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THE MEMPHIS DEPOT
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DEFENSE DISTRIBUTION DEPOT MEMPHIS

FINAL
STREAMLINED RISK ASSESSMENT
PARCEL 3
TECHNICAL MEMORANDUM

JANUARY 1999

CH2MHILL

U.S. Army Engineering and Support Center, Huntsville

TECHNICAL MEMORANDUM CH2MHILL

Streamlined Risk Assessment, Parcel 3, DDMT

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Summary of Findings

Site soils have been extensively sampled across the golf course, near the drainage ditches, at the ballfield and at the playground. Detectable organic chemicals were limited to the surface soil. There are no ecological concerns within Parcel 3. The human health risk assessment evaluated risks under five potential exposure scenarios. These scenarios are a golfer, a baseball player, a child within the playground area, a maintenance worker, and a resident. Risks for all these receptors were found to be within acceptable limits, except for the residential scenario. Thus, under current surface soil conditions, the site can be used as a golf course, baseball field, and playground. This site is not conducive for residential use without reducing potential exposures to the site COPCs.

Background

The Base Realignment and Closure (BRAC) 95 Commission selected the Defense Distribution Depot, Memphis, Tennessee (DDMT), for closure under the BRAC process.

All 642 acres of this facility is considered BRAC property. In preparing the Environmental Baseline Survey (Woodward-Clyde, 1996), the DDMT facility was divided into 35 parcels in accordance with the environmental condition of the property. The environmental condition of these parcels is currently being evaluated to assess whether parcels can be transferred or leased from government control to other private- and public-sector uses.

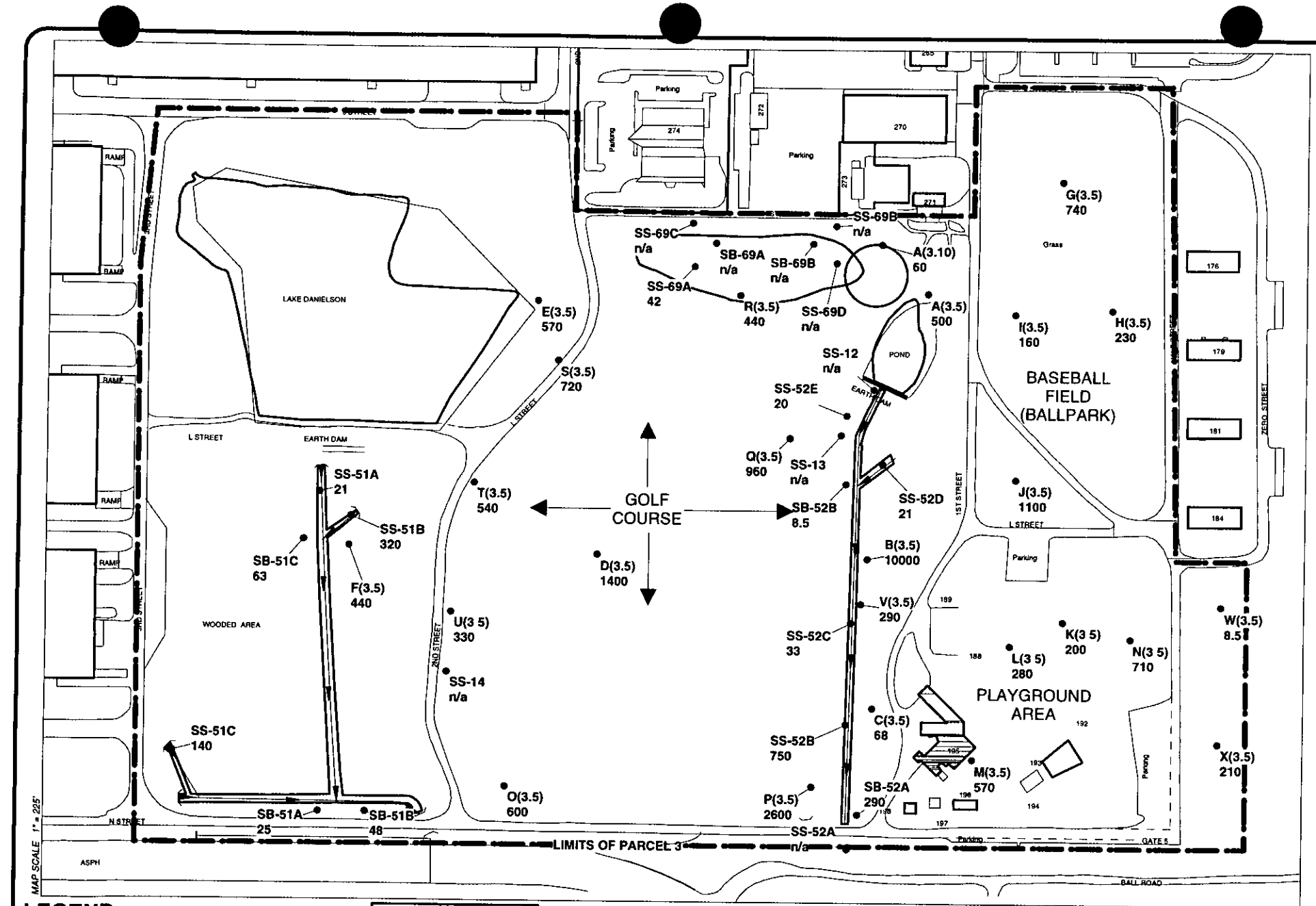
In October 1992, the U.S. Environmental Protection Agency (EPA) placed DDMT on the National Priorities List (NPL). To fulfill the requirements of both the BRAC process and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), sampling and analysis of surface soil, subsurface soil, sediment, and surface water occurred during the winter and spring of 1997. The sampling identified pesticide contamination, primarily dieldrin, in Parcel 3 including the Golf Course, Baseball Field (also referred to as the ballpark), and Playground areas. Elevated dieldrin concentrations have been found in surface soil throughout the DDMT Main Installation.

The City of Memphis is interested in using the Golf Course and associated areas in Parcel 3 under a BRAC lease or transfer agreement. Expedited transfer of the Golf Course is desired because the Golf Course will deteriorate if not properly managed. The BRAC Cleanup Team, consisting of representatives from EPA, Tennessee Department of Environment and Conservation (TDEC), and Defense Depot Susquehanna Pennsylvania-Memphis Environmental (DDSP-FE), proposed to manage the environmental contamination at Parcel 3 as a non-time-critical removal action under CERCLA. Specifically, an Engineering Evaluation/Cost Analysis (EE/CA) will be prepared to evaluate the human health and ecological risks associated with Parcel 3 as well as applicable remedial alternatives. The EE/CA will be prepared in accordance with the *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, August 1993).

Preparation of the EE/CA report has been delayed until a laboratory study of the bioremediation of dieldrin can be completed, and bioremediation can be considered as a potential remedial option. Because of this delay, this risk assessment (RA) is being prepared ahead of the EE/CA document to obtain an early regulatory review of the RA for human health and a qualitative evaluation of the ecological assessment at Parcel 3. Early review of the RA is required to evaluate the No Further Action (NFA) alternative and expedite transfer of Parcel 3.

Introduction

This RA addresses the potential risks associated with the Golf Course and other recreational areas located within Parcel 3. This streamlined risk evaluation is intended to help identify the need to undertake removal actions under current and future exposure conditions. The data collected during the BRAC and remedial investigation (RI) sampling events are included in this risk evaluation. Risks were estimated for potential current and future exposures. Figure 1 presents sampling locations and sample IDs for the Golf Course, Baseball Field, and Playground areas in Parcel 3. The risk evaluation includes surface soil samples from the Golf Course, Baseball Field, Playground, as well as soil samples from drainage ditches connecting to Lake Danielson and the Golf Course Pond. Lake Danielson and the Golf Course Pond are being evaluated as part of a separate RA. This focused RA is conducted to address primarily the surface soils from the Golf Course and the surrounding open areas that make up Parcel 3. The groundwater conditions at Parcel 3 will be assessed in a separate RI.



LEGEND

- Sampling Location
- 330 Dieldrin Concentration (ug/Kg)

Figure 1
PARCEL 3
Sampling Locations
Defense Distribution Depot Memphis, TN

CH2MHILL

The ecological evaluation was conducted by an evaluation of the sensitive habitats at and around the DDMT, following the non-time-critical removal action guidance. Due to lack of natural ecology around the DDMT and highly industrialized nature of the surrounding areas, ecological evaluation included a preliminary site survey and description of the sensitive habitats as per the guidance. This qualitative evaluation is included as part of the exposure assessment section. Further evaluation of the ecological risks will also be conducted as part of the RI for the DDMT Main Installation. The following sections describe the general approach used in the RA as applied to Parcel 3. A conceptual site model has been developed to present the potential source for contamination in Parcel 3, release/migration pathways, potential receptors, and exposures pathways. The RA is a method applied to hazardous waste sites to assess the potential effects on human health and the environment resulting from the presence of hazardous constituents. The RA has the following four primary components:

- Hazard identification and selection of chemicals of potential concern (COPCs)
- Exposure assessment
- Toxicity assessment
- Risk characterization

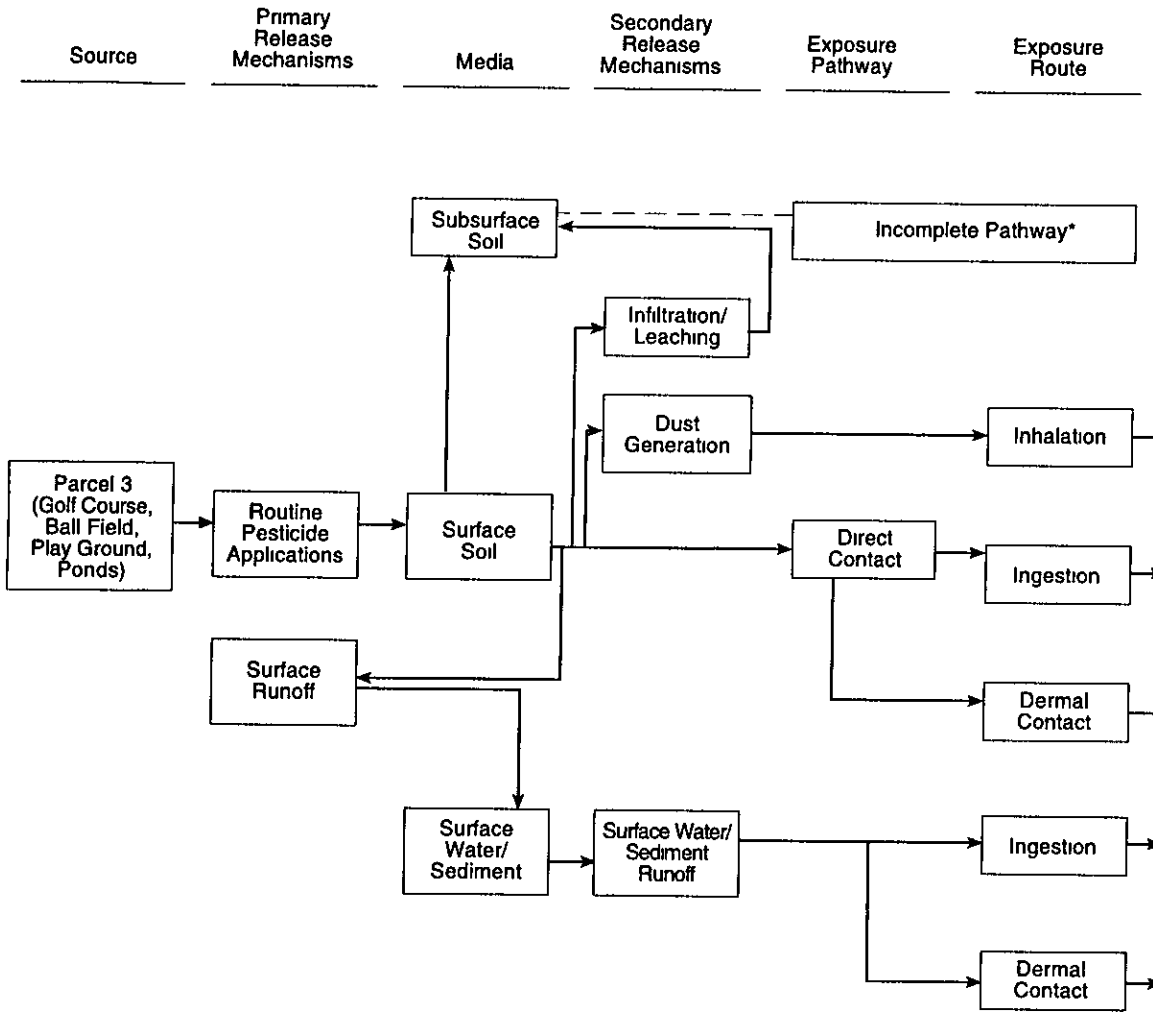
For the streamlined RA at Parcel 3, these four components were evaluated following CERCLA procedures and using the RA Guidance for Superfund (EPA, 1989), and streamlined according to the *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, August 1993). In addition to evaluating remedial goal options (RGOs) for selected chemicals that present excessive risks, this RA:

- Analyzes the data for chemicals identified as COPCs (hazard identification)
- Describes contaminant migration pathways, potential receptors, and magnitude of exposures (exposure assessment)
- Identifies toxicity criteria (toxicity assessment)
- Estimates risks and hazard quotients (HQs) (risk characterization)

Conceptual Site Model

A conceptual site model presents an overview of site conditions, potential contaminant migration pathways, exposure pathways, receptors, and exposure routes. This conceptual site model includes the finding of the available analytical data used in this RA (see Figure 2).

Parcel 3 is a Golf Course that includes two small ponds (Golf Course Pond and Lake Danielson), two main cement-lined drainage ditches, a playground, and a baseball field situated in the southeast corner of the site. Parcel 3 (Golf Course, Ball Field, Playground or ponds) is not in use at the present time. Historical routine pesticide applications have resulted in residual organochlorine pesticides in surface soils at the site. The other detected chemicals include some of the PAHs and metals. Subsurface soils do not have detectable levels of organic chemicals or inorganic chemicals above background. Thus, surface soil is the primary medium of interest at this site.



Potential Receptors							
Human					Ecological	
Golfer	Baseball Player	Playground Recreational Child	Industrial Worker	Future Residential Receptor	Terrestrial	Aquatic
X	X	X	X	X		
X	X	X	X	X		
X	X	X	X	X		
0				0		0
0				0		0

0 = Potentially Complete Pathway - Evaluated as part of a separate report addressing onsite ponds
* = Incomplete pathway due to lack of contamination

FIGURE 2.
Conceptual Site Model for Parcel 3.

There is no undisturbed natural habitat within the site. The land use is highly developed and industrial in nature, and has very little vegetation. Onsite ponds have limited aquatic species such as fish, amphibians, and waterfowl. The onsite impoundments have been addressed as part of a separate report (Radian, 1997), and a brief habitat characterization is included in this report.

Potential release mechanisms for conceptual evaluations include past pesticide applications to the Golf Course. No other spills or releases are known within the Golf Course area. As indicated by the sampling results, surface soil is the primary medium of interest at this site. Potential secondary release pathways from the surface soil include surface runoff to the drainage ditches, potential local runoff into the onsite ponds, and release to air through airborne dust. Infiltration is not a significant concern as the detected chemicals are not very mobile for leaching into subsurface soil. This is evidenced by lack of presence in the subsurface soil samples, in spite of the pesticide application practices at the base for more than 50 years.

Potential exposure pathways for the surface soils include direct contact and dust inhalation. Potential receptors for the surface soil include future golfers, maintenance workers, ballfield users, playground users, and offsite residents receiving dust from Parcel 3. A future residential use of the Golf Course may be assumed for conservative evaluations. The potential routes of exposure to all these receptors include direct contact with soils that may result in incidental ingestion, dermal contact, and inhalation of dust. There are no readily identifiable terrestrial ecological receptors for Parcel 3. There are some aquatic ecological receptors in the ponds, which were characterized as part of a separate report (Radian, 1997). A description of field observations and a brief ecological site characterization are included in later parts of this section.

COPC Selection

The data set presented in this RA includes samples collected during previous investigations (Law Environmental, 1990) as well as during BRAC and RI sampling efforts. The samples and data summaries used in this investigation are listed in Appendix A. The data were validated, and a Data Quality Evaluation (DQE) memorandum was prepared for the entire data set for all parcels. Conclusions of the DQE process for BRAC data include the following:

- The laboratory analyzed the samples according to the EPA methods stated in the work plan, as demonstrated by the data package deliverables.
- Acetone and phthalates (including di-n-butylphthalate and dimethyl phthalate) can be attributed to field sampling and laboratory contamination rather than to environmental contamination.
- Spike recoveries and duplicate sample results indicate that the specific sample matrix did not interfere with the overall analytical process.
- Poor duplicate precision for metals in the five duplicate soil samples should be attributed to poor sample homogeneity as well as to potentially poor sampling and analysis precision.

These data can be used in the project decision-making process without further qualification. A copy of the DQE will be included in an RI report. A data summary of the samples, frequency of detections, and concentration ranges is provided in Appendix A.

Only Parcel 3-related data from the database were used in this RA, which includes the data collected at RI Sites 51, 52, and 69. All detected chemicals were compared against background concentrations and EPA Region III risk-based criteria (RBC) values, as part of the Preliminary Risk Evaluation (PRE). During the screening process, all chemicals exceeding background and RBC values (at risk levels equal to or greater than10^{-6}, or a Hazard Index [HI] of 0.1) are included as COPCs for RA. Lead was compared with an RBC value of 200 milligrams per kilogram (mg/kg) (CH2M HILL, March 1995). Table 1 presents the list of COPCs included for surface soils at the Golf Course, Baseball Field, and Playground. Appendix B includes the screening comparisons for the COPCs selection.

A total of 42 surface soil samples were included from the Golf Course, 8 surface soil samples were included from the Baseball Field, and 11 surface soil samples were included from the Playground area for this RA. Samples H(3.5) and I(3.5) were each composites of four individual samples collected from infield and outfield areas of the Baseball Field, respectively. These samples were treated as individual samples in the statistical analysis. The COPCs are the same for the three data subsets.

TABLE 1
List of Chemicals of Potential Concern for Surface Soils at Parcel 3

Pesticides	PAHs	Inorganic Chemicals
DDE	Benzo(a)anthracene	Arsenic
DDT	Benzo(a)pyrene	Chromium, total
Dieldrin	Benzo(b)fluoranthene	Copper
Alpha-Chlordane	N/A	Lead
Gamma-Chlordane	N/A	Manganese
	N/A	Nickel

Exposure Assessment

The overall objective of the exposure assessment is to characterize the potential for exposure to site-related COPCs on a receptor- and site-specific basis. The results of the exposure assessment are represented as chronic daily intakes (CDIs) for carcinogenic or noncarcinogenic endpoints specific to each COPC and receptor identified at each area of Parcel 3.

For this streamlined RA for the surface soil, the exposure scenarios and receptor groups identified as being potentially relevant for Parcel 3 are included in the quantitative risk

evaluation in the following sections. Exposure factors for surface soil are presented in further detail in Table 2 as well as in Appendix C.

For the most part, the exposure assumptions or parameter values used in the dose calculations reflect "upper bound" or reasonable maximum exposure (RME) conditions.

No unusually sensitive sub-populations were identified within the receptors considered relevant for the Golf Course within the fenced area of the DDMT property. However, the Baseball Field and Playground areas in Parcel 3 could be used by children aged 1 to 16 years. Future exposure scenarios are expected to be identical to the current ones that were considered in this analysis. There are no sensitive ecological receptors identified within Parcel 3 or in the vicinity. The following text describes the ecological conditions at Parcel 3.

Ecological Characterization

This portion of the facility, which includes nine fairways and a large clubhouse area, is predominantly maintained as a recreational area for golfing. Landscaping is well maintained, and there are scattered stands of large oaks, hickories, and cedar trees. There are no undisturbed natural habitat areas on the site. The Golf Course includes two surface water impoundments: Lake Danielson and the Golf Course Pond. There are no flowing streams on the site.

Land use immediately surrounding the site is either highly developed or industrial. Large DDMT storage facilities are located to the immediate north and west, and contain little vegetation. A large industrial facility is located to the east, and residential areas are located to the south. In general, undisturbed natural habitats do not exist around the site.

A site-specific investigation of potentially occurring protected plant or animal species has not been conducted by CH2M HILL; however, the disturbed land use conditions at this site are likely to preclude the incident of protected species. In 1997, Radian International LLC reported that no threatened or endangered species had been sighted on the installation. The entire Golf Course landscape is maintained by routine mowing and pesticide/herbicide application; therefore, the area is generally a poor quality habitat. There are no known wetland or other critical or sensitive habitats in this area.

The two surface water impoundments, Lake Danielson and Golf Course Pond, provide aquatic habitat for a variety of fish, amphibians, and invertebrates. These water bodies typically function as stormwater and sedimentation ponds. Lake Danielson historically contained bass, bluegill, and catfish. A fish kill occurred in this lake in 1993 to 1994, after which a followup investigation identified the probable cause as temporary oxygen depletion resulting from sudden lake turnover. Since that time, two attempts have been made to collect edible fish species from Lake Danielson, but none has been found. Arkansas shiners and goldfish were the only fish species collected. Canadian geese have been observed swimming in this lake. Therefore, this and other water bird species may use this aquatic resource.

The Golf Course Pond is very small (approximately 0.3 acres), and is located near the corner of K Street and 1st Street. A qualitative site visit was conducted by CH2M HILL in June 1997, during which tadpoles, adult bullfrogs, and goldfish were observed from the shoreline. The pond water was fairly clear with a brownish green cast, and filamentous algae was common along the shallow rocky shoreline, providing about 10 percent surface water cover.

TABLE 2
Exposure Factors for Soil
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Symbols	Parameter	Future Receptors					
		Recreational Adult Golfer	Recreational Youth Baseball Player	Recreational Child	Residential Adult	Residential Child	Onsite Worker
	Soils						
BW	Body Weight (kg)[a,c]	70 [a]	30 [c]	15 [a]	70 [a]	15 [a]	70 [a]
AT_C	Averaging Time (days) - Carcinogenic[a]	70 x 365	70 x 365	70 x 365	70 x 365	N/A	70 x 365
AT_NC	Averaging Time (days) - Noncarcinogenic [a c]	25 x 365 [a]	8 x 365 [a,c]	6 x 365 [a]	30 x 365 [a]	6 x 365 [a]	25 x 365 [a]
EF	Exposure Frequency (events/year) [b,c,m]	N/A	20 [c]	64 [b m]	350 [a]	350 [a]	250 [a]
ED	Exposure Duration (years) [a,c]	N/A	8 [c]	6 [a]	30 [a]	6 [a]	25 [a]
EFDadj	Time-adjusted Exposure Frequency (events over 30 years))[d]	4680 [d]	N/A	N/A	N/A	N/A	N/A
IRing	Incidental Ingestion Rate (mg/event) [a,b,n]	50 [b,n]	200 [a]	200 [a]	100 [a]	200 [a]	50 [a]
IRing_adj	Age-adjusted Ingestion Rate (mg-y/kg-day) [l]	N/A	N/A	N/A	114 29 [l]	N/A	N/A
FI	Fraction Ingested (unitless)	100%	100%	100%	100%	100%	100%
SA	Skin Surface Area (cm^2) [e,f,g]	4371 [e]	2080 [f]	2394 [g]	5419 [h]	2394 [g]	2458 [i]
AF	Soil-Skin Adherence Factor (mg/cm^2) [j]	1	1	1	1	1	1
ABS	Absorption Factor (unitless)	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific
IRinh	Inhalation Rate (m^3/event) [a,b,r,s t]	1 67 [b r]	1 25 [b s]	2.5 [b t]	20 [a]	15 [a]	20 [a]
PEF	Particulate Emission Factor (m^3/kg) [k]	1.32E+09	1 32E+09	1.32E+09	1.32E+09	1 32E+09	1 32E+09
VF	Volatilization Factor (m^3/kg)	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific

Notes
[a] U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991.
[b] Best professional judgement
[c] Exposure factors developed for a Youth Baseball Player per U.S. EPA memo, March 1997.
[d] Golf activity over thirty years is assumed to be twice a week for twenty years, and five times a week for ten years, per best professional judgement This accumulates to 4680 days over thirty years (104 days/yr x 20 yrs) + (260 days/yr x 10 yrs)
[e] Surface area of hands, 1/2 arms and 1/2 legs of an adult, adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997.
[f] Surface area of 1/2 arms and head of a recreational youth (age 5-13 years), adapted from CEHT, Technical Report· Soil Cleanup Target Levels for FDEP, September 2, 1997
[g] Surface area of hands, 1/2 arms, 1/2 legs and feet of a recreational child (age 1-6 years), adapted from CEHT, Technical Report· Soil Cleanup Target Levels for FDEP, September 2, 1997
[h] Surface area of hands, 1/2 arms, 1/2 legs and feet of an adult, adapted from CEHT, Technical Report. Soil Cleanup Target Levels for FDEP, September 2, 1997
[i] Surface area of hands, 1/2 arms and 1/2 head (face) of an adult worker, adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997
[j] U.S. EPA Dermal Exposure Assessment· Principles and Application, January 1992
[k] Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance· Technical Background Document, May 1996
[l] Age-adjusted ingestion rate for a residential adult, carcinogenic-pathway only
[m] A child is assumed to spend 2 days/week at the park for 8 months of the year (warmest season)
[n] A golfer is assumed to ingest 50 mg/kg of soil during the 2-hour golf outing at a 9-hole golf course
[o] Time spent outdoors playing golf per best professional judgement (2-hour event per 24 hour day)
[p] Time spent outdoors playing baseball per best professional judgement (1 5-hour event/24 hour day)
[q] Time spent outdoors for the recreational child, best professional judgement (4-hour event/24 hour day)
[r] Inhalation rate for the golfer is determined by 20 m^3/day divided by 24-hours/day, and multiplied by the 2 hours/event
[s] Inhalation rate for a baseball player is determined by 20 m^3/day divided by 24 hours/day, and multiplied by the 1 5 hours/event
[t] Inhalation rate for recreational child is determined by 15 m^3/day divided by 24 hours/day, and multiplied by the 4 hours/event.

Overall, the onsite habitat has almost exclusively developed with buildings or pavement. The lack of suitable onsite wildlife habitat minimizes the exposure of any wildlife species. There are no nearby freshwater, estuarine, or marine water bodies. Because the nearest river is more than five miles away, site impacts to these offsite freshwater resources are not important due to the long travel distances and to dilution/attenuation from potential surface runoff. Thus, there are no sensitive habitats within DDMTor in its vicinity. A further detailed analysis also will be included in the RI report for the DDMT Main Installation.

Potentially Exposed Human Populations

The Golf Course is currently and has not been in use since DDMT closed in September 1997. Although no such activity was observed during field visits, occasional grass maintenance work is expected to be performed by facilities maintenance personnel until the Golf Course is transferred. Thus, the potentially exposed individuals under current conditions are maintenance workers. The Baseball Field and the Playground also are not in use at the present time, but currently undergo grass maintenance work

Future land use of the DDMT Parcel 3 area is anticipated as a public golf course. Although future uses of the Playground and Baseball Field areas have not been finalized, it is anticipated that they will be used for similar recreational purposes once the land is turned over to the City of Memphis.

For a conservative evaluation of the potential future uses, assumed use for the Golf Course is for public commercial golfing. The Baseball Field and Playground are assumed to continue in their original intended uses. Thus, future exposure populations are assumed to be golfers at the golf course, youth baseball players using the baseball diamond area, and children using the playground.

Exposure Assumptions and General Characteristics—Recreational Adult Golfer

The golf course is a 9-hole course. A typical golfer is assumed to be male or female, ranging from age 20 to 60, with an average age of 50. Based on the geographic location of Memphis, Tennessee, the DDMT Golf Course should be available for play for all 12 months of the year. The typical golfer is assumed to play twice a week for 20 years, and five times a week for 10 years, accumulating a total of 4,680 days (events) over a 30-year period. The typical 9-hole golf game lasts 2 hours. This information was gathered through a series of phone conversations regarding golfers, as documented in Appendix D.

