Dose - Oral	Reference Dose - Dermal	Slope Factor - Oral	Slope Factor - Dermal	Child Hazard - Ingestion	Child Hazard Dermal	Child Risk - Ingestion	Child Risk Dermal	Adult Risk - Ingestion	Adult Risk Dermal	Total Child Hazard	Total Child Risk	Total Adult Risk	Total Lifetime Risk
BDSB009	LEAD	39000	MG/KG	39000	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	–	–	–	–	–	–	–	–	–	–	–	–	–	
BDSB009	Aluminum	26000	MG/KG	26000	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	1.0E+00	2.0E-01	–	–	3.4E-01	3.4E-02	–	–	–	–	3.7E-01	–	–	
BDSB009	INDENO(1,2,3-c,d)PYRENE	1800	UG/KG	1.8	MG/KG	0.18	1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
BDSB009	BENZO(a)ANTHRACENE	2500	UG/KG	2.5	MG/KG	0.25	1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
BDSB009	BENZO(b)FLUORANTHENE	2800	UG/KG	2.8	MG/KG	0.28	1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
BDSB009	BENZO(a)PYRENE	3000	UG/KG	3	MG/KG	3	1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
BDSB009	TEF CPAHs	–	–	–	MG/KG	3.83	1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	–	–	7.3E+00	1.5E+01	–	–	2.8E-05	1.1E-05	1.4E-05	1.4E-05	–	3.9E-05	2.9E-05	
																						Totals	4.E-01	3.9E-05	2.9E-05	6.8E-05
BDSB012	LEAD	1300	MG/KG	1300	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	–	–	–	–										
BDSB012	ARSENIC	2.6	MG/KG	2.6	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-04	2.9E-04	1.6E+00	1.6E+00	1.1E-01	2.3E-03	4.3E-06	8.7E-08	2.2E-06	1.1E-07	1.1E-01	4.4E-06	2.3E-06	
BDSB012	ANTIMONY	13	MG/KG	13	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-04	8.0E-05	–	–	4.2E-01	4.2E-02	–	–	–	–	4.6E-01	–	–	
BDSB012	CHROMIUM, TOTAL	66	MG/KG	66	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-03	6.0E-04	–	–	2.9E-01	2.9E-02	–	–	–	–	3.1E-01	–	–	
BDSB012	COPPER	200	MG/KG	200	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-02	8.0E-03	–	–	6.5E-02	6.5E-03	–	–	–	–	7.2E-02	–	–	
BDSB012	MANGANESE	390	MG/KG	390	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	–	–	7.2E-02	7.2E-03	–	–	–	–	8.0E-02	–	-	
BDSB012	BARIUM	810	MG/KG	810	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	–	–	1.5E-01	1.5E-02	–	–	–	–	1.7E-01	–	–	
BDSB012	IRON	12000	MG/KG	12000	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-01	6.0E-02	–	–	5.2E-01	5.2E-02	–	–	–	–	5.7E-01	–	–	
BDSB012	ALDRIN	160	UG/KG	0.16	MG/KG		1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	3.0E-05	1.5E-05	1.7E+01	3.4E+01	6.9E-02	2.8E-02	3.0E-06	1.1E-06	1.5E-06	1.5E-06	9.7E-02	4.1E-06	3.0E-06	
BDSB012	GAMMA-CHLORDANE	480	UG/KG	0.48	MG/KG		1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	5.0E-04	1.6E-02	3.5E-01	7.0E-01	1.2E-02	7.5E-05	1.8E-07	6.8E-08	9.0E-08	8.7E-08	1.2E-02	2.4E-07	1.8E-07	
BDSB012	BENZO(a)PYRENE	320	UG/KG	0.32	MG/KG		1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	-	-	7.3E+00	1.5E+01	–	–	2.6E-06	1.0E-06	1.3E-06	1.3E-06	–	3.6E-06	2.6E-06	
																						Totals	1.9E+00	1.2E-05	8.1E-06	2.0E-05
BDSB182	LEAD	158	MG/KG	158	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	–	–	–	–	–	–	–	–	–	–	–	–	–	
BDSB182	ARSENIC	2.3	MG/KG	2.3	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-04	2.9E-04	1.6E+00	1.6E+00	1.0E-01	2.1E-03	3.8E-06	7.7E-08	1.9E-06	9.9E-08	1.0E-01	3.9E-06	2.0E-06	
BDSB182	COPPER	110	MG/KG	110	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-02	8.0E-03	–	–	3.6E-02	3.6E-03	–	–	–	–	3.9E-02	–	–	
BDSB182	IRON	5550	MG/KG	5550	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-07	5.6E-07	2.7E-07	3.0E-01	6.0E-02	–	–	2.4E-01	2.4E-02	–	–	–	–	2.6E-01	–	–	
BDSB182	PCB-1260 (AROCHLOR 1260)	260	UG/KG	0.26	MG/KG		1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	–	–	2.0E+00	4.0E+00	–	–	5.7E-07	2.2E-07	2.9E-07	2.8E-07	–	7.9E-07	5.7E-07	
BDSB182	BENZO(a)PYRENE	350	UG/KG	0.35	MG/KG		1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	–	–	7.3E+00	1.5E+01	–	–	2.8E-06	1.1E-06	1.4E-06	1.4E-06	–	3.9E-06	2.8E-06	
BDSB182	TEQ OF 2,3,7,8-TCDD	39.6	NG/KG	3.96E-05	MG/KG		1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	–	–	1.5E+05	3.0E+05	–	–	6.5E-06	2.5E-06	3.3E-06	3.2E-06	–	9.0E-06	6.5E-06	
																						Totals	4.1E-01	1.6E-05	1.2E-05	3.0E-05