On the basis of this receptor's expected activities, it is assumed that it would be possible for the adult golfer to have the potential for direct and indirect contact with surface soils at the DDMT Golf Course area. Playing, walking, and riding along the course will involve some physical disturbance of the surface soils, resulting in incidental dust ingestion of 50 mg/day, or dermal contact with disturbed soils. While most of the Golf Course is covered with grass or sand, occasional disturbed soil could be incidentally ingested. Golfers have also been reported to place golf tees into their mouths, lick golf balls, or touch their mouths, food, or drinks with unwashed hands. These actions potentially increase soil consumption rates from that of dust or sand grit that they may ingest incidentally. The 50-mg/day ingestion rate is assumed to be adequately protective of exposures to a golfer from all sources. The inhalation exposure is for 2 hours during a golf event at an inhalation rate of 20 cubic meters (m^3)/day. Golfers are assumed to wear shorts, short-sleeved shirts, socks,

shoes, and hats. The assumed surface area (4,371 square centimeters [cm^2]) available for contact with soils includes hands, half of the arms, and half of the legs (Florida Department of Environmental Protection, September 1997). The adherence factor of 1 mg/cm^2 is assumed. This is protective of the receptor's feet becoming soiled by mud or grass. Golfers are also known to apply suntan lotions or insect repellants, and may perspire while on the course, which provides an adherent surface area to exposed areas for grass and dirt.

This scenario is conservative based on the assumptions of soil ingestion rate, the high frequency of playtime, the large surface area exposed, and the extended duration of exposure over a 30-year period. Exposure factors are listed in detail in Appendix C.

Exposure Assumptions and General Characteristics—Recreational Youth Baseball Player

This pathway is developed, in part, in accordance with assumptions provided by EPA (March 1997; see Appendix D) and details the exposure factors for a youth baseball player that have been adapted for the DDMT recreational area. The recreational youth baseball player may be male or female, between 5 and 13 years of age; the exposure duration is expected to be throughout the entire 8 years. The youth is assumed to play baseball at the park one season each year, for 1.5 hours per game. Seasonal games and practice account for a total of 20 games (events) per year. The baseball player has an age-adjusted weight (30 kg) to accommodate the specific age range.

On the basis of this receptor's expected activities, it is assumed that it would be possible for the youth baseball player to have the potential for direct and indirect contact with surface soils at the Baseball Field. Expected activities such as running, walking, and sliding along the baseball diamond involve some physical disturbance of the surface soils, resulting in the generation of dust, which could be inhaled. The inhalation rate of 20 m^3/day, resulting in a total inhalation of 1.25 m^3/event, has been assumed for the youth receptor in the Baseball Field area. A surface area of 1,800 cm^2 for the head and arms of the youth was listed in an EPA memo (March 1997; see Appendix D); however, a more recent surface area listing was used to derive exposure area value for this risk calculation. The assumed clothing is a typical baseball uniform consisting of long pants, short-sleeved shirt, socks, shoes, and a hat. This will allow only the head and arms to be exposed, resulting in a surface area of 2,080 cm^2 (Florida Department of Environmental Protection, September 1997). Expected activities could result in a relatively high incidental ingestion of soil and dust. An ingestion rate of 200 mg/event has been assumed for the youth receptor in the risk calculation for the Baseball Field area. The default ingestion and inhalation rates allow some conservatism in this risk scenario. Exposure factors are listed in detail in Appendix C.

Exposure Assumptions and General Characteristics—Recreational Child

The default child for the recreational scenario may be male or female, between 1 to 6 years of age; the exposure duration is expected to be throughout the entire 6 years. The child is assumed to play in the Playground area for 4 hours per event, for approximately 2 days a week during warmer months of the year, which is assumed to be 8 months of the year, for a total of 64 days per year. Realistically, younger children will not be at the Playground for 4 hours at a time.

On the basis of this receptor's expected activities, it is assumed that it would be possible for the recreational child to have the potential for direct and indirect contact with surface soils at the Playground area. Typical behavior of the children (e.g., running, playing, and sitting

in the soil, sand, or grass) is expected, and will involve some physical disturbance of the surface soils, resulting in the generation of dust. The default inhalation rate of 15 m^3/day, results in an inhalation rate of 2.5 m^3/event. The dermal contact was assumed for a child receptor wearing shorts and a T-shirt for most of the year while playing at the park. The assumed surface area (2,394 cm^2) presumes that the hands, half of the arms, half of the legs, and the feet may be exposed to the environment (Florida Department of Environmental Protection, September 1997). This is protective of the child receptor getting his feet dirty from soil, mud, or grass. The default soil ingestion rate of 200 mg/event has been assumed for the child receptor in the area, and should be sufficient for this risk calculation.

This is a very conservative scenario based on the assumed high frequency of playtime, the large surface area exposed, and the default inhalation and ingestion assumptions. Exposure factors are listed in detail in Appendix C.

Exposure Assumptions and General Characteristics—Default Industrial and Residential Scenarios

Because recreational land use is not a certainty, default exposure scenarios were evaluated for a future industrial worker and for future residential use of Parcel 3. All data sets were combined for these pathways. A default future industrial worker is assumed to have a soil ingestion rate of 50 mg/day, for 250 days per year, with an exposure duration of 25 years. Dermal contact with soils was estimated for the exposed skin area of hands, half of arms, and head (2,458 cm^2/event). Dust exposure intake estimations were based on an inhalation rate of 20 m^3/day for a workday of 8 hours/day.

A future residential scenario evaluated an adult and a child exposure scenario using EPA recommended default exposure factors. These include a soil ingestion rate of 100 mg/day for an adult and 200 mg/day for a child. For the carcinogenic RA, age-adjusted exposure factors were used for soil ingestion rate at 114.29 (mg-y/kg-day), age-adjusted inhalation rate at 12.86 (3-y/kg-day), and age-adjusted surface area for exposure at 1574 cm2-y/kg). Inhalation rates for noncarcinogenic chemical-related intake estimates of 20 m^3/day and 15 m^3/day were assumed for an adult and a child, respectively. Further details of the exposure factors are included in Appendix B. These scenarios were evaluated to provide the maximum information to assist in the risk-based decisions for Parcel 3, while providing the worst-case exposure related risks.

Summary of Exposure Assessment

There are no receptors for the Golf Course, Baseball Field, or Playground under current land-use conditions. Under future land use, the receptor groups used in deriving estimates of exposure and health risks for the DDMT Golf Course, Baseball Field, and Playground areas are as follows:

- Future recreational adult golfer
- Future recreational youth baseball player
- Future recreational child at Playground
- Hypothetical future industrial worker—Parcel 3
- Hypothetical future residential receptor (adult and child)—Parcel 3

Quantification of Exposure

This section includes the exposure point concentration and dose estimation algorithms for the exposure scenarios identified previously. The estimated doses will be compared with the toxicity factors identified in the toxicity assessment (next section) to calculate risks and HQs in the risk characterization section.

Exposure Point Concentration

Exposure estimates were derived for each COPC on a media- and receptor-specific basis for both carcinogenic risk and noncarcinogenic hazard estimation purposes.

As described earlier in the COPC selection section, surface soil samples from Parcel 3 included those from the Golf Course, Baseball Field, and Playground, as well as the drainage ditches from the ponds. Forty-two samples were analyzed for dieldrin (a total of 39 samples were analyzed for all of the pesticides); 28 samples were analyzed for polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs); 17 samples were analyzed for other semivolatile organic compounds (SVOCs) and volatile organic compounds (VOCs); and 27 samples were analyzed for target list metals. All of these samples were combined to estimate exposure point concentration for a future industrial worker and residential scenarios. However, these data sets were subdivided into smaller groups based on the location of samples for golfer (from the Golf Course), ball player (from the Baseball Field), and for a child (from the Playground).

An exposure point concentration (EPC) is the RME, which is the upper confidence limit at the 95th percentile on the mean (UCL 95%percent). The UCL 95% calculations, calculation methodology, and decision flow chart are included in Appendix F. A summary of the results is included in Table 3.

Intake Estimates

The intake (dose) estimates were calculated for each of the complete exposure pathways. These estimates were used to compare with cancer slope factors (CSFs) and reference doses (RfDs) for each of the COPCs, and are described in the following paragraphs.

While the specific combination of COPCs, receptors, and exposure routes that are applicable to each site is unique, many assumptions and values adopted for various exposure parameters used in the process of deriving dose estimates for each receptor group are generic. Methods and default values specified in existing EPA (1989) guidance generally were followed in developing CDI estimates for each receptor group.

Best professional judgment was applied for site-specific exposure scenarios for some exposure parameters, where warranted, because of the lack of applicable default values in the available technical guidance, or because the available default value is inapplicable at a site. Site-specific information regarding recreational activity was considered where applicable. For example, a golfer scenario was developed for quantitation using best professional judgement, in consultation with EPA and the state of Tennessee risk assessors, and information gathered by phone interviews and electronic mail with golf courses throughout the eastern U.S. and in the Memphis vicinity (see Appendix D). A ballplayer scenario was developed applying modifications to the "ballplayer scenario" literature

TABLE 3
Exposure Point Concentrations for all COPCs in the Areas of Concern
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Areas of Concern Identifier	Parameter Name	Number of Analyses	Number of Detections	Number of NonDetections	Minimum Detections	Maximum Detections	Arithmetic Mean Value	UCL95 lognormal	UCL95 normal	RME	Basis
Surface Soil	Arsenic	27	27		2	101	22	2	28	29	LOGNORM
Surface Soil	Chromium	27	27		8	40	19	22	21	22	LOGNORM
Surface Soil	Copper	27	27		3	55	25	31	28	31	LOGNORM
Surface Soil	Lead	27	27		3	167	47	76	62	76	LOGNORM
Surface Soil	Manganese	13	13		371	1,860	770	983	960	983	LOGNORM
Surface Soil	Nickel	27	27		4	58	21	26	25	26	LOGNORM
Surface Soil	Alpha-Chlordane	32	1	31	1	1	0 10	0.23	0 17	0 23	LOGNORM
Surface Soil	DDE	41	26	15	0.00	2	0 28	0 80	0 39	0 80	LOGNORM
Surface Soil	DDT	41	24	17	0 01	7	0 42	0 96	0 71	0 96	LOGNORM
Surface Soil	Dieldrin	42	40	2	0 01	10	0 71	2	1	2	LOGNORM
Surface Soil	Gamma-Chlordane	39	2	37	0 02	1	0 11	0 27	0.18	0 27	LOGNORM
Surface Soil	Benzo(a)anthracene	30	13	17	0 05	0 92	0.17	0.25	0 23	0.25	LOGNORM
Surface Soil	Benzo(a)pyrene	30	11	19	0 05	0 93	0 16	0 26	0.22	0 26	LOGNORM
Surface Soil	Benzo(b)fluoranthene	30	11	19	0 05	1	0 18	0 28	0 24	0 28	LOGNORM
Ballpark	Arsenic	4	4		11	22	15	28	21	22	MAXDET
Ballpark	Chromium	4	4		14	19	16	20	19	19	MAXDET
Ballpark	Copper	4	4		19	25	22	27	25	25	MAXDET
Ballpark	Lead	4	4		12	49	23	185	43	49	MAXDET
Ballpark	Manganese	4	4		520	970	711	1,122	932	970	MAXDET
Ballpark	Nickel	4	4		14	21	18	25	22	21	MAXDET
Ballpark	Alpha-Chlordane	4		4			0 09	11	0.18		MAXDET
Ballpark	DDE	4	1	3	0 09	0.09	0 19	11	0 34	0 09	MAXDET
Ballpark	DDT	4	1	3	0.07	0 07	0 18	16	0 34	0 07	MAXDET
Ballpark	Dieldrin	4	4		0 16	1	0 56	52	1 08	1	MAXDET
Ballpark	Gamma-Chlordane	4		4			0 09	11	0 18		MAXDET
Ballpark	Benzo(a)anthracene	4	1	3	0 08	0 08	0 17	0 62	0 24	0 08	MAXDET
Ballpark	Benzo(a)pyrene	4	1	3	0 08	0 08	0 17	0 52	0 24	0.08	MAXDET
Ballpark	Benzo(b)fluoranthene	4	1	3	0 09	0 09	0 17	0 44	0 24	0 09	MAXDET
Playground	Arsenic	5	5		10	19	14	18	17	19	MAXDET
Playground	Chromium	5	5		12	16	14	16	16	16	MAXDET
Playground	Copper	5	5		16	55	27	55	42	55	MAXDET
Playground	Lead	5	5		16	69	32	93	53	69	MAXDET
Playground	Manganese	5	5		432	899	651	914	823	899	MAXDET

TABLE 3 (CONTINUED)
Exposure Point Concentrations for all COPCs
DDMT 1998

Areas of Concern Identifier	Parameter Name	Number of Analysis	Number of Detections	Number of NonDetections	Minimum Detections	Maximum Detections	Arithmetic Mean Value	UCL95 lognormal	UCL95 normal	RME	Basis
Playground	Nickel	5	5		14	21	18	21	21	21	MAXDET
Playground	Alpha-Chlordane	6		6			0.03	5	0 06		MAXDET
Playground	DDE	6	3	3	0 14	0 43	0 14	184	0.27	0.43	MAXDET
Playground	DDT	6	2	4	0.04	0 20	0 09	29	0 16	0 20	MAXDET
Playground	Dieldrin	6	6		0 01	0.71	0 33	70	0 54	0 71	MAXDET
Playground	Gamma-Chlordane	6		6			0 03	5	0 06		MAXDET
Playground	Benzo(a)anthracene	5	1	4	0 57	0.57	0 28	0 53	0.43	0 57	MAXDET
Playground	Benzo(a)pyrene	5	1	4	0 44	0.44	0 25	0.39	0 35	0 44	MAXDET
Playground	Benzo(b)fluoranthene	5	1	4	0 46	0 46	0 26	0 41	0 36	0 46	MAXDET
Golf	Arsenic	18	18		2	101	25	43	34	43	LOGNORM
Golf	Chromium	18	18		8	40	21	26	24	26	LOGNORM
Golf	Copper	18	18		3	52	24	35	29	29	NORM
Golf	Lead	18	18		3	167	57	123	77	123	LOGNORM
Golf	Manganese	4	4		371	1,860	976	13,653	1,749	1,860	MAXDET
Golf	Nickel	18	18		4	58	23	32	28	32	LOGNORM
Golf	Alpha-Chlordane	22	1	21	1	1	0 11	0.35	0.22	0 35	LOGNORM
Golf	DDE	31	22	9	0 00	2	0 32	1	0 46	1	LOGNORM
Golf	DDT	31	21	10	0 01	7	0 52	1	0 90	1	LOGNORM
Golf	Dieldrin	32	30	2	0 02	10	0 81	3	1	3	LOGNORM
Golf	Gamma-Chlordane	29	2	27	0 02	1	0.13	0 40	0 22	0 40	LOGNORM
Golf	Benzo(a)anthracene	21	11	10	0 05	0.92	0.14	0.23	0 22	0 23	LOGNORM
Golf	Benzo(a)pyrene	21	9	12	0 05	0 93	0 14	0 23	0 22	0 23	LOGNORM
Golf	Benzo(b)fluoranthene	21	9	12	0 05	1	0 16	0 28	0 25	0.28	LOGNORM

provided by EPA (March 1997; see Appendix D), which was used at other sites (see Appendix D). A child-using-the-playground scenario was developed in accordance with best professional judgment, assuming conservative exposure conditions as described previously. These three scenarios are specific to this site.

Additionally, conservative default exposure scenarios that were evaluated include a future residential use scenario and an industrial use scenario. The factors that were used include default parameters listed in the guidance, as cited in the Appendix C exposure factors table. The dose algorithms used for the quantification of exposure to the surface soil for each receptor group and the potentially applicable exposure route are summarized in Appendix C. Chemical-specific values adopted for the exposure factors used in the dose algorithms are also summarized in Appendix C. The results of the quantitative exposure analysis (dose estimates), along with the risk calculations, are included in Appendix E.

Toxicity Assessment

The toxicity values from EPA toxicity factor sources for the DDMT Parcel 3 COPCs are presented in Table 4. Eight carcinogens (arsenic; benzo[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; 4'4'-dichlorodiphenyldichloroethene [4'4'-DDE]; 4'4'-dichlorodiphenyldichloroethane [4'4'-DDT]; *gamma*-chlordane; and dieldrin) were detected as COPCs at Parcel 3. Three noncarcinogens (copper, chromium [total], and lead) were detected as COPCs at Parcel 3.

All toxicity values used for the DDMT Parcel 3 area are chronic values. Acute and subchronic values are deemed inappropriate for use based on the long-term exposures assumed for dose estimations. Oral and inhalation CSFs were available for arsenic, PAHs, and pesticides listed in Table 4. The only COPC without an inhalation CSF is 4'4'-DDE. An inhalation CSF was also available for chromium (total). Oral RfDs were available for all inorganics and pesticides listed, with the exception of lead and 4'4'-DDE. An inhalation RfD was available only for chromium (total).

The toxicity equivalency factors (TEFs) for various carcinogenic PAHs have been selected from EPA Region IV and EPA's provisional guidance (EPA/600/R-93/089). They were selected and applied to the toxicity factor for benzo (a) pyrene (B(a)P) to estimate risks from individual PAH compounds. Alternatively, TEFs may be applied to the concentration of individual PAH compounds to convert them to B(a)P concentration, a practice recommended by EPA Region IV. However, since other less toxic PAHs often occur at higher concentrations than B(a)P, to present individual contribution to the total risk, TEFs were applied to the toxicity factors.

Lack of inhalation toxicity factors is not considered critical, because most of the inhalation intakes are based on dust inhalation for these SVOCs, and metal COPCs, resulting in very low doses. In accordance with the conservative assumptions associated with the oral and dermal exposure pathway evaluations, these missing toxicity values are not considered important. Lead, which does not have any of the toxicity factors, will be compared with the generally accepted target concentrations for the risk evaluation.

TABLE 4
Toxicity Criteria for Carcinogenic and Non-Carcinogenic Effects for COPCs
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Chemical Name	CAS Number	Oral Slope Factor (SF) (kg-day/mg)	Source	Inhalation SF (kg-day/mg)	Source	Chronic Oral Reference Dose (RfD) (kg-day/mg)	Source	UF	Chronic Inhalation RfD (mg/kg-day)	Source	UF
Arsenic	7440382	1 50E+00	IRIS	1.51E+01	IRIS	3 00E-04	IRIS	3			
Chromium, total	7440473			4 20E+01	Icr6	5.00E-03	Icr6	500	5 71E-07	WCr3	
Copper	7440508					3.50E+00	E				
Lead	7439921										
Manganese	7439965					2 30E-02	IRIS	1	1.43E-05	IRIS	1,000
Nickel	7440020					2 00E-02	IRIS	300			
DDE	72559	3.40E-01	IRIS								
DDT	50293	3 40E-01	IRIS	3 40E-01	IRIS	5.00E-04	IRIS	100			
Dieldrin	60571	1 60E+01	IRIS	1.61E+01	IRIS	5 00E-05	IRIS	100			
Alpha-chlordane		3 50E-01	IC	3 50E-01	IC	5 00E-04	IC				
Gamma-chlordane	5103742	3 50E-01	IC	3 50E-01	IC	5 00E-04	IC				
Benzo(a)anthracene	56553	7 30E-01	E	3 10E-01	E						
Benzo(a)pyrene	50328	7 30E+00	IRIS	3 10E+00	E						
Benzo(b)fluoranthene	205992	7 30E-01	E	3.10E-01	E						

Weight of Evidence· A Human carcinogen, B1 Probable human carcinogen (limited human data), B2 Probable human carcinogen (sufficient evidence in animals, inadequate evidence in humans); C, Possible human carcinogen, D, Not classified as to human carcinogenicity.

CAS	Chemical Abstract Registry Service Number
E	EPA-NCEA Regional Support provisional value
H	Health Effects Assessment Summary Tables (HEAST); (USEPA, 1997)
I(PCB)	High risk and persistence value used, (IRIS, 1997)
IC	IRIS value for Chlordane used
ICr6	IRIS value for Chromium (VI)
IRIS	Integrated Risk Information System, (IRIS, 1997)
M	Massachusetts Department of Environmental Protection (MDEP), (MDEP, 1995)
SF	Slope Factor
T	from Total Petroleum Hydrocarbon Working Group, (TPH Criteria Working Group, 1996)
UF	Uncertainty Factor
W	Withdrawn from IRIS or HEAST
WCr3	Withdrawn value for Chromium (III)

Risk Characterization

The risk characterization discusses the qualitative and quantitative evaluation of potential risks associated with COPCs detected at DDMT Parcel 3 so that risk managers can make decisions regarding removal actions or potential restrictions in the future. The risk characterization process combines the results of the exposure and toxicity assessments with yield estimates of excess lifetime cancer risks (ELCRs) for carcinogenic COPCs and a cumulative HI for noncarcinogenic COPCs. For the purposes of this assessment, cancer risks and noncarcinogenic health hazards are described on an area-specific basis to facilitate remedial decision-making. Consistent with the exposure assessment results, cumulative ELCRs and HIs are calculated for each COPC as a summation of media-specific results for each receptor.

Carcinogenic risk (ELCR), defined as the unitless upper-bound probability of the individual receptor developing cancer over a lifetime under the specified exposure conditions, is derived for each carcinogenic COPC as follows:

$$ELCR = CDI \times CSF$$

Where:

CDI = Route- and media-specific cumulative daily intake (dose) of a COPC (mg/kg/day)

CSF = Route-specific cancer slope factor $(mg/kg/day)^{-1}$ for the COPC

Summing all of the route- and media-specific ELCR estimates provides a total ELCR for a given COPC for each receptor. The summation of total ELCRs for all of the COPCs provides the total ELCR for the receptor.

Likewise, the upper-bound noncarcinogenic health hazard is estimated initially by calculating HQs on a route- and media-specific basis for each COPC for each receptor, as follows:

$$HQ = CDI/RfD$$

Where:

CDI = Route- and media-specific cumulative daily intake (dose) of a COPC (mg/kg/day)

RfD = Route-specific reference dose (mg/kg/day) (daily intake considered unlikely to cause adverse effects over a lifetime of exposure) for the COPC

Summing the route- and media-specific HQs provides an estimate of a total HI for a given COPC for each receptor. The summation of HIs across COPCs provides a total HI for the receptor. As noted, this procedure ignores toxicological endpoints and mechanisms of action as the basis for estimating the noncarcinogenic hazard from multi-contaminant exposure, thus providing a highly conservative estimate of potential effects.

For scenarios presenting excessive noncarcinogenic hazards above a value of 1.0, individual target organs for each of the COPCs will be separated to identify whether any individual target organ hazard is above a value of 1.0.

For the purposes of regulatory decision-making at contaminated sites, EPA uses an acceptable risk range of 10^{-4} to 10^{-6} (1 chance in 10,000 to 1 chance in 1,000,000). Typically, results falling within or below this range are considered a reasonable basis for NFA, depending on the degree of conservatism and uncertainty associated with the estimates. Likewise, a total HI of 1.0 or less is considered evidence of *de minimus* potential for noncarcinogenic health effects. Conservatism and uncertainties inherent in the analysis again are considered when interpreting the results.

The results of the risk and noncarcinogenic hazard calculations are provided on a media-, receptor-, and route-specific basis for each pathway identified in the exposure assessment section in Appendix C. Cancer risks and HIs are summarized in Table 5.

The carcinogenic risks from individual constituents of PAHs were estimated by applying TEF to the B(a)P toxicity factor. Thus, risks are estimated for individual PAH constituents.

Future Golfer Scenario

The total ELCR to a golfer from the surface soil COPCs at the golf course is estimated to be 2×10^{-5} from soil (with an ingestion rate of 50 mg/day). The estimated risks are associated with ingestion and dermal exposures to arsenic and dieldrin in soil at an EPC of 43 mg/kg and 3.38 mg/kg, respectively. The estimated risk level is well within the acceptable range of 10^{-6} to 10^{-4}, typically considered adequately protective of public health. Total noncarcinogenic health hazard was estimated at approximately 0.1, which is well below a value of 1.0. These results suggest that no significant risks of adverse health impacts exist at this site for future golfers.

Future Youth Ballplayer

The total ELCR to a ballplayer from the Baseball Field surface soil COPCs is estimated to be 2×10^{-6}, primarily from arsenic in soil at an EPC of 21.8 mg/kg, which is near the background levels for DDMT. This risk level is well within the acceptable range of 10^{-6} to 10^{-4}, typically considered adequately protective of public health. Total noncarcinogenic health hazard was indicated by an HI of 0.05, which is well below a value of 1.0. These results suggest that no significant risks of adverse health impacts exist at this site for a ball player under the existing conditions.

Future Recreational Child at the Playground

The total ELCR to a child from the Playground surface soil COPCs is estimated to be 9×10^{-6}, mostly from the presence of arsenic at an EPC of 19.4 mg/kg (below background) and dieldrin at 0.71mg/kg. This risk level is well within the acceptable range of 10^{-6} to 10^{-4}, typically considered adequately protective of public health. Total noncarcinogenic health hazard was estimated at an HI of 0.3, which is well below a value of 1.0. These results suggest that no significant risks of adverse health impacts exist at this site for a child under the existing conditions.

TABLE 5
Summary of Risks and Hazards
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Medium	Exposure Point	Excess Lifetime Cancer Risk	Noncarcinogenic Hazard Index
Surface Soil			
Recreational Adult Golfer	Incidental Ingestion	2E-05	0.1
	Dermal Absorption	2E-06	0.006
	Incidental Inhalation	6E-09	0.0004
	TOTAL	**2E-05**	**0.1**
	Major Contributors	*Arsenic, Dieldrin*	
Surface Soil			
Recreational Youth	Incidental Ingestion	2E-06	0.05
Baseball Player	Dermal Absorption	2E-08	0.0002
	Incidental Inhalation	2E-10	0.00006
	TOTAL	**2E-06**	**0.05**
	Major Contributors	*Arsenic*	
Surface Soil			
Recreational Child	Incidental Ingestion	9E-06	0.3
	Dermal Absorption	3E-07	0.003
	Incidental Inhalation	2E-09	0 0006
	TOTAL	**9E-06**	**0.3**
	Major Contributors	*Arsenic, Dieldrin*	
Surface Soil			
Future Residential Adult	Incidental Ingestion	1E-04	0.3
	Dermal Absorption	4E-05	0.1
	Incidental Inhalation	1E-07	0.008
	TOTAL	**2E-04**	**0.4**
	Major Contributors	*Arsenic, Dieldrin, Benzo(a)Pyrene*	
Surface Soil			
Future Residential Child	Incidental Ingestion	N/A	2.4
	Dermal Absorption	N/A	0.2
	Incidental Inhalation	N/A	0.03
	TOTAL	**0E+00**	**2.7**
	Major Contributors	*Arsenic*	
Surface Soil			
Future Worker	Incidental Ingestion	1E-05	0.09
	Dermal Absorption	1E-05	0.04
	Incidental Inhalation	8E-08	0 006
	TOTAL	**1E-05**	**0.1**
	Major Contributors	*Arsenic, Dieldrin, Benzo(a)Pyrene*	

Hypothetical Future Land Use Conditions

These following scenarios were evaluated to represent the worst-case risk estimation scenarios.

Future Hypothetical Industrial Worker

The total ELCR to hypothetical future onsite workers at Parcel 3 was estimated to be 1×10^{-5}, primarily due to arsenic and dieldrin at their respective EPCs, 29.3 mg/kg and 2.21 mg/kg. The estimated risk is within the 10^{-6} to 10^{-4} acceptable risk range typically considered adequately protective of public health. Total noncarcinogenic HI was estimated at 0.1, which is well below a value of 1.0. Given the conservatism inherent in the assumptions and parameter values used in this analysis, these results suggest that no significant risks of adverse health impacts exist at this site for future industrial/commercial workers.

Future Hypothetical Resident

The total ELCR to hypothetical future onsite adult and child residents at Parcel 3 was estimated to an adult using age-adjusted soil ingestion, dermal surface area, and inhalation rate factors. The estimated cancer risk is 2×10^{-4}, which is slightly above the upper-bound limit on the acceptable risk range of 10^{-6} to 10^{-4}. A separate child cancer risk was not estimated because the adult risk represents a time-adjusted exposure. The estimated risk is due to arsenic at 28.3 mg/kg (compared to a background level of 20 mg/kg) and dieldrin at 2.21 mg/kg. Total noncarcinogenic health hazard was estimated to be an HI of 0.4 for an adult and an HI of 2.7 for a child. These results suggest that site dieldrin and arsenic levels render Parcel 3 unusable as a residential site under current contamination conditions.