TABLE 8.13.1
SURFACE SOIL SAMPLES COLLECTED IN YARDS
CANCER RISK AND HAZARD CALCULATIONS
CHILD AND ADULT
BROWN'S DUMP

Station ID	Compound	Final Result Used	Units	EPC	Units	CPAHs -TEF	Child - Intake - Ingestion - Noncancer	Child - Intake - Dermal - Noncancer	Child - Intake - Ingestion - Cancer	Child - Intake -Dermal - Cancer	Adult - Intake - Ingestion - Cancer	Adult - Intake - Dermal - Cancer	Reference Dose - Oral	Reference Dose - Dermal	Slope Factor - Oral	Slope Factor - Dermal	Child Hazard - Ingestion	Child Hazard Dermal	Child Risk - Ingestion	Child Risk Dermal	Adult Risk - Ingestion	Adult Risk Dermal	Total Child Hazard	Total Child Risk	Total Adult Risk	Total Lifetime Risk
BDSB097	LEAD	2600	MG/KG	2600	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	-	-	-	-	-	-	-	-	-	-	-	-	-	
BDSB097	CADMIUM	8.7	MG/KG	8.7	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	5.0E-04	1.0E-04	-	-	2.3E-01	2.3E-02	-	-	-	-	2.5E-01	-	-	
BDSB097	VANADIUM	17	MG/KG	17	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-03	1.4E-03	-	-	3.2E-02	3.2E-03	-	-	-	-	3.5E-02	-	-	
BDSB097	ARSENIC	21	MG/KG	21	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-04	2.9E-04	1.5E+00	1.6E+00	9.1E-01	1.9E-02	3.5E-05	7.1E-07	1.8E-05	9.1E-07	9.3E-01	3.5E-05	1.9E-05	
BDSB097	ANTIMONY	22	MG/KG	22	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.8E-07	2.7E-08	4.0E-04	8.0E-06	-	-	7.2E-01	7.2E-02	-	-	-	-	7.9E-01	-	-	
BDSB097	CHROMIUM, TOTAL	81	MG/KG	81	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-03	6.0E-04	-	-	3.6E-01	3.5E-02	-	-	-	-	3.9E-01	-	-	
BDSB097	COPPER	480	MG/KG	480	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-02	8.0E-03	-	-	1.5E-01	1.5E-02	-	-	-	-	1.6E-01	-	-	
BDSB097	BARIUM	740	MG/KG	740	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	-	-	1.4E-01	1.4E-02	-	-	-	-	1.5E-01	-	-	
BDSB097	MANGANESE	760	MG/KG	760	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	-	-	1.4E-01	1.4E-02	-	-	-	-	1.0E-01	-	-	
BDSB097	IRON	110000	MG/KG	110000	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-01	6.0E-02	-	-	4.8E+00	4.8E-01	-	-	-	-	5.2E+00	-	-	
BDSB097	BENZO(a)PYRENE	120	UG/KG	0.12	MG/KG		1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	-	-	7.3E+00	1.5E+01	-	-	9.6E-07	3.8E-07	4.9E-07	4.9E-07	-	1.3E-06	9.8E-07	
BDSB097	TEQ OF 2,3,7,8-TCDD	168.7	NG/KG	0.0001687	MG/KG		1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	-	-	1.5E+05	3.0E+05	-	-	2.8E-05	1.1E-05	1.4E-05	1.4E-05	-	3.8E-05	2.8E-05	
																						Totals	8.1E+00	7.8E-05	4.7E-05	1.2E-04
BDSB045	LEAD	2100	MG/KG	2100	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	-	-	-	-	-	-	-	-	-	-	-	-	-	
BDSB045	ARSENIC	4.1	MG/KG	4.1	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-04	2.9E-04	1.5E+00	1.6E+00	1.8E-01	3.7E-03	6.8E-06	1.4E-07	3.4E-06	1.8E-07	1.8E-01	6.9E-06	3.6E-06	
BDSB045	CADMIUM	7.2	MG/KG	7.2	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	5.0E-04	1.0E-04	-	-	1.9E-01	1.8E-02	-	-	-	-	2.1E-01	-	-	
BDSB045	ANTIMONY	19	MG/KG	19	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-04	8.0E-06	-	-	6.2E-01	6.2E-02	-	-	-	-	6.8E-01	-	-	
BDSB045	COPPER	200	MG/KG	200	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-02	8.0E-03	-	-	6.5E-02	6.5E-03	-	-	-	-	7.2E-02	-	-	
BDSB045	BARIUM	500	MG/KG	500	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	-	-	9.3E-02	9.3E-03	-	-	-	-	1.0E-01	-	-	
BDSB045	IRON	9100	MG/KG	9100	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-01	6.0E-02	-	-	3.9E-01	3.9E-02	-	-	-	-	4.3E-01	-	-	
BDSB045	BENZO(a)PYRENE	440	UG/KG	0.44	MG/KG		1.3E-06	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	-	-	7.3E+00	1.5E+01	-	-	3.5E-06	1.4E-00	1.8E-06	1.8E-06	-	4.9E-06	3.6E-06	
																							1.7E+00	1.2E-05	7.2E-06	1.9E-05
BDSB101	LEAD	880	MG/KG	880	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	-	-	-	-	-	-	-	-	-	-	-	-	-	
BDSB101	CADMIUM	6.5	MG/KG	6.5	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	5.0E-04	1.0E-04	-	-	1.7E-01	1.7E-02	-	-	-	-	1.9E-01	-	-	
BDSB101	ARSENIC	8	MG/KG	8	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-04	2.9E-04	1.5E+00	1.6E+00	3.5E-01	7.2E-03	1.3E-05	2.7E-07	6.7E-06	3.5E-07	3.5E-01	1.3E-05	7.1E-06	
BDSB101	ANTIMONY	9.8	MG/KG	9.8	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-04	8.0E-06	-	-	3.2E-01	3.2E-02	-	-	-	-	3.5E-01	-	-	
BDSB101	VANADIUM	22	MG/KG	22	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-03	1.4E-03	-	-	4.1E-02	4.1E-03	-	-	-	-	4.5E-02	-	-	
BDSB101	CHROMIUM, TOTAL	39	MG/KG	39	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-03	6.0E-04	-	-	1.7E-01	1.7E-02	-	-	-	-	1.9E-01	-	-	
BDSB101	COPPER	320	MG/KG	320	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-02	8.0E-03	-	-	1.0E-01	1.0E-02	-	-	-	-	1.1E-01	-	-	
BDSB101	BARIUM	380	MG/KG	380	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	-	-	7.1E-02	7.1E-03	-	-	-	-	7.8E-02	-	-	
BDSB101	MANGANESE	380	MG/KG	380	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	-	-	7.1E-02	7.1E-03	-	-	-	-	7.8E-02	-	-	
BDSB101	ZINC	5100	MG/KG	5100	MG/KG		1.3E-06	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-01	6.0E-02	-	-	2.7E-01	2.7E-02	-	-	-	-	2.4E-01	-	-	
BDSB101	IRON	41000	MG/KG	41000	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-01	6.0E-02	-	-	1.8E+00	1.8E-01	-	-	-	-	2.0E+00	-	-	
																							3.6E+00	1.3E-05	7.1E-06	2.1E-05