Health-based Evaluation for Lead

The maximum observed lead concentration at Parcel 3 is 167 mg/kg, with an estimated mean of 47.3 mg/kg and a UCL95% concentration of 75.9 mg/kg. These concentrations are well below a residential exposure-based screening level of 400 mg/kg and an industrial exposure-based screening level value of 1,000 mg/kg. Thus, the observed lead levels at the site are not expected to pose health hazards for any of the above identified receptors, because the more conservative residential exposure-based screening level of 400 parts per million (ppm) was not exceeded at Parcel 3.

Sources of Uncertainty for Parcel 3

Potential sources of uncertainty exist in each of the steps in this RA. The uncertainty associated with the COPC selection process comes from the sample location, number of samples, time variation in the sampling events, differences in sample analysis by different laboratories, and so forth. Most of these uncertainties are minimized at Parcel 3 due to the presence of a relatively large data set (e.g., 42 samples for dieldrin) and analytical results produced by a single laboratory. The DQE implemented also minimizes the uncertainties associated with analytical data quality issues.

An uncertainty that could potentially over-estimate the chemical activity is the presence of persistent organo-chlorine pesticides that are risk drivers in this risk analysis. Because the use of these pesticides was discontinued at DDMT in the 1970s, the measured pesticides are from historical application. Their availability for absorption through skin and intestinal tracts from soil particles is currently not known. The available toxicity information is based

on dose estimates from experimental studies or occupational exposures using the pure chemicals. Thus, dose estimates could be overestimating the bio-available fraction from the soil matrix.

The other risk drivers at the site include arsenic and PAHs (mostly benzo(a)pyrene). Most of the sample concentrations for arsenic appear to be similar to the naturally occurring background concentrations in the area. The cancer slope factor for arsenic is based on drinking water arsenic exposures in human population. The apparent soil matrix effects cannot be accounted for in these risk estimations, resulting in over-estimates of potential risks from arsenic. The observed PAHs are also widely distributed across DDMT Main Installation, and could be from asphalt-paved roadways and other non-point sources. Toxicity factors for PAHs are based on carcinogenicity among occupationally exposed workers. Bioavailability of the weathered asphalt material and its toxicity likely will be lower than that indicated during occupational and experimental animal exposures to pure chemical (not in solid matrix). Thus, these risk estimations could be biased to higher levels. The exposure pathways evaluated are all based on future hypothetical uses. Summation of the chemicals across pathways for each medium is a conservative evaluation, because exposure through all routes may not occur simultaneously.

Summary of Parcel 3 (Golf Course) Risk Assessment

Site soils were thoroughly sampled across the Golf Course, Playground, and Ballfield areas. Contamination appears to be limited to the surface soils, as subsurface soils do not have any COPCs. Although the site is currently not in use, the facility is interested in maintaining the golf course for future public recreational golfing. Thus, future use is likely to remain as a golf course. If the golf course remains in the current use, the peripheral remote corner occupied by the Ballfield and Playground could remain the same in the future. Since children's exposure evaluation is a more conservative risk evaluation, in the event the Ballfield and Playground are to be a merged part of the golf course, potential risks are conservatively presented by this RA (children's exposure evaluation) RA.

The total carcinogenic risks were estimated by adding the risks from ingestion, dermal contact, and inhalation of dust for each receptor from the site. The total carcinogenic risk to an adult golfer from the site is at 2×10^{-5}, which is within 1 to 100 in a million risk level The HI is 0.1, which is well below a target level of 1.0. The total carcinogenic risks estimated for a youth baseball player is 2×10^{-6}, and a recreational child is 9×10^{-6}, both of which are within the acceptable risk range. The HIs to these recreational receptors (baseball player is 0.05 and recreational child is 0.3) are below a value of 1.0. If the site is converted to a future industrial facility, assuming an outdoor worker is present onsite for the entire workday, the total carcinogenic risk to an industrial worker is 1×10^{-5}, and HI is 0.1, both of which are within acceptable limits. The carcinogenic risk to a future residential aggregate adult (continuously exposed as a child and as an adult) is 2×10^{-4}, which is above the upperbound limit on the acceptable risk level. The HI is 0.4, which is within the acceptable level of 1.0. However, the HI to a child is estimated at 2.7, which is above the acceptable level of 1.0.

There are no ecological concerns due to lack of natural habitat within Parcel 3, and highly developed and industrial nature of the surrounding areas. The ponds have some aquatic receptors which were addressed as a separate report (Radian, 1997). There are no sensitive

habitats within the site or in the vicinity. Thus, ecological receptor exposures are not a concern for this site.

All of the evaluated exposure scenarios result in risks within the acceptable limits, except the residential scenario. Thus, under present surface soil conditions, this site presents risks within acceptable limits to golfers, recreational children, baseball player (youth), and current and future workers. However, based on the risks estimated, the site is not conducive for residential use without reducing exposures to the site COPCs.

Remedial Goal Options

The RGOs are the target concentration values for remedial alternatives analysis. Achieving these goals should fulfill compliance with state and federal standards and satisfy National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requirements to ensure the protection of human health and the environment at hazardous waste sites. The RGOs calculated for DDMT are in accordance with Risk Assessment Guidance for Superfund, Part-B (EPA, 1991) and EPA Region IV Supplemental Guidance to RAGS (EPA, 1994).

The RGOs are developed only for the chemicals detected at the site that had concentrations above the applicable state and federal standards or for those that present risks or HIs above the acceptable levels. The acceptable risks are defined as risk levels below 100 in a million or an HI below 1.0 for either current or future exposure pathways analyzed in the RA. The RGOs are developed only for surface soils that present unacceptable risks and HIs. Chemical-specific RGOs are developed for each medium at the site with underlying assumptions regarding land use (Golf Course, Baseball Field, Playground, or industrial vs residential) at the site.

The two general sources of RGOs are (1) concentrations based on state and federal standards and (2) concentrations based on site-specific RA. There are no state or federal standards for surface soils.

Site-Specific Risk-Based RGOs

Most of the evaluated exposure scenarios did not exceed a risk level of 100 in a million or an HI of 1.0. Thus, the surface soils within Parcel 3 do not require further remedial actions in order to be protective of human health. However, risk-based RGOs are provided for chemicals that present a risk above 1 in a million or an HI above 0.1, as an option for risk-based management decisions. For these chemicals, Tables 6 through 11 present the RGOs for risk levels 10^{-6}, 10^{-5}, and 10^{-4} and HI levels 0.1, 1.0, and 10, calculated following the EPA Region IV guidance.

TABLE 6
Preliminary Soil Risk Goals - Hypothetical Future Golfer Exposure Scenario
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Chemical	Reasonable Maximum Exposure (mg/kg)	Carcinogenic Effects			Noncarcinogenic Effects		
		TR = 1E-06 (mg/kg)	TR = 1E-05 (mg/kg)	TR = 1E-04 (mg/kg)	THI =0.1 (mg/kg)	THI =1 (mg/kg)	THI =10 (mg/kg)
Metals and Pesticides							
Arsenic	43	5	51	506	81	813	8,207
Chromium	26	7,206	72,064	720,641	1,111	11,111	131,344
Copper	29	N/A	N/A	N/A	948,513	9,485,130	94,851,302
Lead	123	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	1,860	N/A	N/A	N/A	6,233	62,331	629,216
Nickel	32	N/A	N/A	N/A	5,420	54,201	547,144
Alpha-chlordane	0.35	17	169	1,693	106	1,058	13,426
Gamma-chlordane	0.40	17	169	1,693	106	1,058	13,426
Dieldrin	3	0.39	4	39	11	112	1,058
DDE	1	18	185	1,846	N/A	N/A	N/A
DDT	1	18	185	1,846	112	1,121	13,426
Semivolatiles							
Benzo(a)anthracene	0.23	6	61	607	N/A	N/A	N/A
Benzo(a)pyrene	0 23	0.61	6	61	N/A	N/A	N/A
Benzo(b)fluoranthene	0.28	6	61	607	N/A	N/A	N/A

Carcinogenic calculation:

$$\text{RBC (mg/kg)} = \frac{TR \times BW \times Atc}{EFDadj \times (A+B+C)}$$

Noncarcinogenic calculation:

$$\text{RBC (mg/kg)} = \frac{THI \times BW \times Atnc}{EFDadj \times (A+B+C)}$$

Where:

Ac = (SFo x IRing x FI x CF)
Bc = (SFo x SA x AF x ABS x ET x CF)
Cc = (SFi x IRinh x ((1/VF)+(1/PEF)))
TR = 1 00E-06

An= ((1/RfDo) x IRing x FI x CF)
Bn = ((1/RfDo) x SA x AF x ABS x ET x CF)
Cn = ((1/RfDi) x IRinh x ((1/VF)+(1/PEF)))
THI = 1.0

TABLE 7
Preliminary Soil Risk Goals - Hypothetical Future Ballplayer (Youth) Scenario
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Chemical	Reasonable Maximum Exposure (mg/kg)	Carcinogenic Effects			Noncarcinogenic Effects		
		TR = 1E-06 (mg/kg)	TR = 1E-05 (mg/kg)	TR = 1E-04 (mg/kg)	THI =0.1 (mg/kg)	THI =1 (mg/kg)	THI =10 (mg/kg)
Metals and Pesticides							
Arsenic	22	16	160	1,596	82	821	8,207
Chromium	19	120,450	1,204,500	12,045,000	1,313	13,134	131,341
Copper	25	N/A	N/A	N/A	957,503	9,575,026	95,750,262
Lead	49	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	970	N/A	N/A	N/A	6,292	62,922	629,216
Nickel	21	N/A	N/A	N/A	5,471	54,714	547,144
Dieldrin	1	1	15	147	13	134	1,343
DDE	0.09	69	691	6,910	N/A	N/A	N/A
DDT	0 07	69	691	6,910	134	1,343	13,426
Semivolatiles							
Benzo(a)anthracene	0.08	31	308	3,080	N/A	N/A	N/A
Benzo(a)pyrene	0 08	3	31	308	N/A	N/A	N/A
Benzo(b)fluoranthene	0 09	31	308	3,080	N/A	N/A	N/A

Carcinogenic calculation:

$$\text{RBC (mg/kg)} = \frac{TR \times BW \times ATc}{EF \times ED \times (A+B+C)}$$

Noncarcinogenic calculation:

$$\text{RBC (mg/kg)} = \frac{THI \times BW \times ATnc}{EF \times ED \times (A+B+C)}$$

Where:

Ac = (SFo x IRing x FI x CF)
Bc = (SFo x SA x AF x ABS x ET x CF)
Cc = (SFi x IRinh x ((1/VF)+(1/PEF)))
TR = 1.00E-06

An = ((1/RfDo) x IRing x FI x CF)
Bn = ((1/RfDo) x SA x AF x ABS x ET x CF)
Cn = ((1/RfDi) x IRinh x ((1/VF)+(1/PEF)))
THI = 1.0

TABLE 8
Preliminary Soil Risk Goals - Future Recreational Child Scenario - Playground
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Chemical	Reasonable Maximum Exposure (mg/kg)	Carcinogenic Effects			Noncarcinogenic Effects		
		TR = 1E-06 (mg/kg)	TR = 1E-05 (mg/kg)	TR = 1E-04 (mg/kg)	THI =0.1 (mg/kg)	THI =1 (mg/kg)	THI =10 (mg/kg)
Metals and Pesticides							
Arsenic	19	3	33	332	13	128	1,281
Chromium	16	12,547	125,469	1,254,688	197	1,971	19,713
Copper	55	N/A	N/A	N/A	149,408	1,494,090	14,940,896
Lead	69	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	899	N/A	N/A	N/A	989	9,818	98,183
Nickel	21	N/A	N/A	N/A	854	8,538	85,377
Dieldrin	0.71	0 29	3	29	2	20	202
DDE	0.43	14	138	1,385	N/A	N/A	N/A
DDT	0.20	14	138	1,385	20	202	2,018
Semivolatiles							
Benzo(a)anthracene	0.57	6	57	570	N/A	N/A	N/A
Benzo(a)pyrene	0 44	0.57	6	57	N/A	N/A	N/A
Benzo(b)fluoranthene	0.46	6	57	567	N/A	N/A	N/A

Carcinogenic calculation:

$$\text{RBC (mg/kg)} = \frac{TR \times BW \times Atc}{EF \times ED \times (A+B+C)}$$

Noncarcinogenic calculation:

$$\text{RBC (mg/kg)} = \frac{THI \times BW \times Atnc}{EF \times ED \times (A+B+C)}$$

Where:

Ac = (SFo x IRing x FI x CF)
Bc = (SFo x SA x AF x ABS x ET x CF)
Cc = (SFi x IRinh x ((1/VF)+(1/PEF)))
TR = 1.00E-06

An = ((1/RfDo) x IRing x FI x CF)
Bn = ((1/RfDo) x SA x AF x ABS x ET x CF)
Cn = ((1/RfDi) x IRinh x ((1/VF)+(1/PEF)))
THI = 1.0

TABLE 9
Preliminary Soil Risk Goals - Hypothetical Future Residential Adult Scenario
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Chemical	Reasonable Maximum Exposure (mg/kg)	Carcinogenic Effects			Noncarcinogenic Effects		
		TR = 1E-06 (mg/kg)	TR = 1E-05 (mg/kg)	TR = 1E-04 (mg/kg)	THI =0.1 (mg/kg)	THI =1 (mg/kg)	THI =10 (mg/kg)
Metals and Pesticides							
Arsenic	29	1	11	108	21	208	2,077
Chromium	22	268	2,677	26,767	275	2,748	27,480
Copper	31				242,366	2,423,662	24,236,618
Manganese	983				1,593	15,927	159,269
Nickel	26				1,385	13,850	138,495
Lead	76						
Alpha-chlordane	0.23	2	15	154	12	115	1,152
Gamma-chlordane	0.27	2	15	154	12	115	1,152
Dieldrin	2.21	0.04	0.41	4	1	14	139
DDE	0.80	2	19	191			
DDT	0.96	2	19	191	14	139	1,390
Semivolatiles							
Benzo(a)anthracene	0.25	0 36	4	36			
Benzo(a)pyrene	0 26	0.04	0.36	4			
Benzo(b)fluoranthene	0.28	0.36	4	36			

Carcinogenic calculation:

$$RBC\ (mg/kg) = \frac{TR \times BW \times Atc}{EF \times ED \times (A+B+C)}$$

Noncarcinogenic calculation:

$$RBC\ (mg/kg) = \frac{THI \times BW \times ATnc}{EF \times ED \times (A+B+C)}$$

Where:

Ac = (SFo x IRing x FI x CF)
Bc = (SFo x SA x AF x ABS x CF)
Cc = (SFi x IRinh x ((1/VF)+(1/PEF)))
TR = 1.00E-06

An = ((1/RfDo) x IRing x FI x CF)
Bn = ((1/RfDo) x SA x AF x ABS x CF)
Cn = ((1/RfDi) x IRinh x ((1/VF)+(1/PEF)))
THI = 1.0

TABLE 10
Preliminary Soil Risk Goals - Hypothetical Future Residential Child Scenario
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Chemical	Reasonable Maximum Exposure (mg/kg)	Noncarcinogenic Effects		
		THI =0.1 (mg/kg)	THI =1 (mg/kg)	THI =10 (mg/kg)
Metals and Pesticides				
Arsenic	29	2	23	232
Chromium	22	78	784	7,837
Copper	31	27,051	270,512	2,705,120
Manganese	983	178	1,778	17,777
Nickel	26	155	1,546	15,458
Lead	76	N/A	N/A	N/A
Alpha-chlordane	0.23	3	26	264
Gamma-chlordane	0.27	3	26	264
Dieldrin	2.21	0.29	3	29
DDE	0 80	N/A	N/A	N/A
DDT	0.96	3	29	288
Semivolatiles				
Benzo(a)anthracene	0.25	N/A	N/A	N/A
Benzo(a)pyrene	0.26	N/A	N/A	N/A
Benzo(b)fluoranthene	0.28	N/A	N/A	N/A

Noncarcinogenic calculation:

$$\text{RBC (mg/kg)} = \frac{\text{THI} \times \text{BW} \times \text{ATnc}}{\text{EF} \times \text{ED} \times (\text{A}+\text{B}+\text{C})}$$

An = ((1/RfDo) x IRing x FI x CF)
Bn = ((1/RfDo) x SA x AF x ABS x CF)
Cn = ((1/RfDi) x IRinh x ((1/VF)+(1/PEF)))
THI = 1.0

TABLE 11
Preliminary Soil Risk Goals - Hypothetical Future Onsite Worker Scenario
Parcel 3, Streamlined Risk Assessment, DDMT 1998

Chemical	Reasonable Maximum Exposure (mg/kg)	Carcinogenic Effects			Noncarcinogenic Effects		
		TR = 1E-06 (mg/kg)	TR = 1E-05 (mg/kg)	TR = 1E-04 (mg/kg)	THI =0.1 (mg/kg)	THI =1 (mg/kg)	THI =10 (mg/kg)
Metals and Pesticides							
Arsenic	29	3.63	36	363	58	584	5,845
Chromium	22	450	4,497	44,968	385	3,849	38,493
Copper	31	N/A	N/A	N/A	681,879	6,818,788	68,187,884
Manganese	983	N/A	N/A	N/A	4,481	44,809	448,092
Nickel	26	N/A	N/A	N/A	3,896	38,965	389,645
Lead	76	N/A	N/A	N/A	N/A	N/A	N/A
Alpha-chlordane	0 23	6	55	551	34	345	3,445
Gamma-chlordane	0.27	6	55	551	34	345	3,445
Dieldrin	2 21	0 14	1	14	4	41	413
DDE	0.80	7	68	680	N/A	N/A	N/A
DDT	0.96	7	68	680	41	413	4,130
Semivolatiles							
Benzo(a)anthracene	0.25	1	13	132	N/A	N/A	N/A
Benzo(a)pyrene	0 26	0.13	1	13	N/A	N/A	N/A
Benzo(b)fluoranthene	0.28	1	13	132	N/A	N/A	N/A

Carcinogenic calculation:

$$\text{RBC (mg/kg)} = \frac{TR \times BW \times Atc}{EF \times ED \times (A+B+C)}$$

Noncarcinogenic calculation.

$$\text{RBC (mg/kg)} = \frac{THI \times BW \times ATnc}{EF \times ED \times (A+B+C)}$$

Where:

Ac = (SFo x IRing x FI x CF)
Bc = (SFo x SA x AF x ABS x CF)
Cc = (SFi x IRinh x ((1/VF)+(1/PEF)))
TR = 1.00E-06

An = ((1/RfDo) x IRing x FI x CF)
Bn = ((1/RfDo) x SA x AF x ABS x CF)
Cn = ((1/RfDi) x IRinh x ((1/VF)+(1/PEF)))
THI = 1 0

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TAB

Appendix A

Sample ID List and Data Summary Tables

Appendix A

Parcel 3 Sample List for Surface Soil Risk Assessment

Area of Concern Identifier	Station ID	Sample ID
SS_BALLPARK	G(3 5)	G(3_5)
SS_BALLPARK	G(3 5)	G3_5
SS_BALLPARK	H(3 5)	H(3_5)
SS_BALLPARK	H(3 5)	H3_5
SS_BALLPARK	I(3 5)	I(3_5)
SS_BALLPARK	I(3 5)	I3_5
SS_BALLPARK	J(3 5)	J(3_5)
SS_BALLPARK	J(3 5)	J3_5
SS_GOLF	A(3 10)	A9
SS_GOLF	A(3 5)	A4
SS_GOLF	B(3 5)	B4
SS_GOLF	C(3 5)	C4
SS_GOLF	D(3 5)	D4
SS_GOLF	E(3 5)	E4
SS_GOLF	F(3 5)	F4
SS_GOLF	O(3 5)	O(3_5)
SS_GOLF	P(3 5)	P(3_5)
SS_GOLF	Q(3 5)	Q(3_5)
SS_GOLF	R(3 5)	R(3_5)
SS_GOLF	S(3 5)	S(3_5)
SS_GOLF	SB51A	SGA168
SS_GOLF	SB51A	SGA168RE
SS_GOLF	SB51B	SGA171
SS_GOLF	SB51C	SGA174
SS_GOLF	SB52A	SGB148
SS_GOLF	SB52A	SGB149FD1
SS_GOLF	SB52B	SGA158
SS_GOLF	SB52B	SGA158RE
SS_GOLF	SB52B	SGA491FD1
SS_GOLF	SB69A	SGA144
SS_GOLF	SB69B	SGA147
SS_GOLF	SS12	LAWSS12
SS_GOLF	SS13	LAWSS13
SS_GOLF	SS14	LAWSS14
SS_GOLF	SS51A	SGB048
SS_GOLF	SS51B	SGA166
SS_GOLF	SS51C	SGB116
SS_GOLF	SS52A	SGB085
SS_GOLF	SS52B	SGB041
SS_GOLF	SS52C	SGB042
SS_GOLF	SS52D	SGA153
SS_GOLF	SS52E	SGB045
SS_GOLF	SS69A	SGB046
SS_GOLF	SS69B	SGA141
SS_GOLF	SS69C	SGA142
SS_GOLF	SS69D	SGA143
SS_GOLF	T(3 5)	T(3_5)
SS_GOLF	U(3 5)	U(3_5)
SS_GOLF	V(3 5)	V(3_5)
SS_GOLF	V(3 5)	DUP_2
SS_PLAYGROUND	K(3 5)	K(3_5)
SS_PLAYGROUND	K(3 5)	K3_5
SS_PLAYGROUND	K(3 5)	K3_5B
SS_PLAYGROUND	L(3 5)	L(3_5)
SS_PLAYGROUND	L(3 5)	L3_5
SS_PLAYGROUND	M(3 5)	M(3_5)
SS_PLAYGROUND	M(3 5)	M3_5
SS_PLAYGROUND	N(3 5)	N(3_5)
SS_PLAYGROUND	N(3 5)	N3_5
SS_PLAYGROUND	W(3 5)	W(3_5)
SS_PLAYGROUND	X(3 5)	X(3_5)

Appendix A. Parcel 3 Data Summaries

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
3SURFACESOIL	MG/KG	ALUMINUM	MET	13	13		8 31E+03	1 71E+04	1 20E+04
3SURFACESOIL	MG/KG	ANTIMONY	MET	25	8	17	4.80E-01	5 00E+00	2 11E+00
3SURFACESOIL	MG/KG	ARSENIC	MET	27	27		1 70E+00	1 01E+02	2 16E+01
3SURFACESOIL	MG/KG	BARIUM	MET	16	16		9 58E+01	2 02E+02	1 38E+02
3SURFACESOIL	MG/KG	BERYLLIUM	MET	24	14	10	2 70E-01	1 10E+00	5 21E-01
3SURFACESOIL	MG/KG	CADMIUM	MET	24	11	13	3 50E-01	1 30E+00	5 06E-01
3SURFACESOIL	MG/KG	CALCIUM	MET	13	13		1 70E+03	4 26E+03	2 28E+03
3SURFACESOIL	MG/KG	CHROMIUM	MET	27	27		7 60E+00	4 03E+01	1 87E+01
3SURFACESOIL	MG/KG	COBALT	MET	13	13		7 00E+00	1 43E+01	9 05E+00
3SURFACESOIL	MG/KG	COPPER	MET	27	27		3 30E+00	5 54E+01	2 46E+01
3SURFACESOIL	MG/KG	IRON	MET	13	13		1 38E+04	2 84E+04	1.96E+04
3SURFACESOIL	MG/KG	LEAD	MET	27	27		2 80E+00	1 67E+02	4 73E+01
3SURFACESOIL	MG/KG	MAGNESIUM	MET	13	13		1 57E+03	3 37E+03	2 27E+03
3SURFACESOIL	MG/KG	MANGANESE	MET	13	13		3.71E+02	1 86E+03	7 70E+02
3SURFACESOIL	MG/KG	MERCURY	MET	27	10	17	5 00E-02	8 00E-01	8 46E-02
3SURFACESOIL	MG/KG	NICKEL	MET	27	27		3 90E+00	5 76E+01	2 11E+01
3SURFACESOIL	MG/KG	POTASSIUM	MET	13	13		9 01E+02	3 36E+03	2 37E+03
3SURFACESOIL	MG/KG	SELENIUM	MET	24	8	16	4 20E-01	2 10E+00	5 47E-01
3SURFACESOIL	MG/KG	SILVER	MET	24		24			5.54E-01
3SURFACESOIL	MG/KG	SODIUM	MET	13	1	12	2 18E+02	2 18E+02	4 14E+01
3SURFACESOIL	MG/KG	THALLIUM	MET	24		24			5 95E-01
3SURFACESOIL	MG/KG	VANADIUM	MET	13	13		2 10E+01	4 32E+01	2 91E+01
3SURFACESOIL	MG/KG	ZINC	MET	27	27		1 08E+01	4 26E+02	9 38E+01
3SURFACESOIL	MG/KG	Total Polynuclear Aromatic Hydrocarbons	ORG	3	3		5 60E-01	1 30E+01	5 61E+00
3SURFACESOIL	MG/KG	PCB-1016 (AROCHLOR 1016)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	PCB-1221 (AROCHLOR 1221)	PCB	28		28			3 59E+00
3SURFACESOIL	MG/KG	PCB-1232 (AROCHLOR 1232)	PCB	28		28			1.77E+00
3SURFACESOIL	MG/KG	PCB-1242 (AROCHLOR 1242)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	PCB-1248 (AROCHLOR 1248)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	PCB-1254 (AROCHLOR 1254)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	PCB-1260 (AROCHLOR 1260)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	ALDRIN	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	ALPHA BHC	PEST	39		39			7.98E-02
3SURFACESOIL	MG/KG	ALPHA ENDOSULFAN	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	ALPHA-CHLORDANE	PEST	32	1	31	1 40E+00	1 40E+00	9 63E-02
3SURFACESOIL	MG/KG	BETA BHC	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	BETA ENDOSULFAN	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	CHLORDANE	PEST	7	1	6	4 10E-02	4 10E-02	1 83E-01
3SURFACESOIL	MG/KG	DDD	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	DDE	PEST	41	26	15	4 30E-03	2 00E+00	2 78E-01
3SURFACESOIL	MG/KG	DDT	PEST	41	24	17	5 20E-03	6 70E+00	4 23E-01

Appendix A. Parcel 3 Data Summaries

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
3SURFACESOIL	MG/KG	DELTA BHC	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	DIELDRIN	PEST	42	40	2	8 50E-03	1 00E+01	7 15E-01
3SURFACESOIL	MG/KG	ENDOSULFAN SULFATE	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	ENDRIN	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	ENDRIN ALDEHYDE	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	ENDRIN KETONE	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	GAMMA BHC (LINDANE)	PEST	39		39			7.98E-02
3SURFACESOIL	MG/KG	GAMMA-CHLORDANE	PEST	39	2	37	2 30E-02	1 40E+00	1 11E-01
3SURFACESOIL	MG/KG	HEPTACHLOR	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	HEPTACHLOR EPOXIDE	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	METHOXYCHLOR	PEST	39		39			7 98E-01
3SURFACESOIL	MG/KG	TOXAPHENE	PEST	39		39			7 98E+00
3SURFACESOIL	MG/KG	1-METHYLNAPHTHALENE	SVOC	16		16			3 76E-02
3SURFACESOIL	MG/KG	2,4,5-TRICHLOROPHENOL	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	2,4,6-TRICHLOROPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2,4-DICHLOROPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2,4-DIMETHYLPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2,4-DINITROPHENOL	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	2,4-DINITROTOLUENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2,6-DINITROTOLUENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-CHLORONAPHTHALENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-CHLOROPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-METHYLNAPHTHALENE	SVOC	28		28			1 08E-01
3SURFACESOIL	MG/KG	2-METHYLPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-NITROANILINE	SVOC	17		17			7.40E-01
3SURFACESOIL	MG/KG	2-NITROPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	3,3'-DICHLOROBENZIDINE	SVOC	17		17			4 02E-01
3SURFACESOIL	MG/KG	3-NITROANILINE	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	4,6-DINITRO-2-METHYLPHENOL	SVOC	17		17			7.40E-01
3SURFACESOIL	MG/KG	4-BROMOPHENYL PHENYL ETHER	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-CHLORO-3-METHYLPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-CHLOROANILINE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-CHLOROPHENYL PHENYL ETHER	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-METHYLPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-NITROANILINE	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	4-NITROPHENOL	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	ACENAPHTHENE	SVOC	28	2	26	6 60E-02	1 30E-01	1 07E-01
3SURFACESOIL	MG/KG	ACENAPHTHYLENE	SVOC	28		28			1 08E-01
3SURFACESOIL	MG/KG	ANTHRACENE	SVOC	29	3	26	6 60E-02	2 80E-01	1 18E-01
3SURFACESOIL	MG/KG	BENZO(a)ANTHRACENE	SVOC	30	13	17	5 40E-02	9 20E-01	1 69E-01
3SURFACESOIL	MG/KG	BENZO(a)PYRENE	SVOC	30	11	19	5 40E-02	9 30E-01	1.62E-01