TABLE B.13.1
SURFACE SOIL SAMPLES COLLECTED IN YARDS
CANCER RISK AND HAZARD CALCULATIONS
CHILD AND ADULT
BROWN'S DUMP

Station ID	Compound	Final Result Used	Units	EPC	Units	CPAHs -TEF	Child - Intake - Ingestion - Noncancer	Child - Intake - Dermal - Noncancer	Child - Intake - Ingestion - Cancer	Child - Intake -Dermal - Cancer	Adult - Intake - Ingestion - Cancer	Adult - Intake - Dermal - Cancer	Reference Dose - Oral	Reference Dose - Dermal	Slope Factor - Oral	Slope Factor - Dermal	Child Hazard - Ingestion	Child Hazard Dermal	Child Risk - Ingestion	Child Risk Dermal	Adult Risk - Ingestion	Adult Risk Dermal	Total Child Hazard	Total Child Risk	Total Adult Risk	Total Lifetime Risk
BDSB130	LEAD	340	MG/KG	340	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	–	–	–	–	–	–	–	–	–	–	–	–	–	
BDSB130	ANTIMONY	3.4	MG/KG	3.4	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-04	8.0E-05	–	–	1.1E-01	1.1E-02	–	–	–	–	1.2E-01	–	–	
BDSB130	ARSENIC	3.5	MG/KG	3.5	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	6.6E-07	2.7E-08	3.0E-04	2.9E-04	1.5E+00	1.6E+00	1.5E-01	3.1E-03	5.8E-06	1.2E-07	2.9E-06	1.5E-07	1.6E-01	5.9E-06	3.1E-06	
BDSB130	CADMIUM	5.1	MG/KG	5.1	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	5.0E-04	1.0E-04	–	–	1.3E-01	1.3E-02	–	–	–	–	1.6E-01	–	–	
BDSB130	CHROMIUM, TOTAL	27	MG/KG	27	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-03	6.0E-04	–	–	1.2E-01	1.2E-02	–	–	–	–	1.3E-01	–	–	
BDSB130	BARIUM	340	MG/KG	340	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	–	–	6.3E-02	6.3E-03	–	–	–	–	6.9E-02	–	–	
BDSB130	ALUMINUM	7900	MG/KG	7900	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	1.0E+00	2.0E-01	–	–	1.0E-01	1.0E-02	–	–	–	–	1.1E-01	–	–	
BDSB130	IRON	10000	MG/KG	10000	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-01	6.0E-02	–	–	4.3E-01	4.3E-02	–	–	–	–	4.8E-01	–	–	
																							1.2E+00	5.9E-06	3.1E-06	9.0E-06
BDSB54	LEAD	630	MG/KG	630	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	–	–	–	–	–	–	–	–	–	–	–	–	–	
BDSB54	ANTIMONY	7.4	MG/KG	7.4	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-04	8.0E-05	–	–	2.4E-01	2.4E-02	–	–	–	–	2.6E-01	–	-	
BDSB54	ARSENIC	12	MG/KG	12	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-04	2.9E-04	1.5E+00	1.5E+00	6.2E-01	1.1E-02	2.0E-05	4.0E-07	1.0E-05	5.2E-07	6.3E-01	2.0E-05	1.1E-05	
BDSB54	CADMIUM	4.3	MG/KG	4.3	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	5.0E-04	1.0E-04	–	–	1.1E-01	1.1E-02	–	–	–	–	1.2E-01	–	–	
BDSB54	CHROMIUM, TOTAL	31	MG/KG	31	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-03	6.0E-04	–	–	1.3E-01	1.3E-02	–	–	–	–	1.5E-01	–	-	
BDSB54	BARIUM	310	MG/KG	310	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	–	–	5.6E-02	5.6E-03	–	–	–	–	6.3E-02	–	–	
BDSB54	IRON	47000	MG/KG	47000	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-01	6.0E-02	–	–	2.0E+00	2.0E-01	–	–	–	–	2.2E+00	–	–	
BDSB54	VANADIUM	16	MG/KG	16	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-03	1.4E-03	–	–	3.0E-02	3.0E-03	–	–	–	–	3.3E-02	–	-	
BDSB54	COPPER	150	MG/KG	150	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	4.0E-02	8.0E-03	–	–	4.9E-02	4.9E-03	–	–	–	–	5.4E-02	–	–	
BDSB54	MANGANESE	390	MG/KG	390	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	7.0E-02	1.4E-02	–	–	7.2E-02	7.2E-03	–	–	–	–	8.0E-02	–	–	
BDSB54	MERCURY	15	MG/KG	15	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	1.0E-04	2.0E-05	–	–	2.0E+00	2.0E-01	–	–	–	–	2.1E+00	–	–	
																							6.7E+00	2.0E-05	1.1E-05	3.1E-05
BDSB014	LEAD	133	MG/KG	133	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	-	–	–	–	–	–	–	–	–	–	–	–	–	
BDSB014	ARSENIC	3.4	MG/KG	3.4	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-04	2.9E-04	1.5E+00	1.6E+00	1.5E-01	3.0E-03	5.6E-06	1.1E-07	2.9E-06	1.5E-07	1.5E-01	5.7E-06	3.0E-06	
BDSB014	IRON	6900	MG/KG	6900	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-01	6.0E-02	–	–	3.0E-01	3.0E-02	–	–	–	–	3.3E-01	–	–	
BDSB014	BENZO(a)PYRENE	170	UG/KG	0.17	MG/KG		1.3E-05	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	-	–	7.3E+00	1.5E-01	–	–	1.4E-06	5.4E-07	6.9E-07	6.9E-07	–	1.9E-06	1.4E-06	
																							4.8E-01	7.6E-06	4.4E-06	1.2E-05
BDSB039	LEAD	128	MG/KG	158	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	-	–	–	–	–	–	–	–	–	–	–	-	–	
BDSB039	ARSENIC	1.3	MG/KG	1.3	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-04	2.9E-04	1.5E+00	1.6E+00	5.6E-02	1.2E-03	2.1E-06	4.4E-08	1.1E-06	5.8E-08	5.7E-02	2.2E-06	1.1E-06	
BDSB039	IRON	2600	MG/KG	2600	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-08	5.6E-07	2.7E-08	3.0E-01	6.0E-02	–	–	1.1E-01	1.1E-02	–	–	–	–	1.2E-01	–	-	
BDSB039	BENZO(a)PYRENE	170	UG/KG	0.17	MG/KG		1.3E-05	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	-	–	7.3E+00	1.5E-01	–	–	1.4E-06	5.4E-07	6.9E-07	6.9E-07	–	1.9E-06	1.4E-06	
BDSB039	TEQ OF 2,3,7,8-TCDD	27.7	NG/KG	2.77E-05	MG/KG		1.3E-05	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07	–	–	1.5E+05	3.0E+05	-	–	4.6E-06	1.7E-06	2.3E-06	2.2E-06	–	6.3E-06	4.6E-06	
																							1.4E-01	1.0E-05	7.1E-06	1.8E-05

Brown's Dump Record of Decision - Table 22 Continued

EXAMPLE CALCULATION EXAMPLE CALCULATION EXAMPLE CALCULATION

TABLE B.13.1
SURFACE SOIL SAMPLES COLLECTED IN YARDS
CANCER RISK AND HAZARD CALCULATIONS
CHILD AND ADULT
BROWN'S DUMP

	A	B	C	D	E	F	G	H	I	J	K	L	M
13	Station ID	Compound	Lab Result	Units	EPC	Units	CPAHs -TEF	Child - Intake - Ingestion - Noncancer	Child - Intake - Dermal - Noncancer	Child - Intake - Ingestion - Cancer	Child - Intake - Dermal - Cancer	Adult - Intake - Ingestion - Cancer	Adult - Intake - Dermal - Cancer
15	BDSB009	LEAD	39000	MG/KG	39000	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-06	5.6E-07	2.7E-08
16	BDSB009	Aluminum	26000	MG/KG	26000	MG/KG		1.3E-05	2.6E-07	1.1E-06	2.1E-06	5.6E-07	2.7E-08
17	BDSB009	INDENO(1,2,:	1800	UG/KG	1.8	MG/KG	0.18	1.3E-05	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07
18	BDSB009	BENZO(a)AN	2500	UG/KG	2.5	MG/KG	0.25	1.3E-05	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07
19	BDSB009	BENZO(b)FL	2800	UG/KG	2.8	MG/KG	0.28	1.3E-05	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07
20	BDSB009	BENZO(a)PY	3000	UG/KG	3	MG/KG	3	1.3E-05	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07
21	BDSB009	TEF CPAHs	--	--	--	MG/KG	3.53	1.3E-05	2.6E-06	1.1E-06	2.1E-07	5.6E-07	2.7E-07

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
10					(H*E)/N	(E*I)/O	G*J*P	G*K*Q	G*L*P	G*M*Q	R+S	T+U	V+W	
13	Reference Dose - Oral	Reference Dose - Dermal	Slope Factor - Oral	Slope Factor - Dermal	Child Hazard - Ingestion	Child Hazard Dermal	Child Risk - Ingestion	Child Risk Dermal	Adult Risk - Ingestion	Adult Risk Dermal	Total Child Hazard	Total Child Risk	Total Adult Risk	Total Lifetime Risk
15	--	--	--	--	--	--	--	--	--	--	--	--	--	
16	1.0E+00	2.0E-01	--	--	3.4E-01	3.4E-02	--	--	--	--	3.7E-01	--	--	
17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
21	--	--	7.3E+00	1.5E+01	--	--	2.8E-05	1.1E-05	1.4E-05	1.4E-05	--	3.9E-05	2.8E-05	
23										Totals	4.E-01	3.9E-05	2.8E-05	6.8E-05

TEF CPAHs : SUM ((E17*0.1)+(E18*0.1)+(E19*0.1)+(E20*1))

SUM(X15 + X2 UM(Y15 + Y2 UM(Z15 + Z2 UM(Y24+ Z24)

TABLE B.11.1
RISK-BASED REMEDIAL GOAL OPTIONS
CURRENT CHILD AND ADULT RESIDENT - SURFACE/SUBSURFACE SOIL
BROWN'S DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

	HAZARD INDEX * (mg/kg)			CARCINOGENIC RISK (mg/kg)			EPA ARARs (mg/kg)
CHEMICAL	0.1	1	3	10-6	10-5	10-4	
CPAHs	--	--	--	0.07	0.7	7	--
Aldrin	--	--	--	0.04	0.4	4	--
Dieldrin	--	--	--	0.04	0.4	4	--
PCB 1260 (Aroclor 1260)	--	--	--	0.26	2.6	26	--
2,3,7,8-TCDD (Dioxin)	--	--	--	0.000003	0.00003	0.0003	0.001**
Antimony	2.9	29	87	--	--	--	--
Aluminum	6,990	69,900	209,700	--	--	--	--
Arsenic	2.3	23	69	0.58	5.8	58	--
Barium	496	4,960	14,880	--	--	--	--
Cadmium	3.5	35	105	--	--	--	--
Chromium	21.1	211	633	--	--	--	--
Copper	281	2,810	8,430	--	--	--	--
Iron	2,105	21,050	63,150	--	--	--	--
Lead	--	--	--	--	--	--	400 **
Manganese		4,790	14,370	--	--	--	--
Mercury	0.7	7	21	--	--	--	--
Vanadium	43	430	1,290	--	--	--	--
Zinc	2,121	21,210	63,630	--	--	--	--

Notes:
* Based on Child Exposure Only.
** These values are based on EPA OSWER Directives.
-- Not Applicable

TABLE B.11.2
RISK-BASED REMEDIAL GOAL OPTIONS
FUTURE CHILD AND ADULT RESIDENT - GROUNDWATER
BROWN'S DUMP
JACKSONVILLE, DUVAL COUNTY, FLORIDA

	HAZARD INDEX * (mg/L)			CARCINOGENIC RISK (mg/L)			EPA Maximum Contaminant Levels (MCLs) (mg/L)	Florida MCLs (mg/L)
CHEMICAL	0.1	1	3	10-6	10-5	10-4		
Aldrin	--	--	--	0.000005	0.00005	0.0005	NE	NE
Chlordane	0.0008	0.008	0.024	0.0003	0.003	0.3	0.002	NE
p,p'-DDE	--	--	--	0.0003	0.003	0.03	NE	NE
p,p'-DDT	0.0008	0.008	0.024	0.0003	0.003	0.03	NE	NE
Heptachlor	0.0008	0.008	0.024	0.00002	0.0002	0.002	0.0004	0.0004
Heptachlor Epoxide	0.00002	0.0002	0.0006	0.00001	0.0001	0.001	0.0002	0.0002
PCB 1016 (Aroclor 1016)	0.0001	0.001	0.003	0.0002	0.002	0.02	0.0005	0.0005
Arsenic	0.0005	0.005	0.015	0.00004	0.0004	0.004	0.05/0.01 (January 2001) **	0.05/NE
Iron	0.5	5	15	--	--	--	NE	0.3
Lead	--	--	--	--	--	--	0.015	0.015
Manganese	0 03	0.3	0.9	--	--	--	NE	0.05

Notes:
* Based on Child Exposure Only.
** In January 2001, the MCL for Arsenic was changed to 0.01 ug/L. However, this value is still under review.
-- Not Applicable
NE Not Established

TABLE 24: FINAL HUMAN HEALTH COCs FOR THE SITE			
Soil	**Groundwater**	**Surface Water**	**Sediment**
antimony	None	None	None
arsenic			
barium			
cadmium			
copper			
lead			
manganese			
zinc			
carcinogenic poly aromatic hydrocarbons (PAHs)			
aroclor 1260			
2,3,7,8-TCDD (dioxin)			

TABLE 25: STEP 2's PRELIMINARY CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPEC)					
Surface Soil		**Sediment**		**Surface Water**	
HQ>1	**No HQ due to Lack of Screening Value**	**HQ>1**	**No HQ Due to Lack of Screening Value**	**HQ>1**	**No HQ Due to Lack of Screening Values**
Aluminum	Calcium	Lead	Aluminum	Cyanide	Calcium
Antimony	Magnesium	Alpha-Chlordane	Barium		Magnesium
Arsenic	Potassium	Gamma-Chlordane	Calcium		Manganese
Barium	Sodium	p,p'-DDE	Iron		Potassium
Cadmium		p,p'-DDT	Magnesium		Sodium
Chromium, total		Benzo(a)anthracene	Manganese		
Copper		Pyrene	Potassium		
Iron			Vandium		
Lead					
Manganese					
Nickel					
Silver					
Vanadium					
Zinc					
Mercury					
Cyanide					
Aldrin					
Alpha-Chlordane					
Deildrin					

TABLE 25: STEP 2's PRELIMINARY CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPEC)

Surface Soil		Sediment		Surface Water	
HQ>1	**No HQ due to Lack of Screening Value**	**HQ>1**	**No HQ Due to Lack of Screening Value**	**HQ>1**	**No HQ Due to Lack of Screening Values**
Gamma-Chordane					
p,p'-DDD					
p,p'-DDE					
p,p'-DDT					
PCB 1260					
Anthracene					
Benzo(a) pyrene					
Carbazole					
Fluoranthene					
Phenanthrene					
Pyrene					
TEQ of 2,3,7,8 dioxin					

TABLE 26: STEP 3's CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN			
Direct Exposure	**Preliminary Remedial Goal (RG) (mg/kg)**	**Direct Exposure**	**Direct Exposure**
Surface Soil		**Sediment**	**Surface Water**
Aluminum	600	None	None
Antimony	5		
Copper	61		
Iron	200		
Zinc	200		
Food Chain Exposure	**Preliminary RG (mg/kg)**	**Food Chain Exposure**	**Food Chain Exposure**
Surface Soil (Vermivores)		**Sediment**	**Surface Water**
Lead	400	None	None
Mercury	0.012a		
4,4-DDT	0.043		

Notes:

a. The Preliminary RG for mercury was based on methyl mercury.

TABLE 27: HUMAN HEALTH SOIL CONSTITUENTS OF CONCERN AND RESIDENTIAL RGs		
Constituent of Concern	RG (mg/kg)[a]	RG Source
Antimony	27	FDEP Chapter 62-777 (Table 2)
Arsenic	2.1	FDEP Chapter 62-777 (Table 2)
Barium	4,960	Brown's Dump Risk Assessment
Cadmium	82	FDEP Chapter 62-777 (Table 2)
Copper	2,810	Brown's Dump Risk Assessment
Lead	400	FDEP Chapter 62-777 (Table 2)
Manganese	3,500	FDEP Chapter 62-777 (Table 2)
Zinc	26,000	FDEP Chapter 62-777 (Table 2)
Aroclor-1260	0.5	FDEP Chapter 62-777 (Table 2)
Carcinogenic Polycyclic Aromatic Hydrocarbons (PAH)	0.1[b]	FDEP Chapter 62-777 (Table 2)
2,4,7,8, TCDD (Dioxin)	0.000007[b]	FDEP Chapter 62-777 (Table 2)

Notes:

a. FDEP Chapter 62-777 (Table 2) is utilized as the default RGs for many COCs. If the background mean concentration for a specific constituents is above the RGs identified above, then cleanup will be to the background concentration. This only occurs with two COCs: carcinogenic PAHs and dioxin.

b. The surface soil background for carcinogenic PAHs is 0.69 mg/kg. The subsurface soil background for carcinogenic PAHs is 0.22 mg/kg. The surface soil background for dioxin is 0.00000882 mg/kg. The subsurface soil background for dioxin is 0.00000882 mg/kg.

TABLE 28: HUMAN HEALTH SOIL CONSTITUENTS OF CONCERN AND INDUSTRIAL RGs		
Constituent of Concern	RG (mg/kg)[a]	RG Source
Antimony	370	FDEP Chapter 62-777 (Table 2)
Arsenic	12	FDEP Chapter 62-777 (Table 2)
Barium	130,000	FDEP Chapter 62-777 (Table 2)
Cadmium	1,700	FDEP Chapter 62-777 (Table 2)
Copper	89,000	FDEP Chapter 62-777 (Table 2)
Lead	1,400	FDEP Chapter 62-777 (Table 2)
Manganese	43,000	FDEP Chapter 62-777 (Table 2)
Zinc	630,000	FDEP Chapter 62-777 (Table 2)
Aroclor-1260	2.6 (Aroclor mixture)	FDEP Chapter 62-777 (Table 2)
Carcinogenic Polycyclic Aromatic Hydrocarbons	0.7	FDEP Chapter 62-777 (Table 2)
2,4,7,8, TCDD (Dioxin)	0.00003	FDEP Chapter 62-777 (Table 2)

Notes:

a. FDEP Chapter 62-777 (Table 2) is utilized as the default RGs for Industrial Scenarios. If the background mean concentration for a specific constituents is above the RGs identified above, then cleanup will be to the background concentration.