Appendix A. Parcel 3 Data Summaries

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
3SURFACESOIL	MG/KG	BENZO(b)FLUORANTHENE	SVOC	30	11	19	5 20E-02	1 10E+00	1 76E-01
3SURFACESOIL	MG/KG	BENZO(g,h,i)PERYLENE	SVOC	29	7	22	4 50E-02	7 80E-01	1.39E-01
3SURFACESOIL	MG/KG	BENZO(k)FLUORANTHENE	SVOC	30	11	19	4.80E-02	1 10E+00	1 67E-01
3SURFACESOIL	MG/KG	BENZYL BUTYL PHTHALATE	SVOC	17		17			1 92E-01
3SURFACESOIL	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	SVOC	20	6	14	7.80E-02	2 70E+00	4 84E-01
3SURFACESOIL	MG/KG	CARBAZOLE	SVOC	17	2	15	1 50E-01	1.80E-01	1 98E-01
3SURFACESOIL	MG/KG	CHRYSENE	SVOC	30	14	16	4 60E-02	1 20E+00	1 70E-01
3SURFACESOIL	MG/KG	DIBENZ(a,h)ANTHRACENE	SVOC	28	1	27	8 30E-02	8 30E-02	1 05E-01
3SURFACESOIL	MG/KG	DIBENZOFURAN	SVOC	17	1	16	5.60E-02	5 60E-02	1 94E-01
3SURFACESOIL	MG/KG	DIETHYL PHTHALATE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	DIMETHYL PHTHALATE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	DI-n-BUTYL PHTHALATE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	DI-n-OCTYLPHTHALATE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	FLUORANTHENE	SVOC	31	19	12	4 60E-02	2 70E+00	2 78E-01
3SURFACESOIL	MG/KG	FLUORENE	SVOC	28	2	26	7 80E-02	1 40E-01	1.08E-01
3SURFACESOIL	MG/KG	HEXACHLOROBENZENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	HEXACHLOROBUTADIENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	HEXACHLOROCYCLOPENTADIENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	HEXACHLOROETHANE	SVOC	17		17			2.02E-01
3SURFACESOIL	MG/KG	INDENO(1,2,3-c,d)PYRENE	SVOC	29	5	24	6 60E-02	7 00E-01	1 33E-01
3SURFACESOIL	MG/KG	ISOPHORONE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	NAPHTHALENE	SVOC	28		28			1 08E-01
3SURFACESOIL	MG/KG	NITROBENZENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	N-NITROSODI-n-PROPYLAMINE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	N-NITROSODIPHENYLAMINE	SVOC	20	3	17	2 60E-01	3 40E-01	2 16E-01
3SURFACESOIL	MG/KG	PENTACHLOROPHENOL	SVOC	17	1	16	5 40E-02	5 40E-02	9 79E-02
3SURFACESOIL	MG/KG	PHENANTHRENE	SVOC	30	14	16	6 50E-02	1 60E+00	2 04E-01
3SURFACESOIL	MG/KG	PHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	PYRENE	SVOC	31	17	14	4 60E-02	1 70E+00	2 18E-01
3SURFACESOIL	MG/KG	1,1,1-TRICHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,1,2,2-TETRACHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,1,2-TRICHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,1-DICHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,1-DICHLOROETHENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,2,4-TRICHLOROBENZENE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	1,2-DICHLOROBENZENE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	1,2-DICHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,2-DICHLOROETHENE, TOTAL	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,2-DICHLOROPROPANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,3-DICHLOROBENZENE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	1,4-DICHLOROBENZENE	VOC	17		17			2 02E-01

Appendix A. Parcel 3 Data Summaries

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
3SURFACESOIL	MG/KG	2,2'-OXYBIS(1-CHLORO)PROPANE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-HEXANONE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	ACETONE	VOC	20	6	14	4 00E-03	3 80E-02	8 58E-03
3SURFACESOIL	MG/KG	BENZENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	bis(2-CHLOROETHOXY) METHANE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	bis(2-CHLOROETHYL) ETHER	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	BROMODICHLOROMETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	BROMOFORM	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	BROMOMETHANE	VOC	17	1	16	2 00E-03	2 00E-03	5 76E-03
3SURFACESOIL	MG/KG	CARBON DISULFIDE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	CARBON TETRACHLORIDE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	CHLOROBENZENE	VOC	17		17			6.00E-03
3SURFACESOIL	MG/KG	CHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	CHLOROFORM	VOC	18	1	17	2 00E-03	2 00E-03	5 78E-03
3SURFACESOIL	MG/KG	CHLOROMETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	cis-1,3-DICHLOROPROPENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	DIBROMOCHLOROMETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	ETHYLBENZENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	METHYL ETHYL KETONE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	METHYL ISOBUTYL KETONE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	METHYLENE CHLORIDE	VOC	20	5	15	2 00E-03	2.10E-02	7 23E-03
3SURFACESOIL	MG/KG	STYRENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	TETRACHLOROETHYLENE (PCE)	VOC	17	1	16	3 00E-03	3 00E-03	5 79E-03
3SURFACESOIL	MG/KG	TOLUENE	VOC	20	3	17	6 00E-03	1.70E-02	6 70E-03
3SURFACESOIL	MG/KG	TOTAL XYLENES	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	trans-1,3-DICHLOROPROPENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	TRICHLOROETHYLENE (TCE)	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	VINYL CHLORIDE	VOC	17		17			6 00E-03

Appendix A. Parcel 3 Data Summaries

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_BALLPARK	MG/KG	ALUMINUM	MET	4	4		8 31E+03	1 59E+04	1 20E+04
SS_BALLPARK	MG/KG	ANTIMONY	MET	4	3	1	4 80E-01	7 40E-01	4 84E-01
SS_BALLPARK	MG/KG	ARSENIC	MET	4	4		1 05E+01	2.18E+01	1 53E+01
SS_BALLPARK	MG/KG	BARIUM	MET	4	4		1 12E+02	1 83E+02	1 55E+02
SS_BALLPARK	MG/KG	BERYLLIUM	MET	4	4		3 90E-01	6 60E-01	5 38E-01
SS_BALLPARK	MG/KG	CADMIUM	MET	4	4		3 90E-01	4 90E-01	4 28E-01
SS_BALLPARK	MG/KG	CALCIUM	MET	4	4		2 01E+03	2 23E+03	2 13E+03
SS_BALLPARK	MG/KG	CHROMIUM	MET	4	4		1 36E+01	1 89E+01	1 58E+01
SS_BALLPARK	MG/KG	COBALT	MET	4	4		7 40E+00	1 07E+01	8 60E+00
SS_BALLPARK	MG/KG	COPPER	MET	4	4		1 90E+01	2 54E+01	2 20E+01
SS_BALLPARK	MG/KG	IRON	MET	4	4		1.38E+04	2 30E+04	1 94E+04
SS_BALLPARK	MG/KG	LEAD	MET	4	4		1 22E+01	4 86E+01	2 31E+01
SS_BALLPARK	MG/KG	MAGNESIUM	MET	4	4		1 57E+03	3 00E+03	2 40E+03
SS_BALLPARK	MG/KG	MANGANESE	MET	4	4		5 20E+02	9 70E+02	7 11E+02
SS_BALLPARK	MG/KG	MERCURY	MET	4	3	1	5 00E-02	6 00E-02	4 88E-02
SS_BALLPARK	MG/KG	NICKEL	MET	4	4		1 37E+01	2 06E+01	1 83E+01
SS_BALLPARK	MG/KG	POTASSIUM	MET	4	4		2 16E+03	3 36E+03	2 80E+03
SS_BALLPARK	MG/KG	SELENIUM	MET	4	2	2	5 60E-01	8 20E-01	4.48E-01
SS_BALLPARK	MG/KG	SILVER	MET	4		4			2 25E-02
SS_BALLPARK	MG/KG	SODIUM	MET	4		4			6 15E+00
SS_BALLPARK	MG/KG	THALLIUM	MET	4		4			1.35E-01
SS_BALLPARK	MG/KG	VANADIUM	MET	4	4		2 10E+01	3 72E+01	2 90E+01
SS_BALLPARK	MG/KG	ZINC	MET	4	4		5 86E+01	6 81E+01	6 36E+01
SS_BALLPARK	MG/KG	PCB-1016 (AROCHLOR 1016)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1221 (AROCHLOR 1221)	PCB	4		4			3 61E+00
SS_BALLPARK	MG/KG	PCB-1232 (AROCHLOR 1232)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1242 (AROCHLOR 1242)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1248 (AROCHLOR 1248)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1254 (AROCHLOR 1254)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1260 (AROCHLOR 1260)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	ALDRIN	PEST	4		4			9.28E-02
SS_BALLPARK	MG/KG	ALPHA BHC	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	ALPHA ENDOSULFAN	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	ALPHA-CHLORDANE	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	BETA BHC	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	BETA ENDOSULFAN	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	DELTA BHC	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	DIELDRIN	PEST	4	4		1 60E-01	1 10E+00	5 58E-01
SS_BALLPARK	MG/KG	ENDOSULFAN SULFATE	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	ENDRIN	PEST	4		4			1 80E-01

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_BALLPARK	MG/KG	ENDRIN ALDEHYDE	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	ENDRIN KETONE	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	GAMMA BHC (LINDANE)	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	GAMMA-CHLORDANE	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	HEPTACHLOR	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	HEPTACHLOR EPOXIDE	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	METHOXYCHLOR	PEST	4		4			9 28E-01
SS_BALLPARK	MG/KG	DDD	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	DDE	PEST	4	1	3	8 60E-02	8 60E-02	1 85E-01
SS_BALLPARK	MG/KG	DDT	PEST	4	1	3	7 10E-02	7 10E-02	1 82E-01
SS_BALLPARK	MG/KG	TOXAPHENE	PEST	4		4			9 28E+00
SS_BALLPARK	MG/KG	2,4,5-TRICHLOROPHENOL	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	2,4,6-TRICHLOROPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2,4-DICHLOROPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2,4-DIMETHYLPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2,4-DINITROPHENOL	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	2,4-DINITROTOLUENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2,6-DINITROTOLUENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-CHLORONAPHTHALENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-CHLOROPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-METHYLNAPHTHALENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-METHYLPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-NITROANILINE	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	2-NITROPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	3,3'-DICHLOROBENZIDINE	SVOC	4		4			3 94E-01
SS_BALLPARK	MG/KG	3-NITROANILINE	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	4,6-DINITRO-2-METHYLPHENOL	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	4-BROMOPHENYL PHENYL ETHER	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	4-CHLORO-3-METHYLPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	4-CHLOROANILINE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	4-CHLOROPHENYL PHENYL ETHER	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	4-METHYLPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	4-NITROANILINE	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	4-NITROPHENOL	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	ACENAPHTHENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	ACENAPHTHYLENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	ANTHRACENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	BENZO(a)ANTHRACENE	SVOC	4	1	3	7 60E-02	7 60E-02	1 68E-01
SS_BALLPARK	MG/KG	BENZO(a)PYRENE	SVOC	4	1	3	8 20E-02	8 20E-02	1 69E-01
SS_BALLPARK	MG/KG	BENZO(b)FLUORANTHENE	SVOC	4	1	3	8 90E-02	8 90E-02	1 71E-01

Appendix A. Parcel 3 Data Summaries

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_BALLPARK	MG/KG	BENZO(g,h,i)PERYLENE	SVOC	4	1	3	4 50E-02	4 50E-02	1 60E-01
SS_BALLPARK	MG/KG	BENZO(k)FLUORANTHENE	SVOC	4	1	3	8 40E-02	8 40E-02	1.70E-01
SS_BALLPARK	MG/KG	BENZYL BUTYL PHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	CARBAZOLE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	CHRYSENE	SVOC	4	1	3	9 40E-02	9 40E-02	1.72E-01
SS_BALLPARK	MG/KG	DIBENZ(a,h)ANTHRACENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	DIBENZOFURAN	SVOC	4		4			1.96E-01
SS_BALLPARK	MG/KG	DIETHYL PHTHALATE	SVOC	4		4			1.96E-01
SS_BALLPARK	MG/KG	DIMETHYL PHTHALATE	SVOC	4		4			1.96E-01
SS_BALLPARK	MG/KG	DI-n-BUTYL PHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	DI-n-OCTYLPHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	FLUORANTHENE	SVOC	4	2	2	5.40E-02	1 60E-01	1 50E-01
SS_BALLPARK	MG/KG	FLUORENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	HEXACHLOROBENZENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	HEXACHLOROBUTADIENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	HEXACHLOROCYCLOPENTADIENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	HEXACHLOROETHANE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	INDENO(1,2,3-c,d)PYRENE	SVOC	4	1	3	6 60E-02	6 60E-02	1 65E-01
SS_BALLPARK	MG/KG	ISOPHORONE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	NAPHTHALENE	SVOC	4		4			1.96E-01
SS_BALLPARK	MG/KG	NITROBENZENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	N-NITROSODI-n-PROPYLAMINE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	N-NITROSODIPHENYLAMINE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	PENTACHLOROPHENOL	SVOC	4		4			9 88E-02
SS_BALLPARK	MG/KG	PHENANTHRENE	SVOC	4	1	3	7 20E-02	7 20E-02	1 67E-01
SS_BALLPARK	MG/KG	PHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	PYRENE	SVOC	4	2	2	4 60E-02	1 70E-01	1.50E-01
SS_BALLPARK	MG/KG	1,1,1-TRICHLOROETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,1,2,2-TETRACHLOROETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,1,2-TRICHLOROETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,1-DICHLOROETHANE	VOC	4		4			5.88E-03
SS_BALLPARK	MG/KG	1,1-DICHLOROETHENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,2,4-TRICHLOROBENZENE	VOC	4		4			1.96E-01
SS_BALLPARK	MG/KG	1,2-DICHLOROBENZENE	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	1,2-DICHLOROETHANE	VOC	4		4			5.88E-03
SS_BALLPARK	MG/KG	1,2-DICHLOROETHENE, TOTAL	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,2-DICHLOROPROPANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,3-DICHLOROBENZENE	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	1,4-DICHLOROBENZENE	VOC	4		4			1 96E-01

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_BALLPARK	MG/KG	2,2'-OXYBIS(1-CHLORO)PROPANE	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-HEXANONE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	ACETONE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	BENZENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	bis(2-CHLOROETHOXY) METHANE	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	bis(2-CHLOROETHYL) ETHER	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	BROMODICHLOROMETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	BROMOFORM	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	BROMOMETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CARBON DISULFIDE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CARBON TETRACHLORIDE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CHLOROBENZENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CHLOROETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CHLOROFORM	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CHLOROMETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	cis-1,3-DICHLOROPROPENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	DIBROMOCHLOROMETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	ETHYLBENZENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	METHYL ETHYL KETONE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	METHYL ISOBUTYL KETONE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	METHYLENE CHLORIDE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	STYRENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	TETRACHLOROETHYLENE (PCE)	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	TOLUENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	TOTAL XYLENES	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	trans-1,3-DICHLOROPROPENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	TRICHLOROETHYLENE (TCE)	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	VINYL CHLORIDE	VOC	4		4			5 88E-03

Appendix A. Parcel 3 Data Summaries

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_PLAYGROUND	MG/KG	ALUMINUM	MET	5	5		9 06E+03	1 38E+04	1 19E+04
SS_PLAYGROUND	MG/KG	ANTIMONY	MET	5	4	1	5 70E-01	1 70E+00	8 14E-01
SS_PLAYGROUND	MG/KG	ARSENIC	MET	5	5		9 60E+00	1.94E+01	1 36E+01
SS_PLAYGROUND	MG/KG	BARIUM	MET	5	5		1.07E+02	2 00E+02	1 36E+02
SS_PLAYGROUND	MG/KG	BERYLLIUM	MET	5	5		4 60E-01	7 30E-01	5 78E-01
SS_PLAYGROUND	MG/KG	CADMIUM	MET	5	5		3 50E-01	6 00E-01	4 62E-01
SS_PLAYGROUND	MG/KG	CALCIUM	MET	5	5		1 83E+03	2 34E+03	2 02E+03
SS_PLAYGROUND	MG/KG	CHROMIUM	MET	5	5		1 20E+01	1 63E+01	1 43E+01
SS_PLAYGROUND	MG/KG	COBALT	MET	5	5		7 50E+00	8 90E+00	8 24E+00
SS_PLAYGROUND	MG/KG	COPPER	MET	5	5		1 58E+01	5 54E+01	2 70E+01
SS_PLAYGROUND	MG/KG	IRON	MET	5	5		1 53E+04	2 20E+04	1 96E+04
SS_PLAYGROUND	MG/KG	LEAD	MET	5	5		1 56E+01	6 88E+01	3 22E+01
SS_PLAYGROUND	MG/KG	MAGNESIUM	MET	5	5		1 61E+03	2 81E+03	2 22E+03
SS_PLAYGROUND	MG/KG	MANGANESE	MET	5	5		4 32E+02	8 99E+02	6 51E+02
SS_PLAYGROUND	MG/KG	MERCURY	MET	5	4	1	5 00E-02	8 00E-02	5 70E-02
SS_PLAYGROUND	MG/KG	NICKEL	MET	5	5		1 38E+01	2 11E+01	1 80E+01
SS_PLAYGROUND	MG/KG	POTASSIUM	MET	5	5		2 08E+03	3 30E+03	2 73E+03
SS_PLAYGROUND	MG/KG	SELENIUM	MET	5	4	1	4 20E-01	6 40E-01	4 54E-01
SS_PLAYGROUND	MG/KG	SILVER	MET	5		5			2 50E-02
SS_PLAYGROUND	MG/KG	SODIUM	MET	5		5			6 29E+00
SS_PLAYGROUND	MG/KG	THALLIUM	MET	5		5			1 36E-01
SS_PLAYGROUND	MG/KG	VANADIUM	MET	5	5		2 35E+01	3 29E+01	2 94E+01
SS_PLAYGROUND	MG/KG	ZINC	MET	5	5		4 97E+01	8 35E+01	6 70E+01
SS_PLAYGROUND	MG/KG	PCB-1016 (AROCHLOR 1016)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1221 (AROCHLOR 1221)	PCB	6		6			1 33E+00
SS_PLAYGROUND	MG/KG	PCB-1232 (AROCHLOR 1232)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1242 (AROCHLOR 1242)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1248 (AROCHLOR 1248)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1254 (AROCHLOR 1254)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1260 (AROCHLOR 1260)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	ALDRIN	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	ALPHA BHC	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	ALPHA ENDOSULFAN	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	ALPHA-CHLORDANE	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	BETA BHC	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	BETA ENDOSULFAN	PEST	6		6			6 59E-02
SS_PLAYGROUND	MG/KG	DELTA BHC	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	DIELDRIN	PEST	6	6		8 50E-03	7 10E-01	3 30E-01
SS_PLAYGROUND	MG/KG	ENDOSULFAN SULFATE	PEST	6		6			6 59E-02
SS_PLAYGROUND	MG/KG	ENDRIN	PEST	6		6			6 59E-02

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_PLAYGROUND	MG/KG	ENDRIN ALDEHYDE	PEST	6		6			6 59E-02
SS_PLAYGROUND	MG/KG	ENDRIN KETONE	PEST	6		6			6 59E-02
SS_PLAYGROUND	MG/KG	GAMMA BHC (LINDANE)	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	GAMMA-CHLORDANE	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	HEPTACHLOR	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	HEPTACHLOR EPOXIDE	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	METHOXYCHLOR	PEST	6		6			3 44E-01
SS_PLAYGROUND	MG/KG	DDD	PEST	6		6			6 59E-02
SS_PLAYGROUND	MG/KG	DDE	PEST	6	3	3	1 40E-01	4 30E-01	1 45E-01
SS_PLAYGROUND	MG/KG	DDT	PEST	6	2	4	4 40E-02	2 00E-01	9 11E-02
SS_PLAYGROUND	MG/KG	TOXAPHENE	PEST	6		6			3 44E+00
SS_PLAYGROUND	MG/KG	2,4,5-TRICHLOROPHENOL	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	2,4,6-TRICHLOROPHENOL	SVOC	5		5			2.03E-01
SS_PLAYGROUND	MG/KG	2,4-DICHLOROPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2,4-DIMETHYLPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2,4-DINITROPHENOL	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	2,4-DINITROTOLUENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2,6-DINITROTOLUENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-CHLORONAPHTHALENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-CHLOROPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-METHYLNAPHTHALENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-METHYLPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-NITROANILINE	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	2-NITROPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	3,3'-DICHLOROBENZIDINE	SVOC	5		5			4 03E-01
SS_PLAYGROUND	MG/KG	3-NITROANILINE	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	4,6-DINITRO-2-METHYLPHENOL	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	4-BROMOPHENYL PHENYL ETHER	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-CHLORO-3-METHYLPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-CHLOROANILINE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-CHLOROPHENYL PHENYL ETHER	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-METHYLPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-NITROANILINE	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	4-NITROPHENOL	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	ACENAPHTHENE	SVOC	5	1	4	1 30E-01	1 30E-01	1 89E-01
SS_PLAYGROUND	MG/KG	ACENAPHTHYLENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	ANTHRACENE	SVOC	5	1	4	2 70E-01	2 70E-01	2 17E-01
SS_PLAYGROUND	MG/KG	BENZO(a)ANTHRACENE	SVOC	5	1	4	5 70E-01	5 70E-01	2 77E-01
SS_PLAYGROUND	MG/KG	BENZO(a)PYRENE	SVOC	5	1	4	4.40E-01	4 40E-01	2 51E-01
SS_PLAYGROUND	MG/KG	BENZO(b)FLUORANTHENE	SVOC	5	1	4	4 60E-01	4 60E-01	2 55E-01

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_PLAYGROUND	MG/KG	BENZO(g,h,i)PERYLENE	SVOC	5	1	4	2 90E-01	2 90E-01	2 21E-01
SS_PLAYGROUND	MG/KG	BENZO(k)FLUORANTHENE	SVOC	5	1	4	4 00E-01	4 00E-01	2 43E-01
SS_PLAYGROUND	MG/KG	BENZYL BUTYL PHTHALATE	SVOC	5		5			1 67E-01
SS_PLAYGROUND	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	SVOC	5		5			2.03E-01
SS_PLAYGROUND	MG/KG	CARBAZOLE	SVOC	5	1	4	1 80E-01	1 80E-01	1 99E-01
SS_PLAYGROUND	MG/KG	CHRYSENE	SVOC	5	2	3	4 90E-02	6 20E-01	2 57E-01
SS_PLAYGROUND	MG/KG	DIBENZ(a,h)ANTHRACENE	SVOC	5	1	4	8 30E-02	8 30E-02	1 80E-01
SS_PLAYGROUND	MG/KG	DIBENZOFURAN	SVOC	5	1	4	5 60E-02	5 60E-02	1 74E-01
SS_PLAYGROUND	MG/KG	DIETHYL PHTHALATE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	DIMETHYL PHTHALATE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	DI-n-BUTYL PHTHALATE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	DI-n-OCTYLPHTHALATE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	FLUORANTHENE	SVOC	5	3	2	4 60E-02	1 20E+00	3.42E-01
SS_PLAYGROUND	MG/KG	FLUORENE	SVOC	5	1	4	1 40E-01	1 40E-01	1 91E-01
SS_PLAYGROUND	MG/KG	HEXACHLOROBENZENE	SVOC	5		5			2.03E-01
SS_PLAYGROUND	MG/KG	HEXACHLOROBUTADIENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	HEXACHLOROCYCLOPENTADIENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	HEXACHLOROETHANE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	INDENO(1,2,3-c,d)PYRENE	SVOC	5	1	4	2 60E-01	2 60E-01	2 15E-01
SS_PLAYGROUND	MG/KG	ISOPHORONE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	NAPHTHALENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	NITROBENZENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	N-NITROSODI-n-PROPYLAMINE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	N-NITROSODIPHENYLAMINE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	PENTACHLOROPHENOL	SVOC	5		5			1 01E-01
SS_PLAYGROUND	MG/KG	PHENANTHRENE	SVOC	5	2	3	7 20E-02	1 00E+00	3 37E-01
SS_PLAYGROUND	MG/KG	PHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	PYRENE	SVOC	5	2	3	6 70E-02	1 10E+00	3 56E-01
SS_PLAYGROUND	MG/KG	1,1,1-TRICHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,1,2,2-TETRACHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,1,2-TRICHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,1-DICHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,1-DICHLOROETHENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,2,4-TRICHLOROBENZENE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	1,2-DICHLOROBENZENE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	1,2-DICHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,2-DICHLOROETHENE, TOTAL	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,2-DICHLOROPROPANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,3-DICHLOROBENZENE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	1,4-DICHLOROBENZENE	VOC	5		5			2 03E-01

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_PLAYGROUND	MG/KG	2,2'-OXYBIS(1-CHLORO)PROPANE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-HEXANONE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	ACETONE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	BENZENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	bis(2-CHLOROETHOXY) METHANE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	bis(2-CHLOROETHYL) ETHER	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	BROMODICHLOROMETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	BROMOFORM	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	BROMOMETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CARBON DISULFIDE	VOC	5		5			6.00E-03
SS_PLAYGROUND	MG/KG	CARBON TETRACHLORIDE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CHLOROBENZENE	VOC	5		5			6.00E-03
SS_PLAYGROUND	MG/KG	CHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CHLOROFORM	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CHLOROMETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	cis-1,3-DICHLOROPROPENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	DIBROMOCHLOROMETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	ETHYLBENZENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	METHYL ETHYL KETONE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	METHYL ISOBUTYL KETONE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	METHYLENE CHLORIDE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	STYRENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	TETRACHLOROETHYLENE (PCE)	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	TOLUENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	TOTAL XYLENES	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	trans-1,3-DICHLOROPROPENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	TRICHLOROETHYLENE (TCE)	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	VINYL CHLORIDE	VOC	5		5			6 00E-03