TABLE 29: CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN IN SURFACE SOIL AND PRELIMINARY RGs

Constituent of Concern	Preliminary RG (mg/kg)	RG Source
Aluminum	600	Brown's Dump Ecological Risk Assessment
Antimony	5	Brown's Dump Ecological Risk Assessment
Copper	61	Brown's Dump Ecological Risk Assessment
Iron	200	Brown's Dump Ecological Risk Assessment
Lead	400	Brown's Dump Ecological Risk Assessment
Mercury	0.012	Brown's Dump Ecological Risk Assessment
Zinc	200	Brown's Dump Ecological Risk Assessment
4,4'-DDT	0.043	Brown's Dump Ecological Risk Assessment

TABLE 4-1
Assembly of Remedial Alternatives
Brown's Dump Site Feasibility Study

Technology/ Process Option	Alternative 1 No Action	Alternative 2 Soil Cover with Excavation and Offsite Disposal	Alternative 3 Shallow Excavation, Offsite Disposal and Soil Cover	Alternative 4 Deep Excavation and Offsite Disposal
No Action	X			
Monitoring		X	X	X
Administrative Restrictions on Land Use		X	X	X
Engineered Caps/ Asphalt or Concrete		X	X	
Native Soil		Minimum 0.5-foot Soil Cover	Minimum 2-foot Soil Cover	
Surface Controls/ Regrading and Vegetation		X	X	X
Excavation of Soil/ash		X As needed to provide soil cover Estimated 30,000 in-situ cys	X As needed to provide soil cover Estimated 85,000 in-situ cys	X All soil/ash > RGOs to water table Estimated 290,000 in-situ cys
Physical Treatment/ In-Situ Soil Mixing Stabilization/ Solidification		[a]	[a]	[a]
Physical Treatment/ Ex-Situ Solidification/ Stabilization		X As needed to meet LDRs	X As needed to meet LDRs	X As needed to meet LDRs
Subtitle D Landfill		X	X	X

[a] Ex situ stabilization of soil/ash exceeding TCLP limits prior to offsite disposal in a Subtitle D Landfill is included in alternative, thus making in-situ stabilization unnecessary.

TABLE 31: CRITERIA FOR EVALUATING REMEDIAL ALTERNATIVES

In selecting the preferred cleanup alternative, EPA uses the following criteria to evaluate each alternative developed in the Feasibility Study (FS).

Threshold Criteria: The first two criteria are essential and if not met, an alternative is not considered further.

1. Overall Protection of Human Health and the Environment -- Degree to which alternative eliminates, reduces, or controls health and environmental threats.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) – Assesses compliance with Federal/State requirements.

Balancing Criteria: The next five are balancing criteria used to further evaluate all options that meet the first two criteria.

3. Long-Term Effectiveness -- How the remedy maintains protection once cleanup goals have been met.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment -- Expected performance of the treatment technologies to lessen harmful nature, movement, or amount of contaminants.

5. Implementability – Technical feasibility and administrative ease of a remedy.

6. Short-Term Effectiveness -- Length of time for remedy to achieve protection and impact of implementing the remedy.

7. Cost -- Weighing of benefits of a remedy against the cost of implementation.

Modifying Criteria: The final two criteria are used to modify EPA's proposed plan after the public comment period has ended and comments from the community and the State have been received.

8. State Acceptance -- Consideration of State's opinion of EPA's proposed plan. EPA seeks state concurrence.

9. Community Acceptance -- Consideration of public comments on proposed plan.

TABLE 5-2
Detailed Evaluation of Remedial Alternatives
Brown's Dump FS

Alternative: Criterion	Alternative 1- No Further Action	Alternative 2- Soil Cover with Excavation and Offsite Disposal	Alternative 3- Shallow Excavation, Offsite Disposal and Soil Cover	Alternative 4- Deep Excavation and Offsite Disposal
1. Overall protection of human health and the environment.	• The risks to residents exposed to the surface or subsurface soil for the school property area and the fenced area north of the property would continue to exceed the acceptable non cancer risk threshold (HI greater than 1) and exceed an ELCR of 1 x 10^{-4}. • Soil lead concentrations would continue to exceed the RGO of 400 mg/kg. Lead concentrations greater than this value in residential areas surrounding the school property are considered a potential public health threat, depending on the bioavailability of lead and the level of exposure pathway completeness. • Land use restrictions to minimize potential exposure to subsurface soil exceeding RGOs would not be enacted.	• The soil cover, administrative restrictions and stabilization of the creek banks are protective of human health and the environment. • Soil cover minimizes potential for direct contact with soil exceeding RGOs, thus preventing unacceptable risks from this exposure path. • Potential for human exposure to subsurface soil will be minimized through administrative restrictions. • Risk assessment concluded that a potential unacceptable risk exists from ingestion of vegetables grown in soil with lead exceeding RGOs. Excavation and backfilling with topsoil to depths of 2 feet would be necessary in areas where residents maintain vegetable gardens. • Soil cover reduces risks to terrestrial biota from direct contact with contaminated soil. • Erosion of soil exceeding RGOs is prevented through soil cover. • Stabilization of Moncrief Creek banks prevents erosion of soil and ash with subsequent contamination of creek sediments. • Risks related to construction are manageable although dust control will be important and safe loading and transport of an estimated 12,000 trucks during the 18 month construction period will be important.	• The soil cover, removal of shallow soils exceeding RGOs in residential areas, administrative restrictions and stabilization of the creek banks are protective of human health and the environment. • Soil cover minimizes potential for direct contact with soil exceeding RGOs, thus preventing unacceptable risks from this exposure path. • Potential for human exposure to subsurface soil below 2 feet will be minimized through administrative restrictions. • Soil cover reduces risks to terrestrial biota from direct contact with contaminated soil. • Erosion of soil exceeding RGOs is prevented through soil cover. • *Stabilization of Moncrief Creek banks prevents erosion of soil and ash with* subsequent contamination of creek sediments. • Risks related to construction are manageable although dust control will be important and safe loading and transport of an estimated 34,000 trucks during the 24 month construction period will be important.	• The excavation and offsite disposal of soils exceeding RGOs and stabilization of the creek banks are protective of human health and the environment. • Direct contact risks are eliminated through removal of the soil posing unacceptable risks. • Risks to terrestrial biota from direct contact with contaminated soil is nearly eliminated. Soil exceeding RGOs will remain below buildings, roadways, driveways and sidewalks. • Erosion of surface soil and soil along stream banks exceeding RGOs is eliminated. • Risks related to construction could be significant and would have to be actively managed. Dust control efforts will be important because nearly all the ash with high concentrations of lead will be excavated, loaded into trucks and transported offsite. The potential for vehicle or pedestrian accidents is much higher for this alternative because of the estimated 78,000 trucks to be loaded and driven through the surrounding neighborhoods during the 32 month construction period.
2. Compliance with ARARs	• The USEPA chemical- specific ARAR of 400 mg/kg for lead would not be met by this alternative because exposure to soils containing 400 ppm lead could occur.	• The USEPA chemical- specific ARAR of 400 mg/kg for lead would be met by this alternative. • FAC 62-785 Brownfield Cleanup Criteria of a minimum of 2 feet of soil meeting residential cleanup criteria would not be met. However this regulation is a TBC and is not required to be met for Brown's Dump Site • RCRA requirements for disposal of contaminated soil would be met. Specifically, excavated soil would be tested for TCLP lead and the soil would be treated to levels below the TCLP limit of 5 mg/l. LDRs for contaminated soil (the higher of 90% reduction in constituent concentrations or 10 x UTS) would also be met prior to landfilling the soil as a solid waste. • Regulations requiring control of erosion and particulate emissions during construction activities would be met. • Construction activities along the banks of Moncrief Creek would be conducted in a manner that minimizes impacts to aquatic habitats.	• The USEPA chemical-specific ARAR of 400 mg/kg for lead would be met by this alternative. • RCRA requirements for disposal of contaminated soil would be met. Specifically, excavated soil would be tested for TCLP lead and the soil would be treated to levels below the TCLP limit of 5 mg/l. LDRs for contaminated soil (the higher of 90% reduction in constituent concentrations or 10 x UTS) would also be met prior to landfilling the soil as a solid waste. • Regulations requiring control of erosion and particulate emissions during construction activities would be met. • Construction activities along the banks of Moncrief Creek would be conducted in a manner that minimizes impacts to aquatic habitats.	• The USEPA chemical-specific ARAR of 400 mg/kg for lead would be met by this alternative. • RCRA requirements for disposal of contaminated soil would be met. Specifically, excavated soil would be tested for TCLP lead and the soil would be treated to levels below the TCLP limit of 5 mg/l. LDRs for contaminated soil (the higher of 90% reduction in constituent concentrations or 10 x UTS) would also be met prior to landfilling the soil as a solid waste. • Regulations requiring control of erosion and particulate emissions during construction activities would be met. • Construction activities along the banks of Moncrief Creek would be conducted in a manner that minimizes impacts to aquatic habitats.

TABLE 5-2
Detailed Evaluation of Remedial Alternatives
Brown's Dump FS

Alternative: Criterion	Alternative 1- No Further Action	Alternative 2- Soil Cover with Excavation and Offsite Disposal	Alternative 3- Shallow Excavation, Offsite Disposal and Soil Cover	Alternative 4- Deep Excavation and Offsite Disposal
3. Long-term effectiveness and permanence				
(a) Magnitude of residual risks	• No significant change in risk because no action taken. • Volume of soil exceeding RGOs Is 309,000 cy.	• The soil cover prevents risks related to direct contact with surficial soils. Residual direct contact risks exceeding acceptable levels however would occur if subsurface soil from resident excavations was spread on the surface where long-term exposure to the soil could occur. Based on the risk assessment results for exposure to subsurface soil, these risks would be a HI of 25 and an ELCR of 4 x 10^{-4}. In addition lead concentrations greater than 400 mg/kg would occur if subsurface soil was spread on the surface. This presents a potential public health threat, depending on the bioavailability of lead and the level of exposure pathway completeness. • Residual volume of soil exceeding RGOs Is 303,000 cy. • Potential unacceptable risks would occur if vegetables were grown in areas where lead exceeds RGOs in the root zone of the plants.	• The soil cover prevents risks related to direct contact with surficial soils. Residual direct contact risks exceeding acceptable levels however would occur if subsurface soil was spread on the surface where long-term exposure to the soil could occur. Based on the risk assessment results for exposure to subsurface soil, these risks would be a HI of 25 and an ELCR of 4 x 10^{-4}. In addition lead concentrations greater than 400 mg/kg would occur if subsurface soil was spread on the surface. This presents a potential public health threat, depending on the bioavailability of lead and the level of exposure pathway completeness. • Residual volume of soil exceeding RGOs Is 210,000 cy.	• Residual risks related to direct contact would remain only if soils exceeding RGOs from below buildings, roadways, driveways and sidewalks are excavated and spread on the surface. Based on the risk assessment results for exposure to subsurface soil, these risks would be a HI of 25 and an ELCR of 4 x 10^{-4}. In addition a potential public health threat from exposure to lead concentrations greater than 400 mg/kg would occur if subsurface soil was spread on the surface. • Residual volume of soil exceeding RGOs (i.e. below buildings, roadways, driveways and sidewalks) is 50,000 cy.
(b) Adequacy and reliability of controls	• Not applicable	• Administrative restrictions are expected to be effective in minimizing the potential for surface spreading of soil excavated from below the soil cover. Area contractors would be made aware of the requirements for proper disposal of subsurface soil from the area as they obtain the necessary building permit. Residents would also be made aware of the need for proper disposal. It is unlikely that a resident would excavate a large area of subsurface soil and spread it on the surface because it would require use of excavation equipment that most residents are not trained to operate Smaller hand excavations, such as that necessary to plant bushes, are unlikely to result in a substantial exposure area.	• Administrative restrictions are expected to be effective in minimizing the potential for surface spreading of soil excavated from below the soil cover. Area contractors would be made aware of the requirements for proper disposal of subsurface soil from the area as they obtain the necessary building permit. Residents would also be made aware of the need for proper disposal. It is unlikely that a resident would excavate soil from below 2 feet or excavate a large area of subsurface soil and spread it on the surface because it would most likely require use of excavation equipment that residents are not trained to operate. Smaller hand excavations, such as that necessary to plant bushes, are unlikely to be at depths greater than the 2 foot cover thickness or result in a substantial exposure area.	• Administrative restrictions are expected to be effective in minimizing the potential for surface spreading of soil excavated from below buildings, roadways, driveways or sidewalks Area contractors would most likely perform such excavations and would be made aware of the requirements for proper disposal of subsurface soil from the area as they obtain the necessary building permit
4. Reduction of toxicity, mobility, or volume through treatment				
(a) Treatment process used	• Not applicable.	• Solidification/stabilization of soil and ash exceeding TCLP limits.	• Solidification/stabilization of soil and ash exceeding TCLP limits.	• Solidification/stabilization of soil and ash exceeding TCLP limits.
(b) Degree and quantity of TMV reduction	• Not applicable.	• An estimated 3,700 cy of soil/ash would be treated to reduce the leachability of lead to less than 5 mg/l, as measured using the TCLP test.	• An estimated 9,000 cy of soil/ash would be treated to reduce the leachability of lead to less than 5 mg/l, as measured using the TCLP test.	• An estimated 30,000 cy of soil/ash would be treated to reduce the leachability of lead to less than 5 mg/l, as measured using the TCLP test.
(c) Irreversibility of TMV reduction	• Not applicable.	• Lead is not destroyed in the solidification/stabilization process but rather its mobility is significantly reduced. The treated soil/ash would be contained in a Subtitle D landfill, further reducing its potential to migrate.	• Lead is not destroyed in the solidification/stabilization process but rather its mobility is significantly reduced. The treated soil/ash would be contained in a Subtitle D landfill, further reducing its potential to migrate.	• Lead is not destroyed in the solidification/stabilization process but rather its mobility is significantly reduced. The treated soil/ash would be contained in a Subtitle D landfill, further reducing its potential to migrate.
(d) Type and quantity of treatment residuals	• None, because no treatment included.	• The treated residuals will include the 3,700 cy of soil/ash plus the stabilization/solidification agent. The solidification/stabilization agents will not increase the volume of treated soils substantially.	• The treated residuals will include the 9,000 cy of soil/ash plus the stabilization/solidification agent. The solidification/stabilization agents will not increase the volume of treated soils substantially.	• The treated residuals will include the 30,000 cy of soil/ash plus the stabilization/solidification agent. The solidification/stabilization agents will not increase the volume of treated soils substantially.
(e) Statutory preference for treatment as a principal element	• Preference not met because no active treatment included.	• Preference met because treatment is directed at the contaminants posing the principal threat.	• Preference met because treatment is directed at the contaminants posing the principal threat.	• Preference met because treatment is directed at the contaminants posing the principal threat.