Appendix A. Parcel 3 Data Summaries

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_GOLF	MG/KG	ALUMINUM	MET	4	4		8 94E+03	1 71E+04	1 21E+04
SS_GOLF	MG/KG	ANTIMONY	MET	16	1	15	5 00E+00	5.00E+00	2 93E+00
SS_GOLF	MG/KG	ARSENIC	MET	18	18		1 70E+00	1 01E+02	2 53E+01
SS_GOLF	MG/KG	BARIUM	MET	7	7		9 58E+01	2.02E+02	1.29E+02
SS_GOLF	MG/KG	BERYLLIUM	MET	15	5	10	2 70E-01	1 10E+00	4 98E-01
SS_GOLF	MG/KG	CADMIUM	MET	15	2	13	4 70E-01	1 30E+00	5 41E-01
SS_GOLF	MG/KG	CALCIUM	MET	4	4		1.70E+03	4 26E+03	2 77E+03
SS_GOLF	MG/KG	CHROMIUM	MET	18	18		7 60E+00	4.03E+01	2 07E+01
SS_GOLF	MG/KG	COBALT	MET	4	4		7.00E+00	1 43E+01	1 05E+01
SS_GOLF	MG/KG	COPPER	MET	18	18		3 30E+00	5 19E+01	2 45E+01
SS_GOLF	MG/KG	IRON	MET	4	4		1 54E+04	2 84E+04	1 99E+04
SS_GOLF	MG/KG	LEAD	MET	18	18		2 80E+00	1 67E+02	5 69E+01
SS_GOLF	MG/KG	MAGNESIUM	MET	4	4		1 65E+03	3 37E+03	2 22E+03
SS_GOLF	MG/KG	MANGANESE	MET	4	4		3 71E+02	1 86E+03	9.76E+02
SS_GOLF	MG/KG	MERCURY	MET	18	3	15	1 00E-01	8 00E-01	1 00E-01
SS_GOLF	MG/KG	NICKEL	MET	18	18		3 90E+00	5 76E+01	2 27E+01
SS_GOLF	MG/KG	POTASSIUM	MET	4	4		9 01E+02	2 77E+03	1.49E+03
SS_GOLF	MG/KG	SELENIUM	MET	15	2	13	5 80E-01	2 10E+00	6 05E-01
SS_GOLF	MG/KG	SILVER	MET	15		15			8 71E-01
SS_GOLF	MG/KG	SODIUM	MET	4	1	3	2 18E+02	2 18E+02	1 21E+02
SS_GOLF	MG/KG	THALLIUM	MET	15		15			8 71E-01
SS_GOLF	MG/KG	VANADIUM	MET	4	4		2 11E+01	4 32E+01	2 88E+01
SS_GOLF	MG/KG	ZINC	MET	18	18		1 08E+01	4 26E+02	1 08E+02
SS_GOLF	MG/KG	Total Polynuclear Aromatic Hydrocarbons	ORG	3	3		5 60E-01	1 30E+01	5 61E+00
SS_GOLF	MG/KG	PCB-1016 (AROCHLOR 1016)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1221 (AROCHLOR 1221)	PCB	18		18			4 34E+00
SS_GOLF	MG/KG	PCB-1232 (AROCHLOR 1232)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1242 (AROCHLOR 1242)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1248 (AROCHLOR 1248)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1254 (AROCHLOR 1254)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1260 (AROCHLOR 1260)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	ALDRIN	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	ALPHA BHC	PEST	29		29			8.74E-02
SS_GOLF	MG/KG	ALPHA ENDOSULFAN	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	ALPHA-CHLORDANE	PEST	22	1	21	1 40E+00	1 40E+00	1 14E-01
SS_GOLF	MG/KG	BETA BHC	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	BETA ENDOSULFAN	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	CHLORDANE	PEST	7	1	6	4 10E-02	4 10E-02	1 83E-01
SS_GOLF	MG/KG	DDD	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	DDE	PEST	31	22	9	4 30E-03	2 00E+00	3 16E-01

Appendix A. Parcel 3 Data Summaries

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_GOLF	MG/KG	DDT	PEST	31	21	10	5 20E-03	6.70E+00	5 18E-01
SS_GOLF	MG/KG	DELTA BHC	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	DIELDRIN	PEST	32	30	2	2 10E-02	1 00E+01	8 07E-01
SS_GOLF	MG/KG	ENDOSULFAN SULFATE	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	ENDRIN	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	ENDRIN ALDEHYDE	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	ENDRIN KETONE	PEST	29		29			1.68E-01
SS_GOLF	MG/KG	GAMMA BHC (LINDANE)	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	GAMMA-CHLORDANE	PEST	29	2	27	2 30E-02	1.40E+00	1 30E-01
SS_GOLF	MG/KG	HEPTACHLOR	PEST	29		29			8.74E-02
SS_GOLF	MG/KG	HEPTACHLOR EPOXIDE	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	METHOXYCHLOR	PEST	29		29			8 74E-01
SS_GOLF	MG/KG	TOXAPHENE	PEST	29		29			8 74E+00
SS_GOLF	MG/KG	1-METHYLNAPHTHALENE	SVOC	16		16			3.76E-02
SS_GOLF	MG/KG	2,4,5-TRICHLOROPHENOL	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	2,4,6-TRICHLOROPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2,4-DICHLOROPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2,4-DIMETHYLPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2,4-DINITROPHENOL	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	2,4-DINITROTOLUENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2,6-DINITROTOLUENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-CHLORONAPHTHALENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-CHLOROPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-METHYLNAPHTHALENE	SVOC	19		19			6 48E-02
SS_GOLF	MG/KG	2-METHYLPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-NITROANILINE	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	2-NITROPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	3,3'-DICHLOROBENZIDINE	SVOC	8		8			4 06E-01
SS_GOLF	MG/KG	3-NITROANILINE	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	4,6-DINITRO-2-METHYLPHENOL	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	4-BROMOPHENYL PHENYL ETHER	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	4-CHLORO-3-METHYLPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	4-CHLOROANILINE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	4-CHLOROPHENYL PHENYL ETHER	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	4-METHYLPHENOL	SVOC	8		8			2.05E-01
SS_GOLF	MG/KG	4-NITROANILINE	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	4-NITROPHENOL	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	ACENAPHTHENE	SVOC	19	1	18	6 60E-02	6 60E-02	6 67E-02
SS_GOLF	MG/KG	ACENAPHTHYLENE	SVOC	19		19			6 48E-02
SS_GOLF	MG/KG	ANTHRACENE	SVOC	20	2	18	6 60E-02	2 80E-01	7 73E-02

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_GOLF	MG/KG	BENZO(a)ANTHRACENE	SVOC	21	11	10	5 40E-02	9 20E-01	1 44E-01
SS_GOLF	MG/KG	BENZO(a)PYRENE	SVOC	21	9	12	5 40E-02	9 30E-01	1 39E-01
SS_GOLF	MG/KG	BENZO(b)FLUORANTHENE	SVOC	21	9	12	5 20E-02	1 10E+00	1.58E-01
SS_GOLF	MG/KG	BENZO(g,h,i)PERYLENE	SVOC	20	5	15	5 00E-02	7 80E-01	1 14E-01
SS_GOLF	MG/KG	BENZO(k)FLUORANTHENE	SVOC	21	9	12	4 80E-02	1 10E+00	1 48E-01
SS_GOLF	MG/KG	BENZYL BUTYL PHTHALATE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	SVOC	11	6	5	7 80E-02	2.70E+00	7 16E-01
SS_GOLF	MG/KG	CARBAZOLE	SVOC	8	1	7	1 50E-01	1 50E-01	1 98E-01
SS_GOLF	MG/KG	CHRYSENE	SVOC	21	11	10	4 60E-02	1 20E+00	1 50E-01
SS_GOLF	MG/KG	DIBENZ(a,h)ANTHRACENE	SVOC	19		19			6 63E-02
SS_GOLF	MG/KG	DIBENZOFURAN	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	DIETHYL PHTHALATE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	DIMETHYL PHTHALATE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	DI-n-BUTYL PHTHALATE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	DI-n-OCTYLPHTHALATE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	FLUORANTHENE	SVOC	22	14	8	7 30E-02	2.70E+00	2 86E-01
SS_GOLF	MG/KG	FLUORENE	SVOC	19	1	18	7 80E-02	7 80E-02	6.73E-02
SS_GOLF	MG/KG	HEXACHLOROBENZENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	HEXACHLOROBUTADIENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	HEXACHLOROCYCLOPENTADIENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	HEXACHLOROETHANE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	INDENO(1,2,3-c,d)PYRENE	SVOC	20	3	17	9 20E-02	7 00E-01	1 06E-01
SS_GOLF	MG/KG	ISOPHORONE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	NAPHTHALENE	SVOC	19		19			6 48E-02
SS_GOLF	MG/KG	NITROBENZENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	N-NITROSODI-n-PROPYLAMINE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	N-NITROSODIPHENYLAMINE	SVOC	11	3	8	2 60E-01	3 40E-01	2 29E-01
SS_GOLF	MG/KG	PENTACHLOROPHENOL	SVOC	8	1	7	5 40E-02	5 40E-02	9 55E-02
SS_GOLF	MG/KG	PHENANTHRENE	SVOC	21	11	10	6 50E-02	1 60E+00	1 79E-01
SS_GOLF	MG/KG	PHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	PYRENE	SVOC	22	13	9	5 50E-02	1 70E+00	1 99E-01
SS_GOLF	MG/KG	1,1,1-TRICHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,1,2,2-TETRACHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,1,2-TRICHLOROETHANE	VOC	8		8			6.06E-03
SS_GOLF	MG/KG	1,1-DICHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,1-DICHLOROETHENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,2,4-TRICHLOROBENZENE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	1,2-DICHLOROBENZENE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	1,2-DICHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,2-DICHLOROETHENE, TOTAL	VOC	8		8			6 06E-03

AOC_ID	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_GOLF	MG/KG	1,2-DICHLOROPROPANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,3-DICHLOROBENZENE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	1,4-DICHLOROBENZENE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	2,2'-OXYBIS(1-CHLORO)PROPANE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-HEXANONE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	ACETONE	VOC	11	6	5	4 00E-03	3 80E-02	1 07E-02
SS_GOLF	MG/KG	BENZENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	bis(2-CHLOROETHOXY) METHANE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	bis(2-CHLOROETHYL) ETHER	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	BROMODICHLOROMETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	BROMOFORM	VOC	8		8			6.06E-03
SS_GOLF	MG/KG	BROMOMETHANE	VOC	8	1	7	2 00E-03	2 00E-03	5 56E-03
SS_GOLF	MG/KG	CARBON DISULFIDE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	CARBON TETRACHLORIDE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	CHLOROBENZENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	CHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	CHLOROFORM	VOC	9	1	8	2 00E-03	2 00E-03	5 61E-03
SS_GOLF	MG/KG	CHLOROMETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	cis-1,3-DICHLOROPROPENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	DIBROMOCHLOROMETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	ETHYLBENZENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	METHYL ETHYL KETONE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	METHYL ISOBUTYL KETONE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	METHYLENE CHLORIDE	VOC	11	5	6	2 00E-03	2 10E-02	8 27E-03
SS_GOLF	MG/KG	STYRENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	TETRACHLOROETHYLENE (PCE)	VOC	8	1	7	3 00E-03	3 00E-03	5 63E-03
SS_GOLF	MG/KG	TOLUENE	VOC	11	3	8	6 00E-03	1 70E-02	7 32E-03
SS_GOLF	MG/KG	TOTAL XYLENES	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	trans-1,3-DICHLOROPROPENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	TRICHLOROETHYLENE (TCE)	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	VINYL CHLORIDE	VOC	8		8			6.06E-03

Appendix A. Parcel 3 Data Summaries

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
3SURFACESOIL	MG/KG	ALUMINUM	MET	13	13		8.31E+03	1 71E+04	1 20E+04
3SURFACESOIL	MG/KG	ANTIMONY	MET	25	8	17	4 80E-01	5 00E+00	2 11E+00
3SURFACESOIL	MG/KG	ARSENIC	MET	27	27		1 70E+00	1 01E+02	2 16E+01
3SURFACESOIL	MG/KG	BARIUM	MET	16	16		9 58E+01	2 02E+02	1 38E+02
3SURFACESOIL	MG/KG	BERYLLIUM	MET	24	14	10	2 70E-01	1 10E+00	5.21E-01
3SURFACESOIL	MG/KG	CADMIUM	MET	24	11	13	3 50E-01	1 30E+00	5 06E-01
3SURFACESOIL	MG/KG	CALCIUM	MET	13	13		1 70E+03	4 26E+03	2 28E+03
3SURFACESOIL	MG/KG	CHROMIUM	MET	27	27		7 60E+00	4 03E+01	1 87E+01
3SURFACESOIL	MG/KG	COBALT	MET	13	13		7 00E+00	1 43E+01	9 05E+00
3SURFACESOIL	MG/KG	COPPER	MET	27	27		3 30E+00	5 54E+01	2.46E+01
3SURFACESOIL	MG/KG	IRON	MET	13	13		1 38E+04	2 84E+04	1 96E+04
3SURFACESOIL	MG/KG	LEAD	MET	27	27		2 80E+00	1 67E+02	4 73E+01
3SURFACESOIL	MG/KG	MAGNESIUM	MET	13	13		1 57E+03	3 37E+03	2 27E+03
3SURFACESOIL	MG/KG	MANGANESE	MET	13	13		3.71E+02	1.86E+03	7.70E+02
3SURFACESOIL	MG/KG	MERCURY	MET	27	10	17	5 00E-02	8 00E-01	8 46E-02
3SURFACESOIL	MG/KG	NICKEL	MET	27	27		3 90E+00	5 76E+01	2 11E+01
3SURFACESOIL	MG/KG	POTASSIUM	MET	13	13		9 01E+02	3 36E+03	2 37E+03
3SURFACESOIL	MG/KG	SELENIUM	MET	24	8	16	4 20E-01	2 10E+00	5 47E-01
3SURFACESOIL	MG/KG	SILVER	MET	24		24			5 54E-01
3SURFACESOIL	MG/KG	SODIUM	MET	13	1	12	2 18E+02	2 18E+02	4 14E+01
3SURFACESOIL	MG/KG	THALLIUM	MET	24		24			5 95E-01
3SURFACESOIL	MG/KG	VANADIUM	MET	13	13		2 10E+01	4 32E+01	2 91E+01
3SURFACESOIL	MG/KG	ZINC	MET	27	27		1 08E+01	4 26E+02	9.38E+01
3SURFACESOIL	MG/KG	Total Polynuclear Aromatic Hydrocarbons	ORG	3	3		5 60E-01	1 30E+01	5 61E+00
3SURFACESOIL	MG/KG	PCB-1016 (AROCHLOR 1016)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	PCB-1221 (AROCHLOR 1221)	PCB	28		28			3 59E+00
3SURFACESOIL	MG/KG	PCB-1232 (AROCHLOR 1232)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	PCB-1242 (AROCHLOR 1242)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	PCB-1248 (AROCHLOR 1248)	PCB	28		28			1.77E+00
3SURFACESOIL	MG/KG	PCB-1254 (AROCHLOR 1254)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	PCB-1260 (AROCHLOR 1260)	PCB	28		28			1 77E+00
3SURFACESOIL	MG/KG	ALDRIN	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	ALPHA BHC	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	ALPHA ENDOSULFAN	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	ALPHA-CHLORDANE	PEST	32	1	31	1 40E+00	1 40E+00	9 63E-02
3SURFACESOIL	MG/KG	BETA BHC	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	BETA ENDOSULFAN	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	CHLORDANE	PEST	7	1	6	4 10E-02	4 10E-02	1 83E-01
3SURFACESOIL	MG/KG	DDD	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	DDE	PEST	41	26	15	4 30E-03	2 00E+00	2 78E-01
3SURFACESOIL	MG/KG	DDT	PEST	41	24	17	5 20E-03	6 70E+00	4 23E-01

Appendix A. Parcel 3 Data Summaries

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
3SURFACESOIL	MG/KG	DELTA BHC	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	DIELDRIN	PEST	42	40	2	8.50E-03	1 00E+01	7 15E-01
3SURFACESOIL	MG/KG	ENDOSULFAN SULFATE	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	ENDRIN	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	ENDRIN ALDEHYDE	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	ENDRIN KETONE	PEST	39		39			1 53E-01
3SURFACESOIL	MG/KG	GAMMA BHC (LINDANE)	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	GAMMA-CHLORDANE	PEST	39	2	37	2 30E-02	1 40E+00	1 11E-01
3SURFACESOIL	MG/KG	HEPTACHLOR	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	HEPTACHLOR EPOXIDE	PEST	39		39			7 98E-02
3SURFACESOIL	MG/KG	METHOXYCHLOR	PEST	39		39			7 98E-01
3SURFACESOIL	MG/KG	TOXAPHENE	PEST	39		39			7 98E+00
3SURFACESOIL	MG/KG	1-METHYLNAPHTHALENE	SVOC	16		16			3 76E-02
3SURFACESOIL	MG/KG	2,4,5-TRICHLOROPHENOL	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	2,4,6-TRICHLOROPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2,4-DICHLOROPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2,4-DIMETHYLPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2,4-DINITROPHENOL	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	2,4-DINITROTOLUENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2,6-DINITROTOLUENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-CHLORONAPHTHALENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-CHLOROPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-METHYLNAPHTHALENE	SVOC	28		28			1 08E-01
3SURFACESOIL	MG/KG	2-METHYLPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-NITROANILINE	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	2-NITROPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	3,3'-DICHLOROBENZIDINE	SVOC	17		17			4 02E-01
3SURFACESOIL	MG/KG	3-NITROANILINE	SVOC	17		17			7.40E-01
3SURFACESOIL	MG/KG	4,6-DINITRO-2-METHYLPHENOL	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	4-BROMOPHENYL PHENYL ETHER	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-CHLORO-3-METHYLPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-CHLOROANILINE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-CHLOROPHENYL PHENYL ETHER	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-METHYLPHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	4-NITROANILINE	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	4-NITROPHENOL	SVOC	17		17			7 40E-01
3SURFACESOIL	MG/KG	ACENAPHTHENE	SVOC	28	2	26	6 60E-02	1 30E-01	1 07E-01
3SURFACESOIL	MG/KG	ACENAPHTHYLENE	SVOC	28		28			1 08E-01
3SURFACESOIL	MG/KG	ANTHRACENE	SVOC	29	3	26	6 60E-02	2 80E-01	1.18E-01
3SURFACESOIL	MG/KG	BENZO(a)ANTHRACENE	SVOC	30	13	17	5 40E-02	9 20E-01	1 69E-01
3SURFACESOIL	MG/KG	BENZO(a)PYRENE	SVOC	30	11	19	5 40E-02	9 30E-01	1 62E-01

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
3SURFACESOIL	MG/KG	BENZO(b)FLUORANTHENE	SVOC	30	11	19	5 20E-02	1 10E+00	1 76E-01
3SURFACESOIL	MG/KG	BENZO(g,h,i)PERYLENE	SVOC	29	7	22	4.50E-02	7 80E-01	1 39E-01
3SURFACESOIL	MG/KG	BENZO(k)FLUORANTHENE	SVOC	30	11	19	4 80E-02	1 10E+00	1.67E-01
3SURFACESOIL	MG/KG	BENZYL BUTYL PHTHALATE	SVOC	17		17			1 92E-01
3SURFACESOIL	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	SVOC	20	6	14	7 80E-02	2 70E+00	4 84E-01
3SURFACESOIL	MG/KG	CARBAZOLE	SVOC	17	2	15	1 50E-01	1 80E-01	1 98E-01
3SURFACESOIL	MG/KG	CHRYSENE	SVOC	30	14	16	4 60E-02	1 20E+00	1 70E-01
3SURFACESOIL	MG/KG	DIBENZ(a,h)ANTHRACENE	SVOC	28	1	27	8 30E-02	8 30E-02	1 05E-01
3SURFACESOIL	MG/KG	DIBENZOFURAN	SVOC	17	1	16	5 60E-02	5 60E-02	1 94E-01
3SURFACESOIL	MG/KG	DIETHYL PHTHALATE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	DIMETHYL PHTHALATE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	DI-n-BUTYL PHTHALATE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	DI-n-OCTYLPHTHALATE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	FLUORANTHENE	SVOC	31	19	12	4 60E-02	2 70E+00	2 78E-01
3SURFACESOIL	MG/KG	FLUORENE	SVOC	28	2	26	7 80E-02	1.40E-01	1 08E-01
3SURFACESOIL	MG/KG	HEXACHLOROBENZENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	HEXACHLOROBUTADIENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	HEXACHLOROCYCLOPENTADIENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	HEXACHLOROETHANE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	INDENO(1,2,3-c,d)PYRENE	SVOC	29	5	24	6 60E-02	7.00E-01	1 33E-01
3SURFACESOIL	MG/KG	ISOPHORONE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	NAPHTHALENE	SVOC	28		28			1 08E-01
3SURFACESOIL	MG/KG	NITROBENZENE	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	N-NITROSODI-n-PROPYLAMINE	SVOC	17		17			2.02E-01
3SURFACESOIL	MG/KG	N-NITROSODIPHENYLAMINE	SVOC	20	3	17	2 60E-01	3 40E-01	2 16E-01
3SURFACESOIL	MG/KG	PENTACHLOROPHENOL	SVOC	17	1	16	5 40E-02	5 40E-02	9.79E-02
3SURFACESOIL	MG/KG	PHENANTHRENE	SVOC	30	14	16	6.50E-02	1 60E+00	2 04E-01
3SURFACESOIL	MG/KG	PHENOL	SVOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	PYRENE	SVOC	31	17	14	4 60E-02	1 70E+00	2 18E-01
3SURFACESOIL	MG/KG	1,1,1-TRICHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,1,2,2-TETRACHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,1,2-TRICHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,1-DICHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,1-DICHLOROETHENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,2,4-TRICHLOROBENZENE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	1,2-DICHLOROBENZENE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	1,2-DICHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,2-DICHLOROETHENE, TOTAL	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,2-DICHLOROPROPANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	1,3-DICHLOROBENZENE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	1,4-DICHLOROBENZENE	VOC	17		17			2 02E-01

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
3SURFACESOIL	MG/KG	2,2'-OXYBIS(1-CHLORO)PROPANE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	2-HEXANONE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	ACETONE	VOC	20	6	14	4 00E-03	3 80E-02	8 58E-03
3SURFACESOIL	MG/KG	BENZENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	bis(2-CHLOROETHOXY) METHANE	VOC	17		17			2 02E-01
3SURFACESOIL	MG/KG	bis(2-CHLOROETHYL) ETHER	VOC	17		17			2.02E-01
3SURFACESOIL	MG/KG	BROMODICHLOROMETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	BROMOFORM	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	BROMOMETHANE	VOC	17	1	16	2 00E-03	2 00E-03	5 76E-03
3SURFACESOIL	MG/KG	CARBON DISULFIDE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	CARBON TETRACHLORIDE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	CHLOROBENZENE	VOC	17		17			6.00E-03
3SURFACESOIL	MG/KG	CHLOROETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	CHLOROFORM	VOC	18	1	17	2.00E-03	2 00E-03	5 78E-03
3SURFACESOIL	MG/KG	CHLOROMETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	cis-1,3-DICHLOROPROPENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	DIBROMOCHLOROMETHANE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	ETHYLBENZENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	METHYL ETHYL KETONE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	METHYL ISOBUTYL KETONE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	METHYLENE CHLORIDE	VOC	20	5	15	2 00E-03	2 10E-02	7 23E-03
3SURFACESOIL	MG/KG	STYRENE	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	TETRACHLOROETHYLENE (PCE)	VOC	17	1	16	3 00E-03	3 00E-03	5 79E-03
3SURFACESOIL	MG/KG	TOLUENE	VOC	20	3	17	6 00E-03	1 70E-02	6 70E-03
3SURFACESOIL	MG/KG	TOTAL XYLENES	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	trans-1,3-DICHLOROPROPENE	VOC	17		17			6.00E-03
3SURFACESOIL	MG/KG	TRICHLOROETHYLENE (TCE)	VOC	17		17			6 00E-03
3SURFACESOIL	MG/KG	VINYL CHLORIDE	VOC	17		17			6 00E-03

Appendix A. Parcel 3 Data Summaries

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_BALLPARK	MG/KG	ALUMINUM	MET	4	4		8 31E+03	1 59E+04	1 20E+04
SS_BALLPARK	MG/KG	ANTIMONY	MET	4	3	1	4 80E-01	7.40E-01	4 84E-01
SS_BALLPARK	MG/KG	ARSENIC	MET	4	4		1 05E+01	2 18E+01	1 53E+01
SS_BALLPARK	MG/KG	BARIUM	MET	4	4		1 12E+02	1 83E+02	1 55E+02
SS_BALLPARK	MG/KG	BERYLLIUM	MET	4	4		3 90E-01	6 60E-01	5 38E-01
SS_BALLPARK	MG/KG	CADMIUM	MET	4	4		3 90E-01	4.90E-01	4 28E-01
SS_BALLPARK	MG/KG	CALCIUM	MET	4	4		2 01E+03	2 23E+03	2 13E+03
SS_BALLPARK	MG/KG	CHROMIUM	MET	4	4		1 36E+01	1 89E+01	1 58E+01
SS_BALLPARK	MG/KG	COBALT	MET	4	4		7 40E+00	1 07E+01	8 60E+00
SS_BALLPARK	MG/KG	COPPER	MET	4	4		1 90E+01	2 54E+01	2 20E+01
SS_BALLPARK	MG/KG	IRON	MET	4	4		1.38E+04	2 30E+04	1 94E+04
SS_BALLPARK	MG/KG	LEAD	MET	4	4		1 22E+01	4 86E+01	2 31E+01
SS_BALLPARK	MG/KG	MAGNESIUM	MET	4	4		1 57E+03	3 00E+03	2 40E+03
SS_BALLPARK	MG/KG	MANGANESE	MET	4	4		5 20E+02	9 70E+02	7 11E+02
SS_BALLPARK	MG/KG	MERCURY	MET	4	3	1	5 00E-02	6 00E-02	4 88E-02
SS_BALLPARK	MG/KG	NICKEL	MET	4	4		1 37E+01	2 06E+01	1 83E+01
SS_BALLPARK	MG/KG	POTASSIUM	MET	4	4		2 16E+03	3 36E+03	2 80E+03
SS_BALLPARK	MG/KG	SELENIUM	MET	4	2	2	5 60E-01	8 20E-01	4 48E-01
SS_BALLPARK	MG/KG	SILVER	MET	4		4			2 25E-02
SS_BALLPARK	MG/KG	SODIUM	MET	4		4			6 15E+00
SS_BALLPARK	MG/KG	THALLIUM	MET	4		4			1 35E-01
SS_BALLPARK	MG/KG	VANADIUM	MET	4	4		2 10E+01	3 72E+01	2 90E+01
SS_BALLPARK	MG/KG	ZINC	MET	4	4		5 86E+01	6 81E+01	6 36E+01
SS_BALLPARK	MG/KG	PCB-1016 (AROCHLOR 1016)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1221 (AROCHLOR 1221)	PCB	4		4			3 61E+00
SS_BALLPARK	MG/KG	PCB-1232 (AROCHLOR 1232)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1242 (AROCHLOR 1242)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1248 (AROCHLOR 1248)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1254 (AROCHLOR 1254)	PCB	4		4			1 80E+00
SS_BALLPARK	MG/KG	PCB-1260 (AROCHLOR 1260)	PCB	4		4			1.80E+00
SS_BALLPARK	MG/KG	ALDRIN	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	ALPHA BHC	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	ALPHA ENDOSULFAN	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	ALPHA-CHLORDANE	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	BETA BHC	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	BETA ENDOSULFAN	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	DELTA BHC	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	DIELDRIN	PEST	4	4		1 60E-01	1 10E+00	5 58E-01
SS_BALLPARK	MG/KG	ENDOSULFAN SULFATE	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	ENDRIN	PEST	4		4			1 80E-01

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_BALLPARK	MG/KG	ENDRIN ALDEHYDE	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	ENDRIN KETONE	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	GAMMA BHC (LINDANE)	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	GAMMA-CHLORDANE	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	HEPTACHLOR	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	HEPTACHLOR EPOXIDE	PEST	4		4			9 28E-02
SS_BALLPARK	MG/KG	METHOXYCHLOR	PEST	4		4			9 28E-01
SS_BALLPARK	MG/KG	DDD	PEST	4		4			1 80E-01
SS_BALLPARK	MG/KG	DDE	PEST	4	1	3	8 60E-02	8 60E-02	1.85E-01
SS_BALLPARK	MG/KG	DDT	PEST	4	1	3	7 10E-02	7 10E-02	1 82E-01
SS_BALLPARK	MG/KG	TOXAPHENE	PEST	4		4			9 28E+00
SS_BALLPARK	MG/KG	2,4,5-TRICHLOROPHENOL	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	2,4,6-TRICHLOROPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2,4-DICHLOROPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2,4-DIMETHYLPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2,4-DINITROPHENOL	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	2,4-DINITROTOLUENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2,6-DINITROTOLUENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-CHLORONAPHTHALENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-CHLOROPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-METHYLNAPHTHALENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-METHYLPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-NITROANILINE	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	2-NITROPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	3,3'-DICHLOROBENZIDINE	SVOC	4		4			3 94E-01
SS_BALLPARK	MG/KG	3-NITROANILINE	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	4,6-DINITRO-2-METHYLPHENOL	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	4-BROMOPHENYL PHENYL ETHER	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	4-CHLORO-3-METHYLPHENOL	SVOC	4		4			1.96E-01
SS_BALLPARK	MG/KG	4-CHLOROANILINE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	4-CHLOROPHENYL PHENYL ETHER	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	4-METHYLPHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	4-NITROANILINE	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	4-NITROPHENOL	SVOC	4		4			4 85E-01
SS_BALLPARK	MG/KG	ACENAPHTHENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	ACENAPHTHYLENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	ANTHRACENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	BENZO(a)ANTHRACENE	SVOC	4	1	3	7 60E-02	7 60E-02	1 68E-01
SS_BALLPARK	MG/KG	BENZO(a)PYRENE	SVOC	4	1	3	8 20E-02	8 20E-02	1 69E-01
SS_BALLPARK	MG/KG	BENZO(b)FLUORANTHENE	SVOC	4	1	3	8 90E-02	8 90E-02	1 71E-01

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_BALLPARK	MG/KG	BENZO(g,h,i)PERYLENE	SVOC	4	1	3	4 50E-02	4 50E-02	1 60E-01
SS_BALLPARK	MG/KG	BENZO(k)FLUORANTHENE	SVOC	4	1	3	8.40E-02	8 40E-02	1 70E-01
SS_BALLPARK	MG/KG	BENZYL BUTYL PHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	CARBAZOLE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	CHRYSENE	SVOC	4	1	3	9 40E-02	9.40E-02	1 72E-01
SS_BALLPARK	MG/KG	DIBENZ(a,h)ANTHRACENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	DIBENZOFURAN	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	DIETHYL PHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	DIMETHYL PHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	DI-n-BUTYL PHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	DI-n-OCTYLPHTHALATE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	FLUORANTHENE	SVOC	4	2	2	5 40E-02	1.60E-01	1 50E-01
SS_BALLPARK	MG/KG	FLUORENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	HEXACHLOROBENZENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	HEXACHLOROBUTADIENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	HEXACHLOROCYCLOPENTADIENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	HEXACHLOROETHANE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	INDENO(1,2,3-c,d)PYRENE	SVOC	4	1	3	6 60E-02	6 60E-02	1 65E-01
SS_BALLPARK	MG/KG	ISOPHORONE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	NAPHTHALENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	NITROBENZENE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	N-NITROSODI-n-PROPYLAMINE	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	N-NITROSODIPHENYLAMINE	SVOC	4		4			1.96E-01
SS_BALLPARK	MG/KG	PENTACHLOROPHENOL	SVOC	4		4			9 88E-02
SS_BALLPARK	MG/KG	PHENANTHRENE	SVOC	4	1	3	7 20E-02	7 20E-02	1 67E-01
SS_BALLPARK	MG/KG	PHENOL	SVOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	PYRENE	SVOC	4	2	2	4 60E-02	1 70E-01	1 50E-01
SS_BALLPARK	MG/KG	1,1,1-TRICHLOROETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,1,2,2-TETRACHLOROETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,1,2-TRICHLOROETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,1-DICHLOROETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,1-DICHLOROETHENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,2,4-TRICHLOROBENZENE	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	1,2-DICHLOROBENZENE	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	1,2-DICHLOROETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,2-DICHLOROETHENE, TOTAL	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,2-DICHLOROPROPANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	1,3-DICHLOROBENZENE	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	1,4-DICHLOROBENZENE	VOC	4		4			1 96E-01

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_BALLPARK	MG/KG	2,2'-OXYBIS(1-CHLORO)PROPANE	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	2-HEXANONE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	ACETONE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	BENZENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	bis(2-CHLOROETHOXY) METHANE	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	bis(2-CHLOROETHYL) ETHER	VOC	4		4			1 96E-01
SS_BALLPARK	MG/KG	BROMODICHLOROMETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	BROMOFORM	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	BROMOMETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CARBON DISULFIDE	VOC	4		4			5.88E-03
SS_BALLPARK	MG/KG	CARBON TETRACHLORIDE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CHLOROBENZENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CHLOROETHANE	VOC	4		4			5.88E-03
SS_BALLPARK	MG/KG	CHLOROFORM	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	CHLOROMETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	cis-1,3-DICHLOROPROPENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	DIBROMOCHLOROMETHANE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	ETHYLBENZENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	METHYL ETHYL KETONE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	METHYL ISOBUTYL KETONE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	METHYLENE CHLORIDE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	STYRENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	TETRACHLOROETHYLENE (PCE)	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	TOLUENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	TOTAL XYLENES	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	trans-1,3-DICHLOROPROPENE	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	TRICHLOROETHYLENE (TCE)	VOC	4		4			5 88E-03
SS_BALLPARK	MG/KG	VINYL CHLORIDE	VOC	4		4			5 88E-03

Appendix A. Parcel 3 Data Summaries

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_PLAYGROUND	MG/KG	ALUMINUM	MET	5	5		9 06E+03	1 38E+04	1 19E+04
SS_PLAYGROUND	MG/KG	ANTIMONY	MET	5	4	1	5 70E-01	1 70E+00	8 14E-01
SS_PLAYGROUND	MG/KG	ARSENIC	MET	5	5		9 60E+00	1 94E+01	1 36E+01
SS_PLAYGROUND	MG/KG	BARIUM	MET	5	5		1 07E+02	2 00E+02	1 36E+02
SS_PLAYGROUND	MG/KG	BERYLLIUM	MET	5	5		4 60E-01	7 30E-01	5 78E-01
SS_PLAYGROUND	MG/KG	CADMIUM	MET	5	5		3 50E-01	6 00E-01	4 62E-01
SS_PLAYGROUND	MG/KG	CALCIUM	MET	5	5		1 83E+03	2 34E+03	2 02E+03
SS_PLAYGROUND	MG/KG	CHROMIUM	MET	5	5		1 20E+01	1 63E+01	1 43E+01
SS_PLAYGROUND	MG/KG	COBALT	MET	5	5		7 50E+00	8 90E+00	8 24E+00
SS_PLAYGROUND	MG/KG	COPPER	MET	5	5		1 58E+01	5 54E+01	2 70E+01
SS_PLAYGROUND	MG/KG	IRON	MET	5	5		1 53E+04	2 20E+04	1 96E+04
SS_PLAYGROUND	MG/KG	LEAD	MET	5	5		1 56E+01	6 88E+01	3 22E+01
SS_PLAYGROUND	MG/KG	MAGNESIUM	MET	5	5		1 61E+03	2 81E+03	2 22E+03
SS_PLAYGROUND	MG/KG	MANGANESE	MET	5	5		4 32E+02	8 99E+02	6 51E+02
SS_PLAYGROUND	MG/KG	MERCURY	MET	5	4	1	5 00E-02	8 00E-02	5 70E-02
SS_PLAYGROUND	MG/KG	NICKEL	MET	5	5		1 38E+01	2 11E+01	1 80E+01
SS_PLAYGROUND	MG/KG	POTASSIUM	MET	5	5		2 08E+03	3 30E+03	2 73E+03
SS_PLAYGROUND	MG/KG	SELENIUM	MET	5	4	1	4 20E-01	6 40E-01	4 54E-01
SS_PLAYGROUND	MG/KG	SILVER	MET	5		5			2 50E-02
SS_PLAYGROUND	MG/KG	SODIUM	MET	5		5			6 29E+00
SS_PLAYGROUND	MG/KG	THALLIUM	MET	5		5			1 36E-01
SS_PLAYGROUND	MG/KG	VANADIUM	MET	5	5		2 35E+01	3 29E+01	2 94E+01
SS_PLAYGROUND	MG/KG	ZINC	MET	5	5		4 97E+01	8.35E+01	6 70E+01
SS_PLAYGROUND	MG/KG	PCB-1016 (AROCHLOR 1016)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1221 (AROCHLOR 1221)	PCB	6		6			1 33E+00
SS_PLAYGROUND	MG/KG	PCB-1232 (AROCHLOR 1232)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1242 (AROCHLOR 1242)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1248 (AROCHLOR 1248)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1254 (AROCHLOR 1254)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	PCB-1260 (AROCHLOR 1260)	PCB	6		6			6 59E-01
SS_PLAYGROUND	MG/KG	ALDRIN	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	ALPHA BHC	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	ALPHA ENDOSULFAN	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	ALPHA-CHLORDANE	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	BETA BHC	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	BETA ENDOSULFAN	PEST	6		6			6 59E-02
SS_PLAYGROUND	MG/KG	DELTA BHC	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	DIELDRIN	PEST	6	6		8 50E-03	7 10E-01	3 30E-01
SS_PLAYGROUND	MG/KG	ENDOSULFAN SULFATE	PEST	6		6			6 59E-02
SS_PLAYGROUND	MG/KG	ENDRIN	PEST	6		6			6 59E-02

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_PLAYGROUND	MG/KG	ENDRIN ALDEHYDE	PEST	6		6			6 59E-02
SS_PLAYGROUND	MG/KG	ENDRIN KETONE	PEST	6		6			6 59E-02
SS_PLAYGROUND	MG/KG	GAMMA BHC (LINDANE)	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	GAMMA-CHLORDANE	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	HEPTACHLOR	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	HEPTACHLOR EPOXIDE	PEST	6		6			3 44E-02
SS_PLAYGROUND	MG/KG	METHOXYCHLOR	PEST	6		6			3 44E-01
SS_PLAYGROUND	MG/KG	DDD	PEST	6		6			6.59E-02
SS_PLAYGROUND	MG/KG	DDE	PEST	6	3	3	1.40E-01	4 30E-01	1 45E-01
SS_PLAYGROUND	MG/KG	DDT	PEST	6	2	4	4 40E-02	2 00E-01	9 11E-02
SS_PLAYGROUND	MG/KG	TOXAPHENE	PEST	6		6			3 44E+00
SS_PLAYGROUND	MG/KG	2,4,5-TRICHLOROPHENOL	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	2,4,6-TRICHLOROPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2,4-DICHLOROPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2,4-DIMETHYLPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2,4-DINITROPHENOL	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	2,4-DINITROTOLUENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2,6-DINITROTOLUENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-CHLORONAPHTHALENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-CHLOROPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-METHYLNAPHTHALENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-METHYLPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-NITROANILINE	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	2-NITROPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	3,3'-DICHLOROBENZIDINE	SVOC	5		5			4 03E-01
SS_PLAYGROUND	MG/KG	3-NITROANILINE	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	4,6-DINITRO-2-METHYLPHENOL	SVOC	5		5			4.99E-01
SS_PLAYGROUND	MG/KG	4-BROMOPHENYL PHENYL ETHER	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-CHLORO-3-METHYLPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-CHLOROANILINE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-CHLOROPHENYL PHENYL ETHER	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-METHYLPHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	4-NITROANILINE	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	4-NITROPHENOL	SVOC	5		5			4 99E-01
SS_PLAYGROUND	MG/KG	ACENAPHTHENE	SVOC	5	1	4	1.30E-01	1 30E-01	1.89E-01
SS_PLAYGROUND	MG/KG	ACENAPHTHYLENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	ANTHRACENE	SVOC	5	1	4	2 70E-01	2 70E-01	2 17E-01
SS_PLAYGROUND	MG/KG	BENZO(a)ANTHRACENE	SVOC	5	1	4	5 70E-01	5 70E-01	2 77E-01
SS_PLAYGROUND	MG/KG	BENZO(a)PYRENE	SVOC	5	1	4	4 40E-01	4 40E-01	2 51E-01
SS_PLAYGROUND	MG/KG	BENZO(b)FLUORANTHENE	SVOC	5	1	4	4 60E-01	4 60E-01	2 55E-01

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_PLAYGROUND	MG/KG	BENZO(g,h,i)PERYLENE	SVOC	5	1	4	2 90E-01	2 90E-01	2 21E-01
SS_PLAYGROUND	MG/KG	BENZO(k)FLUORANTHENE	SVOC	5	1	4	4 00E-01	4 00E-01	2 43E-01
SS_PLAYGROUND	MG/KG	BENZYL BUTYL PHTHALATE	SVOC	5		5			1 67E-01
SS_PLAYGROUND	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	CARBAZOLE	SVOC	5	1	4	1 80E-01	1 80E-01	1 99E-01
SS_PLAYGROUND	MG/KG	CHRYSENE	SVOC	5	2	3	4 90E-02	6 20E-01	2 57E-01
SS_PLAYGROUND	MG/KG	DIBENZ(a,h)ANTHRACENE	SVOC	5	1	4	8 30E-02	8 30E-02	1 80E-01
SS_PLAYGROUND	MG/KG	DIBENZOFURAN	SVOC	5	1	4	5.60E-02	5 60E-02	1 74E-01
SS_PLAYGROUND	MG/KG	DIETHYL PHTHALATE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	DIMETHYL PHTHALATE	SVOC	5		5			2.03E-01
SS_PLAYGROUND	MG/KG	DI-n-BUTYL PHTHALATE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	DI-n-OCTYLPHTHALATE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	FLUORANTHENE	SVOC	5	3	2	4 60E-02	1 20E+00	3 42E-01
SS_PLAYGROUND	MG/KG	FLUORENE	SVOC	5	1	4	1 40E-01	1 40E-01	1.91E-01
SS_PLAYGROUND	MG/KG	HEXACHLOROBENZENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	HEXACHLOROBUTADIENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	HEXACHLOROCYCLOPENTADIENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	HEXACHLOROETHANE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	INDENO(1,2,3-c,d)PYRENE	SVOC	5	1	4	2 60E-01	2 60E-01	2 15E-01
SS_PLAYGROUND	MG/KG	ISOPHORONE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	NAPHTHALENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	NITROBENZENE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	N-NITROSODI-n-PROPYLAMINE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	N-NITROSODIPHENYLAMINE	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	PENTACHLOROPHENOL	SVOC	5		5			1 01E-01
SS_PLAYGROUND	MG/KG	PHENANTHRENE	SVOC	5	2	3	7 20E-02	1 00E+00	3 37E-01
SS_PLAYGROUND	MG/KG	PHENOL	SVOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	PYRENE	SVOC	5	2	3	6 70E-02	1 10E+00	3 56E-01
SS_PLAYGROUND	MG/KG	1,1,1-TRICHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,1,2,2-TETRACHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,1,2-TRICHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,1-DICHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,1-DICHLOROETHENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,2,4-TRICHLOROBENZENE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	1,2-DICHLOROBENZENE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	1,2-DICHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,2-DICHLOROETHENE, TOTAL	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,2-DICHLOROPROPANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	1,3-DICHLOROBENZENE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	1,4-DICHLOROBENZENE	VOC	5		5			2 03E-01

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_PLAYGROUND	MG/KG	2,2'-OXYBIS(1-CHLORO)PROPANE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	2-HEXANONE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	ACETONE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	BENZENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	bis(2-CHLOROETHOXY) METHANE	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	bis(2-CHLOROETHYL) ETHER	VOC	5		5			2 03E-01
SS_PLAYGROUND	MG/KG	BROMODICHLOROMETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	BROMOFORM	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	BROMOMETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CARBON DISULFIDE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CARBON TETRACHLORIDE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CHLOROBENZENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CHLOROETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CHLOROFORM	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	CHLOROMETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	cis-1,3-DICHLOROPROPENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	DIBROMOCHLOROMETHANE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	ETHYLBENZENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	METHYL ETHYL KETONE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	METHYL ISOBUTYL KETONE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	METHYLENE CHLORIDE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	STYRENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	TETRACHLOROETHYLENE (PCE)	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	TOLUENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	TOTAL XYLENES	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	trans-1,3-DICHLOROPROPENE	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	TRICHLOROETHYLENE (TCE)	VOC	5		5			6 00E-03
SS_PLAYGROUND	MG/KG	VINYL CHLORIDE	VOC	5		5			6 00E-03

Appendix A. Parcel 3 Data Summaries

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_GOLF	MG/KG	ALUMINUM	MET	4	4		8 94E+03	1 71E+04	1 21E+04
SS_GOLF	MG/KG	ANTIMONY	MET	16	1	15	5 00E+00	5 00E+00	2 93E+00
SS_GOLF	MG/KG	ARSENIC	MET	18	18		1 70E+00	1 01E+02	2 53E+01
SS_GOLF	MG/KG	BARIUM	MET	7	7		9 58E+01	2 02E+02	1 29E+02
SS_GOLF	MG/KG	BERYLLIUM	MET	15	5	10	2 70E-01	1.10E+00	4 98E-01
SS_GOLF	MG/KG	CADMIUM	MET	15	2	13	4 70E-01	1 30E+00	5.41E-01
SS_GOLF	MG/KG	CALCIUM	MET	4	4		1 70E+03	4 26E+03	2 77E+03
SS_GOLF	MG/KG	CHROMIUM	MET	18	18		7 60E+00	4 03E+01	2 07E+01
SS_GOLF	MG/KG	COBALT	MET	4	4		7 00E+00	1 43E+01	1 05E+01
SS_GOLF	MG/KG	COPPER	MET	18	18		3 30E+00	5 19E+01	2 45E+01
SS_GOLF	MG/KG	IRON	MET	4	4		1 54E+04	2 84E+04	1.99E+04
SS_GOLF	MG/KG	LEAD	MET	18	18		2 80E+00	1 67E+02	5 69E+01
SS_GOLF	MG/KG	MAGNESIUM	MET	4	4		1 65E+03	3 37E+03	2 22E+03
SS_GOLF	MG/KG	MANGANESE	MET	4	4		3 71E+02	1 86E+03	9 76E+02
SS_GOLF	MG/KG	MERCURY	MET	18	3	15	1 00E-01	8 00E-01	1 00E-01
SS_GOLF	MG/KG	NICKEL	MET	18	18		3.90E+00	5 76E+01	2.27E+01
SS_GOLF	MG/KG	POTASSIUM	MET	4	4		9 01E+02	2 77E+03	1 49E+03
SS_GOLF	MG/KG	SELENIUM	MET	15	2	13	5 80E-01	2 10E+00	6 05E-01
SS_GOLF	MG/KG	SILVER	MET	15		15			8 71E-01
SS_GOLF	MG/KG	SODIUM	MET	4	1	3	2 18E+02	2 18E+02	1 21E+02
SS_GOLF	MG/KG	THALLIUM	MET	15		15			8 71E-01
SS_GOLF	MG/KG	VANADIUM	MET	4	4		2 11E+01	4 32E+01	2 88E+01
SS_GOLF	MG/KG	ZINC	MET	18	18		1 08E+01	4 26E+02	1 08E+02
SS_GOLF	MG/KG	Total Polynuclear Aromatic Hydrocarbons	ORG	3	3		5 60E-01	1 30E+01	5 61E+00
SS_GOLF	MG/KG	PCB-1016 (AROCHLOR 1016)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1221 (AROCHLOR 1221)	PCB	18		18			4 34E+00
SS_GOLF	MG/KG	PCB-1232 (AROCHLOR 1232)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1242 (AROCHLOR 1242)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1248 (AROCHLOR 1248)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1254 (AROCHLOR 1254)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	PCB-1260 (AROCHLOR 1260)	PCB	18		18			2 14E+00
SS_GOLF	MG/KG	ALDRIN	PEST	29		29			8.74E-02
SS_GOLF	MG/KG	ALPHA BHC	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	ALPHA ENDOSULFAN	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	ALPHA-CHLORDANE	PEST	22	1	21	1 40E+00	1 40E+00	1 14E-01
SS_GOLF	MG/KG	BETA BHC	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	BETA ENDOSULFAN	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	CHLORDANE	PEST	7	1	6	4 10E-02	4 10E-02	1 83E-01
SS_GOLF	MG/KG	DDD	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	DDE	PEST	31	22	9	4 30E-03	2 00E+00	3 16E-01

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_GOLF	MG/KG	DDT	PEST	31	21	10	5 20E-03	6 70E+00	5 18E-01
SS_GOLF	MG/KG	DELTA BHC	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	DIELDRIN	PEST	32	30	2	2 10E-02	1 00E+01	8 07E-01
SS_GOLF	MG/KG	ENDOSULFAN SULFATE	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	ENDRIN	PEST	29		29			1.68E-01
SS_GOLF	MG/KG	ENDRIN ALDEHYDE	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	ENDRIN KETONE	PEST	29		29			1 68E-01
SS_GOLF	MG/KG	GAMMA BHC (LINDANE)	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	GAMMA-CHLORDANE	PEST	29	2	27	2 30E-02	1 40E+00	1 30E-01
SS_GOLF	MG/KG	HEPTACHLOR	PEST	29		29			8 74E-02
SS_GOLF	MG/KG	HEPTACHLOR EPOXIDE	PEST	29		29			8.74E-02
SS_GOLF	MG/KG	METHOXYCHLOR	PEST	29		29			8 74E-01
SS_GOLF	MG/KG	TOXAPHENE	PEST	29		29			8 74E+00
SS_GOLF	MG/KG	1-METHYLNAPHTHALENE	SVOC	16		16			3 76E-02
SS_GOLF	MG/KG	2,4,5-TRICHLOROPHENOL	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	2,4,6-TRICHLOROPHENOL	SVOC	8		8			2.05E-01
SS_GOLF	MG/KG	2,4-DICHLOROPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2,4-DIMETHYLPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2,4-DINITROPHENOL	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	2,4-DINITROTOLUENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2,6-DINITROTOLUENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-CHLORONAPHTHALENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-CHLOROPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-METHYLNAPHTHALENE	SVOC	19		19			6 48E-02
SS_GOLF	MG/KG	2-METHYLPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-NITROANILINE	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	2-NITROPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	3,3'-DICHLOROBENZIDINE	SVOC	8		8			4 06E-01
SS_GOLF	MG/KG	3-NITROANILINE	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	4,6-DINITRO-2-METHYLPHENOL	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	4-BROMOPHENYL PHENYL ETHER	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	4-CHLORO-3-METHYLPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	4-CHLOROANILINE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	4-CHLOROPHENYL PHENYL ETHER	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	4-METHYLPHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	4-NITROANILINE	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	4-NITROPHENOL	SVOC	8		8			1 02E+00
SS_GOLF	MG/KG	ACENAPHTHENE	SVOC	19	1	18	6 60E-02	6 60E-02	6 67E-02
SS_GOLF	MG/KG	ACENAPHTHYLENE	SVOC	19		19			6 48E-02
SS_GOLF	MG/KG	ANTHRACENE	SVOC	20	2	18	6 60E-02	2 80E-01	7 73E-02

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_GOLF	MG/KG	BENZO(a)ANTHRACENE	SVOC	21	11	10	5 40E-02	9 20E-01	1 44E-01
SS_GOLF	MG/KG	BENZO(a)PYRENE	SVOC	21	9	12	5 40E-02	9 30E-01	1 39E-01
SS_GOLF	MG/KG	BENZO(b)FLUORANTHENE	SVOC	21	9	12	5 20E-02	1.10E+00	1 58E-01
SS_GOLF	MG/KG	BENZO(g,h,i)PERYLENE	SVOC	20	5	15	5 00E-02	7 80E-01	1 14E-01
SS_GOLF	MG/KG	BENZO(k)FLUORANTHENE	SVOC	21	9	12	4 80E-02	1 10E+00	1 48E-01
SS_GOLF	MG/KG	BENZYL BUTYL PHTHALATE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	bis(2-ETHYLHEXYL) PHTHALATE	SVOC	11	6	5	7 80E-02	2 70E+00	7 16E-01
SS_GOLF	MG/KG	CARBAZOLE	SVOC	8	1	7	1 50E-01	1 50E-01	1 98E-01
SS_GOLF	MG/KG	CHRYSENE	SVOC	21	11	10	4 60E-02	1 20E+00	1 50E-01
SS_GOLF	MG/KG	DIBENZ(a,h)ANTHRACENE	SVOC	19		19			6 63E-02
SS_GOLF	MG/KG	DIBENZOFURAN	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	DIETHYL PHTHALATE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	DIMETHYL PHTHALATE	SVOC	8		8			2.05E-01
SS_GOLF	MG/KG	DI-n-BUTYL PHTHALATE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	DI-n-OCTYLPHTHALATE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	FLUORANTHENE	SVOC	22	14	8	7 30E-02	2 70E+00	2 86E-01
SS_GOLF	MG/KG	FLUORENE	SVOC	19	1	18	7 80E-02	7 80E-02	6 73E-02
SS_GOLF	MG/KG	HEXACHLOROBENZENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	HEXACHLOROBUTADIENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	HEXACHLOROCYCLOPENTADIENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	HEXACHLOROETHANE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	INDENO(1,2,3-c,d)PYRENE	SVOC	20	3	17	9 20E-02	7 00E-01	1 06E-01
SS_GOLF	MG/KG	ISOPHORONE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	NAPHTHALENE	SVOC	19		19			6 48E-02
SS_GOLF	MG/KG	NITROBENZENE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	N-NITROSODI-n-PROPYLAMINE	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	N-NITROSODIPHENYLAMINE	SVOC	11	3	8	2 60E-01	3 40E-01	2 29E-01
SS_GOLF	MG/KG	PENTACHLOROPHENOL	SVOC	8	1	7	5 40E-02	5 40E-02	9 55E-02
SS_GOLF	MG/KG	PHENANTHRENE	SVOC	21	11	10	6 50E-02	1 60E+00	1 79E-01
SS_GOLF	MG/KG	PHENOL	SVOC	8		8			2 05E-01
SS_GOLF	MG/KG	PYRENE	SVOC	22	13	9	5 50E-02	1 70E+00	1 99E-01
SS_GOLF	MG/KG	1,1,1-TRICHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,1,2,2-TETRACHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,1,2-TRICHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,1-DICHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,1-DICHLOROETHENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,2,4-TRICHLOROBENZENE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	1,2-DICHLOROBENZENE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	1,2-DICHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,2-DICHLOROETHENE, TOTAL	VOC	8		8			6 06E-03

Appendix A. Parcel 3 Data Summaries

982960010	Units	Parameter Name	Parameter Class	Number of Analysis	Number of Detects	Number of NonDetects	MinDet	MaxDet	Arithmetic Mean Value
SS_GOLF	MG/KG	1,2-DICHLOROPROPANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	1,3-DICHLOROBENZENE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	1,4-DICHLOROBENZENE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	2,2'-OXYBIS(1-CHLORO)PROPANE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	2-HEXANONE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	ACETONE	VOC	11	6	5	4 00E-03	3 80E-02	1 07E-02
SS_GOLF	MG/KG	BENZENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	bis(2-CHLOROETHOXY) METHANE	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	bis(2-CHLOROETHYL) ETHER	VOC	8		8			2 05E-01
SS_GOLF	MG/KG	BROMODICHLOROMETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	BROMOFORM	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	BROMOMETHANE	VOC	8	1	7	2 00E-03	2 00E-03	5.56E-03
SS_GOLF	MG/KG	CARBON DISULFIDE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	CARBON TETRACHLORIDE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	CHLOROBENZENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	CHLOROETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	CHLOROFORM	VOC	9	1	8	2 00E-03	2 00E-03	5 61E-03
SS_GOLF	MG/KG	CHLOROMETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	cis-1,3-DICHLOROPROPENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	DIBROMOCHLOROMETHANE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	ETHYLBENZENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	METHYL ETHYL KETONE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	METHYL ISOBUTYL KETONE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	METHYLENE CHLORIDE	VOC	11	5	6	2 00E-03	2 10E-02	8 27E-03
SS_GOLF	MG/KG	STYRENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	TETRACHLOROETHYLENE (PCE)	VOC	8	1	7	3.00E-03	3 00E-03	5 63E-03
SS_GOLF	MG/KG	TOLUENE	VOC	11	3	8	6 00E-03	1 70E-02	7 32E-03
SS_GOLF	MG/KG	TOTAL XYLENES	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	trans-1,3-DICHLOROPROPENE	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	TRICHLOROETHYLENE (TCE)	VOC	8		8			6 06E-03
SS_GOLF	MG/KG	VINYL CHLORIDE	VOC	8		8			6 06E-03