TABLE 5-2
Detailed Evaluation of Remedial Alternatives
Brown's Dump FS

Alternative: Criterion	Alternative 1- No Further Action	Alternative 2- Soil Cover with Excavation and Offsite Disposal	Alternative 3- Shallow Excavation, Offsite Disposal and Soil Cover	Alternative 4- Deep Excavation and Offsite Disposal
5. Short-term effectiveness				
(a) Protection of workers during remedial action	• No construction activities, so no risks to workers	• Employing appropriate health and safety procedures and protective equipment can minimize risks to workers from exposure to contaminants. Construction-related injury risks would also be minimized through implementation of the plan.	• Employing appropriate health and safety procedures and protective equipment can minimize risks to workers from exposure to contaminants. Construction-related injury risks would also be minimized through implementation of the plan.	• Employing appropriate health and safety procedures and protective equipment can minimize risks to workers from exposure to contaminants. Construction-related injury risks would also be minimized through implementation of the plan.
(b) Protection of community during remedial action	• No construction activities, so no short-term risks to community.	• Risks to community during construction would be minimized through implementation of a construction health and safety plan. Specific elements of plan would focus on minimizing dust generation through use of dust control measures such as soil wetting and minimizing safety threats to the community by control of access to the construction area. • Also truck transport routes would be selected to minimize impacts from noise and inconvenience associated with the estimated 12,000 truckloads of soil that would be transported to or from the site. Based on an 18 month construction schedule about 30 trucks would be entering and leaving the site each day.	• Risks to community during construction would be minimized through implementation of a construction health and safety plan. Specific elements of plan would focus on minimizing dust generation through use of dust control measures such as soil wetting and minimizing safety threats to the community by control of access to the construction area. • Also truck transport routes would be selected to minimize impacts from noise and inconvenience associated with the estimated 34,000 truckloads of soil that would be transported to or from the site. Based on a 24 month construction schedule about 60 trucks would be entering and leaving the site each day.	• Risks to community during construction would be minimized through implementation of a construction health and safety plan. Specific elements of plan would focus on minimizing dust generation through use of dust control measures such as soil wetting and minimizing safety threats to the community by control of access to the construction area. • Also truck transport routes would be selected to minimize impacts from noise and inconvenience associated with the estimated 78,000 truckloads of soil that would be transported to or from the site. Based on a 32 month construction schedule about 110 trucks would be entering and leaving the site each day.
(c) Environmental impacts of remedial action	• No construction activities, so no environmental impacts from remedial action.	• Environmental impacts will likely be limited to erosion of soils during excavation, particularly during stabilization of the stream banks. The impacts can be minimized through the use of appropriate erosion control measures or stream diversion during construction.	• Environmental impacts will likely be limited to erosion of soils during excavation, particularly during stabilization of the stream banks. The impacts can be minimized through the use of appropriate erosion control measures or stream diversion during construction.	• Environmental impacts will likely be limited to erosion of soils during excavation, particularly during stabilization of the stream banks. The impacts can be minimized through the use of appropriate erosion control measures or stream diversion during construction.
(d) Time until RAOs are achieved	• RAO's not achieved.	• RAOs achieved at completion of the estimated 18 month construction schedule.	• RAOs achieved at completion of the estimated 24 month construction schedule.	• RAOs achieved at completion of the estimated 32 month construction schedule.
6. Implementability				
(a) Technical feasibility	• No technical constraints.	• No technical constraints although construction contractor selection and oversight will be important in successful project performance.	• No technical constraints although construction contractor selection and oversight will be important in successful project performance.	• No technical constraints although construction contractor selection and oversight will be important in successful project performance.
(b) Administrative feasibility	• No impediments.	• Excavation and placement of soil cover on residential properties will require extensive coordination with local community officials and individual residents. • Administrative restrictions will also require close coordination with local officials.	• Excavation and placement of soil cover on residential properties will require extensive coordination with local community officials and individual residents. • Administrative restrictions will also require close coordination with local officials.	• Excavation on residential properties will require extensive coordination with local community officials and individual residents. • Administrative restrictions will also require close coordination with local officials.
(c) Availability of services and materials	• None needed	• Trail Ridge landfill has sufficient capacity to accept soil for disposal. • Services and materials readily available for other alternative components.	• Trail Ridge landfill has sufficient capacity to accept soil for disposal. • Services and materials readily available for other alternative components.	• Trail Ridge landfill has sufficient capacity to accept soil for disposal. • Services and materials readily available for other alternative components.
7. Total Cost	Capital Cost $0 Average Annual O&M Cost $3,900 Total Present Worth Cost $50,000	Capital Cost $10,600,000 Average Annual O&M Cost $38,000 Total Present Worth Cost $11,100,000	Capital Cost $19,900,000 Average Annual O&M Cost $38,000 Total Present Worth Cost $20,400,000	Capital Cost $42,900,000 Average Annual O&M Cost $3,900 Total Present Worth Cost $43,000,000

[a]For a detailed listing and analysis of key ARARS, see Appendix A.

TABLE 33: COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES[a]				
Criterion	No Further Action (1)	Soil Cover with Excavation and Offsite Disposal (2)	Shallow Excavation, Offsite Disposal and Soil Cover (3)	Deep Excavation and Offsite Disposal (4)
1. Overall Protectiveness[b]	1	2	3	4
2. Compliance with ARARS[b]	1	2	3	3
3. Long-Term Effectiveness and Permanence	1	2	3	4
4. Reduction of Toxicity, Mobility, or Volume	1	2	3	4
5. Short-Term Effectiveness	1	4	3	2
6. Implementability	4	3	2	1
7. Present Worth Cost	$50,000	$11,100,000	$20,400,000	$43,000,000

Notes:

a. The numerical ranking attempts to provide a relative relationship, on a scale of 1-4, of each alternative's performance under each criteria. The higher the number, the better the rating of that alternative for the criterion under consideration (i.e., 1 is the least favorable)). Some alternatives are deemed basically equivalent for certain criterion and carry the same rating.

b. All of the alternatives, except Alternative 1, would meet this threshold criteria. The rating for this threshold criteria constitutes a relative ranking of how well the alternative satisfies the threshold criteria.

TABLE 34: COST				
	Alternative 1 (No Further Action)	Alternative 2 (Soil Cover with Excavation and Offsite Disposal)	Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover)	Alternative 4 (Deep Excavation and Offsite Disposal)
Capital Costs	$0	$10,600,0000	$19,900,000	$42,900,000
Average Annual O&M	$3,900	$38,000	$38,000	$3,900
Total Present Worth Cost	**$50,000**	**$11,100,000**	**$20,400,000**	**$43,900,000**

TABLE 35: COST SENSITIVITY OF DISCOUNTED RATES				
	Alternative 1 (No Further Action)	Alternative 2 (Soil Cover with Excavation and Offsite Disposal)	Alternative 3 (Shallow Excavation, Offsite Disposal and Soil Cover)	Alternative 4 (Deep Excavation and Offsite Disposal)
Total Present Worth Costs 3% Discount Rate	$100,000	$11,600,000	$20,900,000	$43,900,000
Total Present Worth Costs 7% Discount Rate	$50,000	$11,100,000	$20,400,000	$43,000,000
Total Present Worth Costs 10% Discount Rate	$40,000	11,000,000	$23,300,000	$42,900,000

TABLE 36: ESTIMATED COST OF SELECTED REMEDY	
Capital Costs	$19,900,000
Average Annual O&M	$38,000
Total Present Worth Cost	**$20,400,000**

TABLE 37: CHEMICAL - SPECIFIC ARARs				
Standard, Requirement, Criteria or Limitation	**Citation (Certain Provisions of)**	**Description**	**Federal or State ARAR**	**Comment**
Toxic Substances Control Act PCB Requirements	15 USC Sec. 2601-2629	Establishes storage and disposal requirements for PCBs. See 40 CFR Part 761, Subpart D.	Federal	PCBs are a site COC. Concentrations, however, may be below levels that require adherence to TSCA.
Clean Air Act National Primary and Secondary Ambient Air Quality Standards	42 USC Section 7401-7671	Establishes standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead). See 40 CFR Part 50.6, 50.7 and 50.12.	Federal	Relevant and Appropriate to activities which might result in air emissions during remedial actions
National Emission Standards for Hazardous Air Pollutants		Sets emission standards for designed hazardous pollutants. See 40 CFR Part 61 Subpart A	Federal	Regulates new installations that will or might reasonably be expected to become a source or indirect source of air pollution. Emissions of hazardous air pollutants is not anticipated under any alternatives.
"Global" Risk Based Corrective Action	Section 376.30701 FS	Establishes risk levels for cleanups (i.e., 1×10^{-6} for carcinogens and a hazard index of 1 for noncarcinogens).	State	NOTE: The only identified ARAR from Section 376.30701 and Chapter 62-780 are the risk levels.

TABLE 38: LOCATION - SPECIFIC ARARs				
Standard, Requirement, Criteria or Limitation	**Citation (Certain Provisions of)**	**Description**	**Federal or State ARAR**	**Comment**
Fish and Wildlife Coordination Act Regulations	33 CFR Subsection 320.3	Requires that the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and related state agencies be consulted prior to structural modification of any body of water, including wetlands. If modifications must be conducted, the regulation requires that adequate protection be provided for fish and wildlife resources.	Federal	If the remedy along Moncrief Creek involves creek alternation, these agencies would be consulted.
Endangered Species Act	16 USC Sec. 1531-1543	Requires that Federal agencies insure that any action authorized, funded, or carried by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat. See 40 CFR 6-302(h), 50 CFR Par 200, 50 CFR Part 402	Federal	If the remedy along Moncrief Creek impacts endangered species, then this order would be followed.