TAB

Appendix B

Human Health COPC Screening Tables for Parcel 3

Appendix B.
COPC Screening from BRAC Sampling - Carcinogenic

BRAC Parcel	Screening Site	Station ID	Parameter	ConcSO	BkgdSO	ResSO	IndSO	Units	Risk Ratio ResSO Exceeded	Risk Ratio IndSO Exceeded	Risk Ratio ResSO All	Risk Ratio IndSO All
3		A(3 10)	ARSENIC	1 01E+02	20	43	3 8	MG/KG	2 35E-04	2 66E-05	2 35E-04	2 66E-05
3		A(3 10)	DIELDRIN	6 00E-02	086	04	36	MG/KG			1 50E-06	1 67E-07
3		A(3 5)	DIELDRIN	5 00E-01	086	04	36	MG/KG	1 25E-05	1 39E-06	1 25E-05	1 39E-06
3		B(3 5)	DIELDRIN	1 00E+01	086	04	36	MG/KG	2 50E-04	2 78E-05	2 50E-04	2 78E-05
3		C(3 5)	DIELDRIN	6 80E-02	086	04	36	MG/KG			1 70E-06	1 89E-07
3		D(3 5)	DIELDRIN	1 40E+00	.086	04	36	MG/KG	3.50E-05	3 89E-06	3 50E-05	3 89E-06
3		E(3.5)	DIELDRIN	5.70E-01	086	04	36	MG/KG	1 43E-05	1 58E-06	1 43E-05	1 58E-06
3		F(3 5)	DIELDRIN	4 40E-01	086	04	.36	MG/KG	1 10E-05	1 22E-06	1 10E-05	1 22E-06
3		G(3 5)	ARSENIC	1 05E+01	20	43	3 8	MG/KG			2 44E-05	2 76E-06
3		G(3 5)	BERYLLIUM	5 30E-01	1 1	15	1 3	MG/KG			3 53E-06	4 08E-07
3		G(3 5)	DIELDRIN	7 40E-01	086	04	36	MG/KG	1 85E-05	2 06E-06	1 85E-05	2 06E-06
3		H(3 5)	ARSENIC	1 60E+01	20	43	3 8	MG/KG			3 72E-05	4 21E-06
3		H(3.5)	BERYLLIUM	3 90E-01	1 1	15	1.3	MG/KG			2 60E-06	3 00E-07
3		H(3 5)	DIELDRIN	2.30E-01	086	04	36	MG/KG	5 75E-06	6 39E-07	5 75E-06	6 39E-07
3		I(3 5)	ARSENIC	2 18E+01	20	43	3.8	MG/KG	5 07E-05	5 74E-06	5 07E-05	5 74E-06
3		I(3 5)	BERYLLIUM	5 70E-01	1 1	15	1 3	MG/KG			3 80E-06	4 38E-07
3		I(3 5)	DIELDRIN	1 60E-01	086	04	36	MG/KG	4 00E-06	4 44E-07	4 00E-06	4 44E-07
3		J(3 5)	ARSENIC	1 30E+01	20	43	3 8	MG/KG			3 02E-05	3 42E-06
3		J(3 5)	BERYLLIUM	6 60E-01	1 1	15	1 3	MG/KG			4 40E-06	5 08E-07
3		J(3 5)	DIELDRIN	1 10E+00	086	04	36	MG/KG	2 75E-05	3 06E-06	2 75E-05	3 06E-06
3		K(3 5)	ARSENIC	1 24E+01	20	43	3.8	MG/KG			2 88E-05	3 26E-06
3		K(3 5)	BERYLLIUM	7 30E-01	1.1	15	1 3	MG/KG			4 87E-06	5 62E-07
3		K(3 5)	DIELDRIN	2 00E-01	086	04	36	MG/KG	5 00E-06	5 56E-07	5 00E-06	5 56E-07
3		K(3 5B)	ARSENIC	1.42E+01	20	43	3 8	MG/KG			3 30E-05	3 74E-06
3		K(3 5B)	BERYLLIUM	5 60E-01	1 1	15	1 3	MG/KG			3 73E-06	4 31E-07
3		L(3 5)	ARSENIC	1 23E+01	20	43	3 8	MG/KG			2 86E-05	3 24E-06
3		L(3 5)	BERYLLIUM	5 60E-01	1.1	15	1 3	MG/KG			3 73E-06	4 31E-07
3		L(3 5)	DIELDRIN	2 80E-01	086	04	36	MG/KG	7 00E-06	7 78E-07	7 00E-06	7 78E-07
3		M(3 5)	ARSENIC	9 60E+00	20	43	3 8	MG/KG			2 23E-05	2 53E-06
3		M(3 5)	BENZO(a)PYRENE	4 40E-01	96	088	78	MG/KG			5 00E-06	5 64E-07
3		M(3 5)	BERYLLIUM	4 60E-01	1 1	15	1 3	MG/KG			3 07E-06	3 54E-07
3		M(3 5)	DIELDRIN	5 70E-01	086	04	36	MG/KG	1 43E-05	1 58E-06	1 43E-05	1 58E-06
3		N(3 5)	ARSENIC	1 94E+01	20	43	3 8	MG/KG			4 51E-05	5 11E-06
3		N(3 5)	BERYLLIUM	5 80E-01	1 1	15	1 3	MG/KG			3.87E-06	4 46E-07
3		N(3 5)	DIELDRIN	7 10E-01	086	04	36	MG/KG	1 78E-05	1 97E-06	1 78E-05	1 97E-06
3		O(3.5)	ALPHA-CHLORDANE	1 40E+00	029	0 49	4 4	MG/KG	2 86E-06	3 18E-07	2.86E-06	3 18E-07
3		O(3 5)	DDT	2.40E+00	074	1 9	17	MG/KG	1 26E-06	1 41E-07	1 26E-06	1 41E-07
3		O(3 5)	DIELDRIN	6 00E-01	086	04	36	MG/KG	1 50E-05	1 67E-06	1 50E-05	1 67E-06
3		O(3 5)	GAMMA-CHLORDANE	1 40E+00	026	0 49	4 4	MG/KG	2 86E-06	3 18E-07	2 86E-06	3 18E-07
3		P(3 5)	DIELDRIN	2 60E+00	.086	04	.36	MG/KG	6 50E-05	7 22E-06	6 50E-05	7 22E-06
3		Q(3.5)	DIELDRIN	9 60E-01	086	04	36	MG/KG	2 40E-05	2 67E-06	2 40E-05	2 67E-06
3		R(3 5)	DIELDRIN	4.40E-01	086	04	36	MG/KG	1 10E-05	1 22E-06	1 10E-05	1 22E-06
3		S(3 5)	DIELDRIN	7 20E-01	.086	04	36	MG/KG	1 80E-05	2 00E-06	1 80E-05	2 00E-06
3		T(3 5)	DIELDRIN	5 40E-01	086	04	36	MG/KG	1 35E-05	1 50E-06	1 35E-05	1 50E-06
3		U(3 5)	DIELDRIN	3 30E-01	086	04	36	MG/KG	8 25E-06	9 17E-07	8 25E-06	9 17E-07
3		V(3 5)	DIELDRIN	2 90E-01	086	04	36	MG/KG	7 25E-06	8 06E-07	7 25E-06	8 06E-07
3		X(3 5)	DIELDRIN	2.10E-01	086	04	36	MG/KG	5 25E-06	5 83E-07	5 25E-06	5 83E-07

Appendix B.
COPC Screening from BRAC Sampling - Noncarcinogenic

BRAC Parcel	Screening Site	Station ID	Parameter	ConcSO	BkgdSO	ResSO	IndSO	Units	Risk Ratio ResSO Exceeded	Risk Ratio IndSO Exceeded	Risk Ratio ResSO All	Risk Ratio IndSO All
3		A(3 10)	CHROMIUM, TOTAL	3.93E+01	24 8	39	1000	MG/KG	1 01E+00	3 93E-02	1 01E+00	3 93E-02
3		A(3 10)	COPPER	5 19E+01	33	310	8200	MG/KG	1 67E-01	6 33E-03	1 67E-01	6 33E-03
3		N(3 5)	COPPER	5 54E+01	33	310	8200	MG/KG	1 79E-01	6 76E-03	1 79E-01	6 76E-03

Appendix B.
COPC Screening from Screening Sites Sampling - Carcinogenic

BRAC Parcel	Screening Site	Station ID	Parameter	ConcSO	BkgdSO	ResSO	IndSO	Units	Risk Ratio ResSO Exceeded	Risk Ratio IndSO Exceeded	Risk Ratio ResSO All	Risk Ratio IndSO All
3	51	SB51A	ARSENIC	2 01E+01	20	43	3 8	MG/KG	4 67E-05	5 29E-06	4 67E-05	5 29E-06
3	51	SB51A	BENZO(a)ANTHRACENE	2.50E-01	71	88	7 8	MG/KG			2 84E-07	3 21E-08
3	51	SB51A	BENZO(a)PYRENE	2 40E-01	96	088	78	MG/KG			2 73E-06	3 08E-07
3	51	SB51A	BENZO(b)FLUORANTHENE	3 10E-01	78	88	7 8	MG/KG			3 52E-07	3 97E-08
3	51	SB51A	BENZO(k)FLUORANTHENE	3 50E-01	78	8 8	78	MG/KG			3 98E-08	4 49E-09
3	51	SB51A	bis(2-ETHYLHEXYL) PHTHALATE	1.50E-01	NA	46	410	MG/KG			3 26E-09	3 66E-10
3	51	SB51A	CADMIUM	1 30E+00	1 4	3 9	100	MG/KG			3 33E-07	1 30E-08
3	51	SB51A	CARBAZOLE	1 50E-01	067	32	290	MG/KG	4 69E-09	5 17E-10	4 69E-09	5 17E-10
3	51	SB51A	CHRYSENE	2 60E-01	.94	88	780	MG/KG			2 95E-09	3 33E-10
3	51	SB51A	DDE	4.40E-02	16	1 9	17	MG/KG			2 32E-08	2 59E-09
3	51	SB51A	DDT	4 40E-02	074	1 9	17	MG/KG			2 32E-08	2 59E-09
3	51	SB51A	DIELDRIN	2 50E-02	086	04	36	MG/KG			6 25E-07	6 94E-08
3	51	SB51A	INDENO(1,2,3-c,d)PYRENE	1 90E-01	7	88	7 8	MG/KG			2 16E-07	2 44E-08
3	51	SB51A	LEAD	6 32E+01	30	200	1000	MG/KG	3 16E-07	6 32E-08	3.16E-07	6 32E-08
3	51	SB51A	METHYLENE CHLORIDE	2 00E-03	NA	85	760	MG/KG			2 35E-11	2 63E-12
3	51	SB51B	ARSENIC	1 45E+01	20	43	3 8	MG/KG			3 37E-05	3 82E-06
3	51	SB51B	BENZO(a)ANTHRACENE	5 90E-02	71	88	7.8	MG/KG			6 70E-08	7 56E-09
3	51	SB51B	CHRYSENE	5 90E-02	94	88	780	MG/KG			6 70E-10	7 56E-11
3	51	SB51B	DDE	8 00E-02	16	1 9	17	MG/KG			4 21E-08	4 71E-09
3	51	SB51B	DDT	9 00E-02	074	1 9	17	MG/KG	4 74E-08	5 29E-09	4 74E-08	5 29E-09
3	51	SB51B	DIELDRIN	4 80E-02	086	04	36	MG/KG			1 20E-06	1 33E-07
3	51	SB51B	LEAD	6.22E+01	30	200	1000	MG/KG	3 11E-07	6 22E-08	3 11E-07	6 22E-08
3	51	SB51C	ARSENIC	1 71E+01	20	43	3 8	MG/KG			3 98E-05	4 50E-06
3	51	SB51C	bis(2-ETHYLHEXYL) PHTHALATE	2 30E-01	NA	46	410	MG/KG			5 00E-09	5 61E-10
3	51	SB51C	DDE	3 80E-02	16	1 9	17	MG/KG			2 00E-08	2 24E-09
3	51	SB51C	DDT	5 60E-01	074	1 9	17	MG/KG	2 95E-07	3 29E-08	2 95E-07	3 29E-08
3	51	SB51C	DIELDRIN	6 30E-02	086	04	36	MG/KG			1 58E-06	1 75E-07
3	51	SB51C	LEAD	4 15E+01	30	200	1000	MG/KG	2 08E-07	4.15E-08	2 08E-07	4 15E-08
3	52	SB52A	ARSENIC	2 32E+01	20	.43	3 8	MG/KG	5 40E-05	6 11E-06	5 40E-05	6 11E-06
3	52	SB52A	BERYLLIUM	2 90E-01	1 1	.15	1 3	MG/KG			1 93E-06	2 23E-07
3	52	SB52A	DDE	4 30E-01	.16	1 9	17	MG/KG	2 26E-07	2 53E-08	2 26E-07	2 53E-08
3	52	SB52A	DDT	2 40E-01	074	1 9	17	MG/KG	1 26E-07	1 41E-08	1 26E-07	1 41E-08
3	52	SB52A	DIELDRIN	2 90E-01	086	04	36	MG/KG	7 25E-06	8 06E-07	7 25E-06	8 06E-07
3	52	SB52A	LEAD	2 44E+01	30	200	1000	MG/KG			1 22E-07	2 44E-08
3	52	SB52B	ARSENIC	1 19E+01	20	43	3 8	MG/KG			2 77E-05	3 13E-06
3	52	SB52B	DDE	4 30E-03	.16	1 9	17	MG/KG			2 26E-09	2 53E-10
3	52	SB52B	DDT	5 20E-03	074	1 9	17	MG/KG			2 74E-09	3 06E-10
3	52	SB52B	LEAD	1 79E+01	30	200	1000	MG/KG			8 95E-08	1 79E-08
3	69	SB69B	BENZO(a)ANTHRACENE	1 40E-01	71	88	7 8	MG/KG			1 59E-07	1 79E-08
3	69	SB69B	BENZO(a)PYRENE	1 20E-01	96	088	78	MG/KG			1 36E-06	1 54E-07
3	69	SB69B	BENZO(b)FLUORANTHENE	1 60E-01	78	88	7 8	MG/KG			1 82E-07	2 05E-08
3	69	SB69B	BENZO(k)FLUORANTHENE	1 00E-01	78	8 8	78	MG/KG			1 14E-08	1 28E-09
3	69	SB69B	CHRYSENE	1 30E-01	94	88	780	MG/KG			1 48E-09	1 67E-10
3	51	SS51A	ARSENIC	1 70E+00	20	43	3 8	MG/KG			3 95E-06	4.47E-07

Appendix B.
COPC Screening from Screening Sites Sampling - Carcinogenic

BRAC Parcel	Screening Site	Station ID	Parameter	ConcSO	BkgdSO	ResSO	IndSO	Units	Risk Ratio ResSO Exceeded	Risk Ratio IndSO Exceeded	Risk Ratio ResSO All	Risk Ratio IndSO All
3	51	SS51A	DDE	2 20E-02	16	1.9	17	MG/KG			1 16E-08	1 29E-09
3	51	SS51A	DDT	4 30E-02	074	1.9	17	MG/KG			2 26E-08	2 53E-09
3	51	SS51A	DIELDRIN	2 10E-02	086	.04	36	MG/KG			5 25E-07	5 83E-08
3	51	SS51A	LEAD	2 80E+00	30	200	1000	MG/KG			1 40E-08	2 80E-09
3	51	SS51B	ARSENIC	1 74E+01	20	43	3 8	MG/KG			4 05E-05	4 58E-06
3	51	SS51B	BERYLLIUM	1 10E+00	1.1	15	1 3	MG/KG			7 33E-06	8 46E-07
3	51	SS51B	bis(2-ETHYLHEXYL) PHTHALATE	7 80E-02	NA	46	410	MG/KG			1 70E-09	1 90E-10
3	51	SS51B	DDE	1 00E-01	16	1 9	17	MG/KG			5 26E-08	5 88E-09
3	51	SS51B	DDT	7 70E-02	074	1 9	17	MG/KG	4 05E-08	4 53E-09	4 05E-08	4 53E-09
3	51	SS51B	DIELDRIN	3 20E-01	086	04	36	MG/KG	8 00E-06	8 89E-07	8 00E-06	8 89E-07
3	51	SS51B	LEAD	1 38E+02	30	200	1000	MG/KG	6 90E-07	1 38E-07	6 90E-07	1 38E-07
3	51	SS51B	METHYLENE CHLORIDE	3 00E-03	NA	85	760	MG/KG			3 53E-11	3 95E-12
3	51	SS51B	PENTACHLOROPHENOL	5 40E-02	NA	5.3	48	MG/KG			1 02E-08	1 13E-09
3	51	SS51B	TETRACHLOROETHYLENE (PCE)	3 00E-03	NA	NA	NA	MG/KG				
3	51	SS51C	ARSENIC	1 57E+01	20	43	3 8	MG/KG			3 65E-05	4 13E-06
3	51	SS51C	BENZO(a)ANTHRACENE	5 40E-02	71	88	7 8	MG/KG			6 14E-08	6 92E-09
3	51	SS51C	BENZO(a)PYRENE	5 70E-02	96	088	,78	MG/KG			6 48E-07	7 31E-08
3	51	SS51C	BENZO(b)FLUORANTHENE	5.20E-02	78	88	7 8	MG/KG			5 91E-08	6 67E-09
3	51	SS51C	BENZO(k)FLUORANTHENE	4 80E-02	78	8 8	78	MG/KG			5 45E-09	6 15E-10
3	51	SS51C	BERYLLIUM	2 70E-01	1 1	.15	1 3	MG/KG			1 80E-06	2 08E-07
3	51	SS51C	CADMIUM	4.70E-01	1 4	3 9	100	MG/KG			1 21E-07	4 70E-09
3	51	SS51C	CHRYSENE	7 40E-02	94	88	780	MG/KG			8 41E-10	9 49E-11
3	51	SS51C	DDE	3 90E-02	16	1 9	17	MG/KG			2 05E-08	2 29E-09
3	51	SS51C	DIELDRIN	1 40E-01	086	04	36	MG/KG	3 50E-06	3 89E-07	3 50E-06	3 89E-07
3	51	SS51C	LEAD	2 21E+01	30	200	1000	MG/KG			1 11E-07	2 21E-08
3	52	SS52A	ARSENIC	1 20E+01	20	43	3 8	MG/KG			2 79E-05	3 16E-06
3	52	SS52A	BERYLLIUM	3 90E-01	1 1	15	1 3	MG/KG			2.60E-06	3 00E-07
3	52	SS52A	CHRYSENE	4 60E-02	.94	88	780	MG/KG			5.23E-10	5 90E-11
3	52	SS52A	DDE	2 50E-02	16	1 9	17	MG/KG			1.32E-08	1 47E-09
3	52	SS52A	DDT	2 10E-01	074	1 9	17	MG/KG	1 11E-07	1 24E-08	1.11E-07	1 24E-08
3	52	SS52A	DIELDRIN	3 80E-02	086	04	36	MG/KG			9.50E-07	1 06E-07
3	52	SS52A	LEAD	1 85E+01	30	200	1000	MG/KG			9 25E-08	1 85E-08
3	52	SS52B	ARSENIC	4 51E+01	20	43	3 8	MG/KG	1 05E-04	1 19E-05	1 05E-04	1 19E-05
3	52	SS52B	BENZO(a)ANTHRACENE	2 40E-01	71	,88	7 8	MG/KG			2 73E-07	3 08E-08
3	52	SS52B	BENZO(a)PYRENE	2 60E-01	96	088	78	MG/KG			2 95E-06	3 33E-07
3	52	SS52B	BENZO(b)FLUORANTHENE	2 40E-01	78	88	7 8	MG/KG			2 73E-07	3 08E-08
3	52	SS52B	BENZO(k)FLUORANTHENE	2 00E-01	78	8 8	78	MG/KG			2 27E-08	2 56E-09
3	52	SS52B	CHRYSENE	2 60E-01	94	88	780	MG/KG			2 95E-09	3 33E-10
3	52	SS52B	DDT	6 70E+00	074	1 9	17	MG/KG	3 53E-06	3 94E-07	3 53E-06	3 94E-07
3	52	SS52B	DIELDRIN	7 50E-01	086	04	36	MG/KG	1 88E-05	2 08E-06	1 88E-05	2 08E-06
3	52	SS52B	LEAD	1 50E+02	30	200	1000	MG/KG	7 50E-07	1 50E-07	7 50E-07	1 50E-07
3	52	SS52C	ARSENIC	1 97E+01	20	43	3 8	MG/KG			4 58E-05	5 18E-06
3	52	SS52C	BENZO(a)ANTHRACENE	9 00E-02	71	88	7 8	MG/KG			1 02E-07	1 15E-08
3	52	SS52C	BENZO(a)PYRENE	5 80E-02	96	088	78	MG/KG			6 59E-07	7 44E-08

Appendix B.
COPC Screening from Screening Sites Sampling - Carcinogenic

BRAC Parcel	Screening Site	Station ID	Parameter	ConcSO	BkgdSO	ResSO	IndSO	Units	Risk Ratio ResSO Exceeded	Risk Ratio IndSO Exceeded	Risk Ratio ResSO All	Risk Ratio IndSO All
3	52	SS52C	BENZO(b)FLUORANTHENE	7 80E-02	78	88	7 8	MG/KG			8 86E-08	1 00E-08
3	52	SS52C	BENZO(k)FLUORANTHENE	6 40E-02	.78	8 8	78	MG/KG			7 27E-09	8 21E-10
3	52	SS52C	CHRYSENE	6 60E-02	94	88	780	MG/KG			7 50E-10	8 46E-11
3	52	SS52C	DDE	3 00E-02	16	1.9	17	MG/KG			1 58E-08	1 76E-09
3	52	SS52C	DDT	7 30E-02	.074	1 9	17	MG/KG			3 84E-08	4 29E-09
3	52	SS52C	DIELDRIN	3 30E-02	.086	04	36	MG/KG			8 25E-07	9 17E-08
3	52	SS52C	LEAD	3 22E+01	30	200	1000	MG/KG	1 61E-07	3 22E-08	1 61E-07	3 22E-08
3	52	SS52D	ARSENIC	3 12E+01	20	43	3 8	MG/KG	7 26E-05	8 21E-06	7 26E-05	8 21E-06
3	52	SS52D	BENZO(a)ANTHRACENE	6 90E-02	71	88	7 8	MG/KG			7 84E-08	8 85E-09
3	52	SS52D	CHRYSENE	5.70E-02	.94	88	780	MG/KG			6 48E-10	7 31E-11
3	52	SS52D	DDE	6.40E-03	.16	1 9	17	MG/KG			3 37E-09	3 76E-10
3	52	SS52D	DDT	6 90E-03	074	1 9	17	MG/KG			3 63E-09	4 06E-10
3	52	SS52D	DIELDRIN	2 10E-02	086	.04	36	MG/KG			5 25E-07	5 83E-08
3	52	SS52D	LEAD	3 38E+01	30	200	1000	MG/KG	1 69E-07	3 38E-08	1 69E-07	3 38E-08
3	52	SS52E	ARSENIC	1 48E+01	20	43	3 8	MG/KG			3 44E-05	3 89E-06
3	52	SS52E	DDE	3 90E-02	16	1 9	17	MG/KG			2 05E-08	2 29E-09
3	52	SS52E	DDT	4 20E-02	.074	1 9	17	MG/KG			2 21E-08	2 47E-09
3	52	SS52E	LEAD	2 99E+01	30	200	1000	MG/KG			1.50E-07	2 99E-08
3	69	SS69A	ARSENIC	1 35E+01	20	43	3 8	MG/KG			3 14E-05	3 55E-06
3	69	SS69A	BERYLLIUM	4 50E-01	1 1	15	1 3	MG/KG			3 00E-06	3 46E-07
3	69	SS69A	DIELDRIN	4 20E-02	086	04	36	MG/KG			1 05E-06	1 17E-07
3	69	SS69A	LEAD	1 14E+01	30	200	1000	MG/KG			5 70E-08	1 14E-08
3	69	SS69B	BENZO(a)ANTHRACENE	1 00E-01	71	88	7 8	MG/KG			1 14E-07	1 28E-08
3	69	SS69B	BENZO(a)PYRENE	8 60E-02	96	.088	78	MG/KG			9 77E-07	1 10E-07
3	69	SS69B	BENZO(b)FLUORANTHENE	1 20E-01	78	88	7 8	MG/KG			1 36E-07	1 54E-08
3	69	SS69B	BENZO(k)FLUORANTHENE	7 10E-02	78	8 8	78	MG/KG			8 07E-09	9 10E-10
3	69	SS69B	INDENO(1,2,3-c,d)PYRENE	9 20E-02	7	88	7 8	MG/KG			1 05E-07	1 18E-08
3	69	SS69D	BENZO(a)ANTHRACENE	8 10E-02	.71	88	7.8	MG/KG			9 20E-08	1 04E-08
3	69	SS69D	BENZO(a)PYRENE	5 40E-02	96	088	.78	MG/KG			6 14E-07	6 92E-08
3	69	SS69D	BENZO(b)FLUORANTHENE	5 90E-02	78	88	7 8	MG/KG			6 70E-08	7 56E-09
3	69	SS69D	BENZO(k)FLUORANTHENE	5 00E-02	78	8 8	78	MG/KG			5 68E-09	6 41E-10
3	69	SS69D	CHRYSENE	6 90E-02	94	88	780	MG/KG			7.84E-10	8 85E-11

Appendix B.
COPC Screening from Screening Sites Sampling - Noncarcinogenic

BRAC Parcel	Screening Site	Station ID	Parameter	ConcSO	BkgdSO	ResSO	IndSO	Units	Risk Ratio ResSO Exceeded	Risk Ratio IndSO Exceeded	Risk Ratio ResSO All	Risk Ratio IndSO All
3	51	SB51A	ACETONE	6.00E-03	NA	780	20000	MG/KG			7 69E-06	3 00E-07
3	51	SB51A	BENZO(g,h,i)PERYLENE	2 50E-01	82	230	6100	MG/KG			1 09E-03	4 10E-05
3	51	SB51A	CHROMIUM	2 58E+01	24 8	39	1000	MG/KG	6 62E-01	2 58E-02	6 62E-01	2 58E-02
3	51	SB51A	COPPER	2 89E+01	33	310	8200	MG/KG			9 32E-02	3 52E-03
3	51	SB51A	FLUORANTHENE	4 50E-01	1 6	310	8200	MG/KG			1 45E-03	5 49E-05
3	51	SB51A	NICKEL	2 99E+01	30	160	4100	MG/KG			1 87E-01	7 29E-03
3	51	SB51A	PHENANTHRENE	2.30E-01	61	2300	61000	MG/KG			1 00E-04	3 77E-06
3	51	SB51A	PYRENE	2 10E-01	1 5	230	6100	MG/KG			9 13E-04	3 44E-05
3	51	SB51A	ZINC	1 46E+02	130	2300	61000	MG/KG	6 35E-02	2 39E-03	6 35E-02	2 39E-03
3	51	SB51B	ACENAPHTHENE	6 60E-02	NA	470	12000	MG/KG			1 40E-04	5 50E-06
3	51	SB51B	ANTHRACENE	6 60E-02	096	2300	61000	MG/KG			2 87E-05	1 08E-06
3	51	SB51B	BROMOMETHANE	2 00E-03	NA	11	290	MG/KG			1 82E-04	6 90E-06
3	51	SB51B	CHROMIUM	2 18E+01	24 8	39	1000	MG/KG			5 59E-01	2 18E-02
3	51	SB51B	COPPER	2 82E+01	33	310	8200	MG/KG			9 10E-02	3 44E-03
3	51	SB51B	FLUORANTHENE	1 00E-01	1.6	310	8200	MG/KG			3 23E-04	1 22E-05
3	51	SB51B	FLUORENE	7 80E-02	NA	310	8200	MG/KG			2 52E-04	9 51E-06
3	51	SB51B	NICKEL	2 78E+01	30	160	4100	MG/KG			1 74E-01	6.78E-03
3	51	SB51B	PHENANTHRENE	1 20E-01	61	2300	61000	MG/KG			5 22E-05	1 97E-06
3	51	SB51B	PYRENE	8 00E-02	1.5	230	6100	MG/KG			3 48E-04	1 31E-05
3	51	SB51B	ZINC	9 58E+01	130	2300	61000	MG/KG			4 17E-02	1 57E-03
3	51	SB51C	ACETONE	7 00E-03	NA	780	20000	MG/KG			8 97E-06	3 50E-07
3	51	SB51C	CHROMIUM	2 76E+01	24 8	39	1000	MG/KG	7 08E-01	2 76E-02	7 08E-01	2 76E-02
3	51	SB51C	COPPER	3 26E+01	33	310	8200	MG/KG			1 05E-01	3 98E-03
3	51	SB51C	NICKEL	5 76E+01	30	160	4100	MG/KG	3 60E-01	1 40E-02	3 60E-01	1 40E-02
3	51	SB51C	ZINC	1 27E+02	130	2300	61000	MG/KG			5 52E-02	2 08E-03
3	52	SB52A	CHROMIUM	1 26E+01	24 8	39	1000	MG/KG			3 23E-01	1 26E-02
3	52	SB52A	COPPER	1 20E+01	33	310	8200	MG/KG			3 87E-02	1 46E-03
3	52	SB52A	NICKEL	1 29E+01	30	160	4100	MG/KG			8 06E-02	3 15E-03
3	52	SB52A	ZINC	5 80E+01	130	2300	61000	MG/KG			2 52E-02	9 51E-04
3	52	SB52B	CHROMIUM	2 25E+01	24 8	39	1000	MG/KG			5 77E-01	2 25E-02
3	52	SB52B	COPPER	1 94E+01	33	310	8200	MG/KG			6 26E-02	2 37E-03
3	52	SB52B	NICKEL	2 41E+01	30	160	4100	MG/KG			1 51E-01	5 88E-03
3	52	SB52B	ZINC	7 57E+01	130	2300	61000	MG/KG			3 29E-02	1 24E-03
3	69	SB69A	FLUORANTHENE	7 30E-02	1 6	310	8200	MG/KG			2 35E-04	8 90E-06
3	69	SB69B	FLUORANTHENE	1 90E-01	1 6	310	8200	MG/KG			6 13E-04	2 32E-05
3	69	SB69B	PHENANTHRENE	1 00E-01	.61	2300	61000	MG/KG			4 35E-05	1 64E-06
3	69	SB69B	PYRENE	1 60E-01	1 5	230	6100	MG/KG			6 96E-04	2 62E-05
3	51	SS51A	CHROMIUM	7.60E+00	24 8	39	1000	MG/KG			1 95E-01	7 60E-03
3	51	SS51A	COPPER	3 30E+00	33	310	8200	MG/KG			1 06E-02	4 02E-04
3	51	SS51A	NICKEL	3 90E+00	30	160	4100	MG/KG			2 44E-02	9 51E-04
3	51	SS51A	ZINC	1 08E+01	130	2300	61000	MG/KG			4 70E-03	1 77E-04
3	51	SS51B	ACETONE	4 00E-03	NA	780	20000	MG/KG			5 13E-06	2 00E-07
3	51	SS51B	CHROMIUM	2 94E+01	24 8	39	1000	MG/KG	7 54E-01	2 94E-02	7 54E-01	2 94E-02
3	51	SS51B	COPPER	3.72E+01	33	310	8200	MG/KG	1 20E-01	4 54E-03	1 20E-01	4.54E-03