TABLE 38: LOCATION - SPECIFIC ARARs				
Standard, Requirement, Criteria or Limitation	**Citation (Certain Provisions of)**	**Description**	**Federal or State ARAR**	**Comment**
Executive Order on Wetlands	Exec. Order 11990	Requires action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural beneficial values of wetlands	Federal	If the remedy along Moncrief Creek involves wetlands, then this order would be followed.
National Environmental Policy Act (NEPA) Regulations, Wetlands, Floodplains, etc.	40 CFR SubSection 6.301(a)	These regulations contain the procedures for complying with Executive Order 11990 on wetlands protection. Appendix A state that no remedial alternative adversely affect a wetland if another practicable alternative is available. If no alternative is available, impact from implementing the chosen alternative must be mitigated.	Federal	If remedial action affects a wetland, these regulations would apply.
Executive Order on Floodplain Management	Exec. Order 11,988	Requires Federal agencies to evaluate the potential effects of actions they may take in a flood plain to avoid, to the maximum extent possible, the adverse impacts associate with direct and indirect development of a flood plain.	Federal	Applicable to remedial actions that affect or impinge on flood plains.

TABLE 39: ACTION- SPECIFIC ARARs				
Standard, Requirement, Criteria or Limitation	**Citation (Certain Provisions of)**	**Description**	**Federal or State ARAR**	**Comment**
Solid Waste Disposal Act	42 USC Sec. 6901-6987		Federal	
Identification and Listing of Hazardous Waste	40 CFR Part 261	Defines those solid wastes that are subject to regulation as hazardous wastes under 40 CFR Parts 262-265 and Parts 270, 271, 124	Federal	Determines potential waste classifications and applicability of land disposal restrictions under 40 CFR 268.
Standards Applicable to Generators of Hazardous Waste	40 CFR Part 262		Federal	
Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities	40 CFR Part 264	Establishes minimum national standards that define the acceptable management of hazardous waste for owners and operations of facilities that treat, store or dispose of hazardous waste.	Federal	Onsite disposal of hazardous waste is not anticipated. Onsite treatment of characteristic waste in temporary units may be necessary.
Preparedness and Prevention	Subpart C	Specifies requirement for communications, alarm systems and coordination with local authorities	Federal	Onsite waste management of generated hazardous waste may be necessary based on hazardous waste determinations.

TABLE 39: ACTION- SPECIFIC ARARs				
Standard, Requirement, Criteria or Limitation	**Citation (Certain Provisions of)**	**Description**	**Federal or State ARAR**	**Comment**
Contingency Plan and Emergency Procedures	Subpart D	Requires development of a contingency plan and designation of an emergency coordinator	Federal	Onsite waste management of generated hazardous waste may be necessary based on hazardous waste determinations.
Manifest System, Record Keeping and Reporting	Subpart E	See 264.71 (Use of manifest system) and 264.73 (operating record)	Federal	Onsite waste management of generated hazardous waste may be necessary based on hazardous waste determinations.
Releases from Solid Waste Management Units Waste Piles	Subpart F		Federal	Requirements for detection of release from SWMUs are applicable for units treating generated hazardous waste.
Waste Piles	Subpart L	See 264.251 (Design and operating requirements), 264.254 (Monitoring and inspection), 264.258 (Closure and Post-closure care)	Federal	Onsite treatment of generated hazardous waste may be necessary based on hazardous waste determinations.

TABLE 39: ACTION- SPECIFIC ARARs				
Standard, Requirement, Criteria or Limitation	**Citation (Certain Provisions of)**	**Description**	**Federal or State ARAR**	**Comment**
Corrective Action for Solid Waste Management Units	Subpart S - 264.553 (Temporary Units)	This part of the regulation includes the definition of a Temporary Unit (TU) to facilitate waste management treatment associated with cleanup activities. Hazardous waste treated within a TU is not subject to LDRs. However, the treated soil must meet LDRs prior to offsite disposal.	Federal	Onsite treatment of generated hazardous waste may be necessary based on hazardous waste determinations.
Land Disposal Restrictions	40 CFR Part 268	Identifies hazardous waste that are restricted from land disposal	Federal	Based on hazardous waste determinations, compliance with LDRs may be needed.
Alternative Land Disposal Restriction Treatment Standards for Contaminated Soil	40 CFR Part 268.49	Achieve the greater of 90 percent reduction in total constituent concentrations or ten times the Universal Treatment Standards (UTS) for the constituent.	Federal	Based on hazardous waste determinations, compliance with LDRs may be needed.
Toxic Substance Control Act PCB Requirements	15 USC Sec. 2601-2629	Establishes storage and disposal requirements for PCBs (see 40 CFR Part 761, Subpart D).	Federal	PCBs are a site COC. Concentrations, however, may be below levels that require adherence to TSCA.

TABLE 39: ACTION- SPECIFIC ARARs				
Standard, Requirement, Criteria or Limitation	**Citation (Certain Provisions of)**	**Description**	**Federal or State ARAR**	**Comment**
Florida Hazardous Waste Rules	Portions of FAC Chapter 62-730 comparable to the Federal ARARs identified in 40 CFR 261 through 268	Equivalent or more stringent than the Federal ARARs identified in 40 CFR 261 through 268.	State	If the State requirements are more stringent that the Federal requirements, then the State requirements will be followed.
Florida Air Pollution Rules - October 1992	FAC Chapter 62-2	Establishes permitting requirements for owners and operators of any source that emits any air pollutant. The rule also establishes ambient air quality standards for sulfur dioxide, PM_{10}, ozone.	State	
Florida Regulation of Stormwater Discharge - May 1993	FAC Chapter 62-25	Requirements for discharges of untreated storm water to ensure protection of the surface water of the state	State	
Florida Ambient air Quality Standards - December 1994	FAC Chapter 62-272	Establishes ambient air quality standards necessary to protect human health and public welfare.	State	

TABLE 39: ACTION- SPECIFIC ARARs				
Standard, Requirement, Criteria or Limitation	**Citation (Certain Provisions of)**	**Description**	**Federal or State ARAR**	**Comment**
Florida Water Well Permitting and Construction Requirements - March 1992	FAC Chapter 62-532	Establishes minimum standards for the location, construction, repair an abandonment of water well. Permitting requirements and procedures are established.	State	
Florida Rules on Hazardous Waste Warning Signs - July 1991	FAC Chapter 62-736	Requires warning signs at NPL and FDEP identified hazardous waste sites to inform the public of the presence of potentially harmful conditions	State	

TABLE 40: COST EFFECTIVENESS MATRIX

RELEVANT CONSIDERATIONS FOR COST EFFECTIVENESS DETERMINATION					
Alternative	**Cost Effective?**	**Present Worth Cost**	**Long Term Effectiveness and Permanence**	**Reduction of TMV[1] through Treatment**	**Short Term Effectiveness**
1) No Action	Not Applicable	$50,000	No Reduction in Long Term Risk	No reduction of TMV	Continued Risk to Community and Environment
2) Soil Cover with Excavation and Offsite Disposal	Yes	$11,100,000	+ Minimal Reduction in Long Term Risk	+ Reduction of TMV (via some soil treatment for offsite disposal)	+ Controllable risk to community and workers
3) Shallow Excavation, Offsite Disposal and Soil Cover	Yes	$20,400,000	+ Reduces Risks to Acceptable Levels	+ Reduction of TMV (via some soil treatment for offsite disposal)	= Controllable risk to community and workers
4) Deep Excavation and Offsite Disposal	No	$43,900,000	= Reduces Risks to Acceptable Levels	+ Reduction of TMV (via some soil treatment for offsite disposal)	- Controllable risk with great effort and disruption to community. Controllable risk to workers

Notes:

1. TMV = Toxicity, Mobility and Volume

Key:
+ More effective than previous alternative
- Less effective than previous alternative
= No change in effectiveness over previous alternative