Appendix B.
COPC Screening from Screening Sites Sampling - Noncarcinogenic

BRAC Parcel	Screening Site	Station ID	Parameter	ConcSO	BkgdSO	ResSO	IndSO	Units	Risk Ratio ResSO Exceeded	Risk Ratio IndSO Exceeded	Risk Ratio ResSO All	Risk Ratio IndSO All
3	51	SS51B	FLUORANTHENE	7 70E-02	1 6	310	8200	MG/KG			2 48E-04	9 39E-06
3	51	SS51B	NICKEL	3 49E+01	30	160	4100	MG/KG	2 18E-01	8 51E-03	2 18E-01	8.51E-03
3	51	SS51B	SELENIUM	2 10E+00	81	39	1000	MG/KG	5 38E-02	2 10E-03	5 38E-02	2 10E-03
3	51	SS51B	ZINC	1 42E+02	130	2300	61000	MG/KG	6 17E-02	2 33E-03	6 17E-02	2 33E-03
3	51	SS51C	ALUMINUM	8 94E+03	24000	7800	100000	MG/KG			1 15E+00	8 94E-02
3	51	SS51C	BARIUM	1 06E+02	234	550	14000	MG/KG			1 93E-01	7 57E-03
3	51	SS51C	BENZO(g,h,i)PERYLENE	5 00E-02	82	230	6100	MG/KG			2 17E-04	8 20E-06
3	51	SS51C	CALCIUM	1 92E+03	5840	NA	NA	MG/KG				
3	51	SS51C	CHROMIUM	1 13E+01	24 8	39	1000	MG/KG			2 90E-01	1 13E-02
3	51	SS51C	COBALT	8 20E+00	18 3	470	12000	MG/KG			1 74E-02	6 83E-04
3	51	SS51C	COPPER	1 60E+01	33	310	8200	MG/KG			5 16E-02	1 95E-03
3	51	SS51C	FLUORANTHENE	1 40E-01	1 6	310	8200	MG/KG			4 52E-04	1 71E-05
3	51	SS51C	IRON	1.60E+04	37000	2300	61000	MG/KG			6 96E+00	2 62E-01
3	51	SS51C	MAGNESIUM	1 71E+03	4600	NA	NA	MG/KG				
3	51	SS51C	MANGANESE	6 04E+02	1300	180	4700	MG/KG			3 36E+00	1 29E-01
3	51	SS51C	NICKEL	1 39E+01	30	160	4100	MG/KG			8 69E-02	3 39E-03
3	51	SS51C	PHENANTHRENE	6 60E-02	61	2300	61000	MG/KG			2 87E-05	1 08E-06
3	51	SS51C	POTASSIUM	1 09E+03	1820	NA	NA	MG/KG				
3	51	SS51C	PYRENE	1 20E-01	1 5	230	6100	MG/KG			5 22E-04	1 97E-05
3	51	SS51C	SODIUM	2 18E+02	NA	NA	NA	MG/KG				
3	51	SS51C	VANADIUM	2 11E+01	48 4	55	1400	MG/KG			3 84E-01	1 51E-02
3	51	SS51C	ZINC	5 81E+01	130	2300	61000	MG/KG			2 53E-02	9 52E-04
3	52	SS52A	ALUMINUM	1 09E+04	24000	7800	100000	MG/KG			1 40E+00	1 09E-01
3	52	SS52A	BARIUM	1.52E+02	234	550	14000	MG/KG			2 76E-01	1 09E-02
3	52	SS52A	CALCIUM	3 19E+03	5840	NA	NA	MG/KG				
3	52	SS52A	CHROMIUM	1 31E+01	24.8	39	1000	MG/KG			3 36E-01	1 31E-02
3	52	SS52A	COBALT	1 26E+01	18 3	470	12000	MG/KG			2 68E-02	1 05E-03
3	52	SS52A	COPPER	1 38E+01	33	310	8200	MG/KG			4 45E-02	1 68E-03
3	52	SS52A	IRON	1 54E+04	37000	2300	61000	MG/KG			6 70E+00	2 52E-01
3	52	SS52A	MAGNESIUM	1 65E+03	4600	NA	NA	MG/KG				
3	52	SS52A	MANGANESE	1 86E+03	1300	180	4700	MG/KG	1 03E+01	3 96E-01	1 03E+01	3 96E-01
3	52	SS52A	NICKEL	1 48E+01	30	160	4100	MG/KG			9 25E-02	3 61E-03
3	52	SS52A	POTASSIUM	9 01E+02	1820	NA	NA	MG/KG				
3	52	SS52A	PYRENE	5 50E-02	1.5	230	6100	MG/KG			2 39E-04	9 02E-06
3	52	SS52A	SELENIUM	5 80E-01	.81	39	1000	MG/KG			1.49E-02	5 80E-04
3	52	SS52A	VANADIUM	2 48E+01	48 4	55	1400	MG/KG			4 51E-01	1 77E-02
3	52	SS52A	ZINC	7.50E+01	130	2300	61000	MG/KG			3 26E-02	1 23E-03
3	52	SS52B	BENZO(g,h,i)PERYLENE	2 10E-01	82	230	6100	MG/KG			9.13E-04	3 44E-05
3	52	SS52B	CHROMIUM	4 03E+01	24.8	39	1000	MG/KG	1 03E+00	4 03E-02	1 03E+00	4 03E-02
3	52	SS52B	COPPER	3 05E+01	33	310	8200	MG/KG			9 84E-02	3 72E-03
3	52	SS52B	FLUORANTHENE	4 20E-01	1 6	310	8200	MG/KG			1 35E-03	5 12E-05
3	52	SS52B	NICKEL	3 18E+01	30	160	4100	MG/KG	1 99E-01	7 76E-03	1 99E-01	7 76E-03
3	52	SS52B	PHENANTHRENE	2 20E-01	61	2300	61000	MG/KG			9 57E-05	3 61E-06
3	52	SS52B	PYRENE	3 30E-01	1 5	230	6100	MG/KG			1 43E-03	5 41E-05

Appendix B.
COPC Screening from Screening Sites Sampling - Noncarcinogenic

BRAC Parcel	Screening Site	Station ID	Parameter	ConcSO	BkgdSO	ResSO	IndSO	Units	Risk Ratio ResSO Exceeded	Risk Ratio IndSO Exceeded	Risk Ratio ResSO All	Risk Ratio IndSO All
3	52	SS52B	ZINC	4 26E+02	130	2300	61000	MG/KG	1 85E-01	6 98E-03	1 85E-01	6 98E-03
3	52	SS52C	CHROMIUM	2 03E+01	24 8	39	1000	MG/KG			5 21E-01	2 03E-02
3	52	SS52C	COPPER	2 13E+01	33	310	8200	MG/KG			6 87E-02	2 60E-03
3	52	SS52C	FLUORANTHENE	9 40E-02	1 6	310	8200	MG/KG			3 03E-04	1 15E-05
3	52	SS52C	NICKEL	2 53E+01	30	160	4100	MG/KG			1 58E-01	6 17E-03
3	52	SS52C	PHENANTHRENE	7 50E-02	61	2300	61000	MG/KG			3.26E-05	1 23E-06
3	52	SS52C	PYRENE	8 40E-02	1.5	230	6100	MG/KG			3 65E-04	1 38E-05
3	52	SS52C	ZINC	8 53E+01	130	2300	61000	MG/KG			3 71E-02	1.40E-03
3	52	SS52D	CHROMIUM	1 75E+01	24 8	39	1000	MG/KG			4 49E-01	1 75E-02
3	52	SS52D	COPPER	1 93E+01	33	310	8200	MG/KG			6 23E-02	2 35E-03
3	52	SS52D	FLUORANTHENE	8 00E-02	1 6	310	8200	MG/KG			2 58E-04	9 76E-06
3	52	SS52D	NICKEL	2 63E+01	30	160	4100	MG/KG			1 64E-01	6 41E-03
3	52	SS52D	PHENANTHRENE	6.50E-02	61	2300	61000	MG/KG			2 83E-05	1 07E-06
3	52	SS52D	PYRENE	6 10E-02	1 5	230	6100	MG/KG			2 65E-04	1 00E-05
3	52	SS52D	ZINC	7.11E+01	130	2300	61000	MG/KG			3 09E-02	1 17E-03
3	52	SS52E	CHROMIUM	2 10E+01	24 8	39	1000	MG/KG			5 38E-01	2 10E-02
3	52	SS52E	COPPER	2.83E+01	33	310	8200	MG/KG			9 13E-02	3 45E-03
3	52	SS52E	NICKEL	2 49E+01	30	160	4100	MG/KG			1 56E-01	6 07E-03
3	52	SS52E	ZINC	9.13E+01	130	2300	61000	MG/KG			3 97E-02	1 50E-03
3	69	SS69A	ALUMINUM	1 15E+04	24000	7800	100000	MG/KG			1 47E+00	1 15E-01
3	69	SS69A	BARIUM	1 14E+02	234	550	14000	MG/KG			2 07E-01	8 14E-03
3	69	SS69A	CALCIUM	1 70E+03	5840	NA	NA	MG/KG				
3	69	SS69A	CHROMIUM	1 26E+01	24 8	39	1000	MG/KG			3 23E-01	1 26E-02
3	69	SS69A	COBALT	7 00E+00	18 3	470	12000	MG/KG			1 49E-02	5 83E-04
3	69	SS69A	COPPER	1 68E+01	33	310	8200	MG/KG			5 42E-02	2 05E-03
3	69	SS69A	IRON	1 97E+04	37000	2300	61000	MG/KG			8 57E+00	3 23E-01
3	69	SS69A	MAGNESIUM	2.14E+03	4600	NA	NA	MG/KG				
3	69	SS69A	MANGANESE	3 71E+02	1300	180	4700	MG/KG			2 06E+00	7 89E-02
3	69	SS69A	NICKEL	1 56E+01	30	160	4100	MG/KG			9 75E-02	3 80E-03
3	69	SS69A	POTASSIUM	1 19E+03	1820	NA	NA	MG/KG				
3	69	SS69A	VANADIUM	2 61E+01	48 4	55	1400	MG/KG			4 75E-01	1 86E-02
3	69	SS69A	ZINC	5 78E+01	130	2300	61000	MG/KG			2 51E-02	9 48E-04
3	69	SS69B	BENZO(g,h,i)PERYLENE	8 60E-02	82	230	6100	MG/KG			3 74E-04	1 41E-05
3	69	SS69B	FLUORANTHENE	2 10E-01	1 6	310	8200	MG/KG			6 77E-04	2 56E-05
3	69	SS69B	PHENANTHRENE	1 60E-01	.61	2300	61000	MG/KG			6 96E-05	2 62E-06
3	69	SS69B	PYRENE	1 60E-01	1 5	230	6100	MG/KG			6 96E-04	2 62E-05
3	69	SS69D	FLUORANTHENE	1 40E-01	1 6	310	8200	MG/KG			4 52E-04	1 71E-05
3	69	SS69D	PHENANTHRENE	9.80E-02	61	2300	61000	MG/KG			4 26E-05	1 61E-06
3	69	SS69D	PYRENE	1 20E-01	1 5	230	6100	MG/KG			5 22E-04	1 97E-05

TAB

Appendix C

Exposure Factor Assumptions and Dose Estimation Algorithms

Surface Area for Recreational Youth (Baseball player)

ages	Arms	Hands	Head	(cm^2)	
5<6	*	*	*		
6<7	1212	436	1212		
7<9	*	*	*		
9<10	1427	615	1392		
10<12	*	*	*		
12<13	2034	800	1298		
Average.	1557 7	617	1300.7		
Modified:	**778.8** (half)	**617**	**1300.7**	**2080**	for soils (1/2arms+head)

Surface Area for Recreational Children

ages	Arms	Hands	Legs	Feet	(cm^2)	
2<3	697	313	1371	418		
3<4	1036	437	1928	519		
4<5	1007	410	2000	525		
6<7	1212	436	2507	638		
Average	988	399	1951.5	525		
Modified	**494** (half)	**399**	**975.75** (half)	**525**	**2394**	for soils (1/2arms+hands+1/2legs+feet)

Surface Area for Recreational Adult Golfer

	Arms	Hands	Legs	(cm^2)	
Average	2190	793	4965		
Modified	**1095** (half)	**793**	**2482.5** (half)	**4371**	for soils (1/2arms+hands+1/2legs)

Surface Area for Residential Children

ages	Arms	Hands	Legs	Feet	(cm^2)	
2<3	697	313	1371	418		
3<4	1036	437	1928	519		
4<5	1007	410	2000	525		
6<7	1212	436	2507	638		
Average	988	399	1951 5	525		
Modified	**494** (half)	**399**	**975.75** (half)	**525**	**2394**	for soils (1/2arms+hands+1/2legs+feet)

Surface Area for Residential Adult

	Arms	Hands	Legs	Feet	(cm^2)	
Average	2190	793	4965	1048		
Modified	**1095** (half)	**793**	**2482.5** (half)	**1048**	**5419**	for soils (1/2arms+hands+1/2legs+feet)

Surface Area for Adult Worker

	Arms	Hands	Head	Feet	cm2	
Average	2190	793	1140	1048		
Modified·	**1095** (half)	**793**	**570** (half)	**1048**	**2458**	For soils (1/2arms+hands+1/2head)

Values from Florida SCTLs Guidance

CEHT 1997 = Center for Environmental & Human Toxicology, Technical Report Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-785, F A C , prepared for the Divison of Waste Management, FDEP, September 1997

Appendix C. Algorithms

Recreational Child (Playground) and Youth (Baseball Player)

Incidental Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

Dermal Absorption:

$$CDI = \frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$$

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Recreational Adult Golfer

Incidental Ingestion:

$$CDI = \frac{Cs * IRing * FI * EFDadj * CF}{BW * AT}$$

Dermal Absorption:

$$CDI = \frac{Cs * SA * AF * ABS * ET * EFDadj * CF}{BW * AT}$$

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EFDadj}{BW * AT}$$

Residential Child and Adult Worker

Incidental Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

Dermal Absorption:

$$CDI = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Residential Adult

Age-adjusted Carcinogenic Incidental Ingestion:

$$CDI = \frac{Cs * IRing\_adj * FI * EF * CF}{AT}$$

Non-carcinogenic Incidental Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

Dermal Absorption:

$$CDI = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Exposure Factors for Soil
DDMT, 1998

Symbols	Parameter	FUTURE RECEPTORS: Recreational Adult Golfer	Recreational Youth Baseball Player	Recreational Child	Residential Adult	Residential Child	Onsite Worker
	Soils						
BW	Body Weight (kg)[a,c]	70 [a]	30 [c]	15 [a]	70 [a]	15 [a]	70 [a]
AT_C	Averaging Time (days) - Carcinogenic[a]	70 x 365	70 x 365	70 x 365	70 x 365	n/a	70 x 365
AT_NC	Averaging Time (days) - Noncarcinogenic [a,c]	25 x 365 [a]	8 x 365 [a,c]	6 x 365 [a]	30 x 365 [a]	6 x 365 [a]	25 x 365 [a]
ET	Exposure Time (events/day) [b,o,p,q]	0 083 [b,o]	0 0625 [b,p]	0 167 [b,q]	n/a	n/a	n/a
EF	Exposure Frequency (events/year) [b,c,m]	n/a	20 [c]	64 [b,m]	350 [a]	350 [a]	250 [a]
ED	Exposure Duration (years) [a,c]	n/a	8 [c]	6 [a]	30 [a]	6 [a]	25 [a]
EFDadj	Time-adjusted Exposure Frequency (events over 30 years))[d]	4680 [d]	n/a	n/a	n/a	n/a	n/a
IRing	Incidental Ingestion Rate (mg/event) [a,b,n]	50 [b,n]	200 [a]	200 [a]	100 [a]	200 [a]	50 [a]
IRing_adj	Age-adjusted Ingestion Rate (mg-kg/event-year) [l]	n/a	n/a	n/a	114 29 [l]	n/a	n/a
FI	Fraction Ingested (unitless)	100%	100%	100%	100%	100%	100%
SA	Skin Surface Area (cm^2) [e,f,g]	4371 [e]	2080 [f]	2394 [g]	5419 [h]	2394 [g]	2458 [i]
AF	Soil-Skin Adherence Factor (mg/cm^2) [j]	1	1	1	1	1	1
ABS	Absorption Factor (unitless)	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific
IRinh	Inhalation Rate (m^3/event) [a,b,r,s,t]	1 67 [b,r]	1 25 [b,s]	2 5 [b,t]	20 [a]	15 [a]	20 [a]
PEF	Particulate Emission Factor (m^3/kg) [k]	1 32E+09	1 32E+09	1 32E+09	1 32E+09	1 32E+09	1 32E+09
VF	Volatilization Factor (m^3/kg)	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific

Notes

a U S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991
b Best professional judgement
c Exposure factors developed for a Youth Baseball Player per U S EPA memo, March 1997
d Golf activity over thirty years is assumed to be twice a week for twenty years, and five times a week for ten years, per best professional judgement This accumulates to 4680 days over thirty years (104 days/yr x 20 yrs) + (260 days/yr x 10 yrs)
e Surface area of hands, 1/2 arms and 1/2 legs of an adult, adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997
f Surface area of 1/2 arms and head of a recreational youth (age 5-13 years), adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997
g Surface area of hands, 1/2 arms, 1/2 legs and feet of a recreational child (age 1-6 years), adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997
h Surface area of hands, 1/2 arms, 1/2 legs and feet of an adult, adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997
i Surface area of hands, 1/2 arms and 1/2 head (face) of an adult worker, adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997
j U S EPA Dermal Exposure Assessment Principles and Application, January 1992
k Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance Technical Background Document, May 1996
l Age-adjusted ingestion rate for a residential adult, carcinogenic-pathway only
m A child is assumed to spend 2 days/week at the park for 8 months of the year (warmest season)
n A golfer is assumed to ingest 50 mg/kg of soil during the 2 hour golf outing at a 9-hole golf course
o Time spent outdoors playing golf per best professional judgement (2 hour event per 24 hour day)
p Time spent outdoors playing baseball per best professional judgement (1 5 hour event/24 hour day)
q Time spent outdoors for the recreational child, best professional judgement (4 hour event/24 hour day)
r Inhalation rate for the golfer is determined by 20 m^3/day divided by 24 hours/day, and multiplied by the 2 hours/event
s Inhalation rate for a baseball player is determined by 20 m^3/day divided by 24 hours/day, and multiplied by the 1 5 hours/event
t Inhalation rate for recreational child is determined by 15 m^3/day divided by 24 hours/day, and multiplied by the 4 hours/event

Chemical-specific factors

DDMT, 1998

Chemical Name	ABS	VFresidential
Arsenic	0 1% [a]	n/a
Chromium, total	0.1% [a]	n/a
Copper	0.1% [a]	n/a
Lead	0 1% [a]	n/a
Manganese	0 1% [a]	n/a
Nickel	0.1% [a]	n/a
DDE	3% [b]	n/a
DDT	3% [b]	n/a
Dieldrin	3% [b]	n/a
alpha-Chlordane	4% [b]	n/a
gamma-Chlordane	4% [b]	n/a
Benzo(a)anthracene	10% [b]	1.09E+07 [c]
Benzo(a)pyrene	10% [b]	2.96E+07 [c]
Benzo(b)fluoranthene	10% [b]	5 72E+06 [c]

[a] Absorption factors are derived from USEPA Region IV, Supplemental guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, November 1995.

[b] Absorption factors are derived from USEPA Region III, Technical Guidance Manual, Risk Assessment, Draft: Assessing Dermal Exposure from Soil, August 1995.

[c] Volatilization factors are derived from CEHT, Technical Report: Soil Cleanup Target Levels for FDEP, September 2, 1997

TAB

Appendix D

Research Information for Golfer and Baseball Player Scenarios

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
100 ALABAMA STREET, S.W.
ATLANTA, GEORGIA 30303-3104

4WD-OTS

MEMORANDUM

SUBJECT: Exposure Assumptions for Adults and Youths using the ball fields, Naval Ordinance Station Louisville, Louisville, KY

FROM: Ted W. Simon, Ph.D. D.A.B.T., Toxicologist
Office of Technical Services

TO: Patricia Goldberg, RPM
FFB/BRAC EPA Region 4

Dr. Al Westerman
Kentucky DEP

Ms. LeeAnn Sinagoga
Brown & Root Environmental

CC: Elmer W. Akin, Chief
Office of Technical Services

Kevin Shartzer, Vice President
Beechmont Youth Sports

The purpose of this memo is to state the exposure assumptions to be used in the upcoming risk assessment at NAVSURFWARCEN for continued use of the ball fields by Beechmont Youth Sports. Dioxin congeners were discovered in the surface and subsurface soil, and this memo is the result of discussions held at Louisville on March 12, 1997 and the meeting of the Restoration Advisory Board on the same evening.

I want to express my gratitude to Mr. Kevin Sharzter of Beechmont Youth Sports for discussing these exposure assumptions with me. His contribution will enable the risk assessment to use site-specific exposure assumptions rather than less preferable generic assumptions.

Receptors

In the spring, the fields are used for baseball, softball and t-ball. In the fall, the outfields of the baseball and softball fields are used for soccer. 900 children play baseball, softball or t-ball with Beechmont Youth Sports. Of these 900, about 50% also play soccer. Children between the ages of 5 and 13 play both sports, an 8 year time period. Children older than 13 do not play in Beechmont Youth Sports, choosing instead junior high or high school athletics. It was also assumed that an adult/coach would not remain active in Beechmont Youth Sports for no longer than 8 years. Hence, the Exposure Duration (ED) for all receptors was assumed to be 8 years.

Four receptors were chosen to represent different levels of exposure - a youth playing baseball only; (2) a youth playing baseball and soccer; (3) a youth playing both sports spending more time at the field because of a sibling on another team, car pools, etc.; and (4) an adult who mows the fields and coaches teams in both sports.

A trespasser was not chosen because the fields are in plain view of a guard and they are fenced and locked when not in use.

Pathways

The two exposure routes examined were incidental ingestion of soil and dermal contact with soil. Previous risk estimates indicated that inhalation exposure was insignificant compared with the dermal and oral routes, and hence, it was not included.

Exposure Assumptions for the four receptors

1) *A youth playing baseball only*

Baseball, softball or t-ball season occurs during 8 weeks in the spring from the middle to end of April until the end of June. Teams have 1 practice per week prior to the season and practice at other venues during the season. During the season, teams play two games per week on the fields. Practices and games are assumed to last 1.5 hours. Hence, there are 20 contact events per year. The number of contact events was assumed to be the exposure frequency (EF) in days/yr.

2) *A youth playing baseball and soccer*

Soccer season occupies for eight weeks during the fall from the end of August to the middle of November. There is 1 practice per week for a month prior to the season and 2 games per week once the season starts. Each game or practice is assumed to last 1.5 hours. Therefore, for this receptor, there would be 40 contact events per year, i.e. an EF of 40 days/yr.

3) *A youth playing both sports with a sibling playing both sports*

For the purposes of this assessment, a youth experiencing twice as many contact events was explored. This receptor is assumed to be a player whose sibling practices on alternate nights. Each child attends the other's practice and games because of car pooling, etc. Thus, for this receptor, there would be 80 contact events per year, i.e. an EF of 80 days/yr.

4) *An adult coach who also cuts the grass*

It was assumed that the adult coach would work with two baseball teams and two soccer teams. In addition, from April through June, there would be one additional contact event per week when this receptor would cut the grass. From June through September, the grass would grow more slowly and would need cutting only once a fortnight. From October through mid-November, the grass would be cut once a week. For this receptor, there would be 105 contact events per year. It was assumed that, at each of the contact events, this receptor would wear shorts and a short-sleeved shirt.

Exposure Assumptions			
IR_{Youth}	Soil Ingestion Rate (Youth)	200	mg/day (default)
IR_{Adult}	Soil Ingestion Rate (Adult)	100	mg/day (default)
ED	Exposure Duration	8	yrs
$EF_{Baseball}$	Exposure Frequency	20	d/yr
EF_{Soccer}	Exposure Frequency	20	d/yr
EF_{Coach}	Exposure Frequency	25	d/yr
BW_{Youth}	Body Weight	30	kg
BW_{Adult}	Body Weight	70	kg (default)
$SSA_{Baseball}$	Skin Surface Area (Baseball)	1800	cm^2
SSA_{Soccer}	Skin Surface Area (Soccer)	4800	cm^2
SSA_{Coach}	Skin Surface Area (Coach)	6340	cm^2
SAF	Skin Adherence Factor	1	mg/cm^2 (default)
ABS	Absorption Factor	0.01	(default)
AT	Averaging Time	2555	days

The body weight of the youth is the age adjusted weight at the 50th percentile for ages 5 to 13 considering both males and females.[1] The body weight of the adult is the standard default. The skin surface area of the youth is the age adjusted value at the 50th percentile for ages 5-13.[2] Baseball/softball/t-ball players were assumed to have their arms and heads exposed. Soccer players were assumed to have their arms, heads and legs exposed. Tables from which these values were derived are attached.

[1]Burmaster DE, Lloyd KJ, Crouch EAC (1994) Lognormal distributions of body weight as a function of age for female and male children in the United States. cited in EPA's Draft Exposure Factors Handbook, NCEA-W-005, May 1995

[2]Draft Exposure Factors Handbook, NCEA-W-005, May 1995

Dioxin Slope Factors

The various congeners of dioxin should be multiplied by the Toxicity Equivalency Factors (TEFs) to arrive at an equivalent concentration of 2,3,7,8-tetrachlorodibenzodioxin (TCDD).[3] This equivalent concentration is referred to as "TEQs" or toxic equivalents. A table of TEFs for the various dioxin congeners is attached. The oral cancer slope factor (CSF_{Oral}) for TCDD is 1.5E+05 per (mg/kg-day), and the dermal cancer slope factor (CSF_{Dermal}) is 3.0E+05 per (mg/kg-day).

Uncertainties in the Exposure Assessment

The equations on the following page should provide a guide to those conducting risk assessments at the ball fields at NAVSURFWARCEN, Louisville. With the site-specific exposure assumptions provided, this assessment is tailored to the current receptors. Where site-specific values were not available, values were assumed that would tend to be protective of human health.

Uncertainties regarding the toxicity of chlorinated dioxins and furans

The values of the cancer slope factors for dioxin were obtained from animal studies and extrapolated to man. There is considerable uncertainty acknowledged by EPA regarding carcinogenic effects of dioxin for dioxin in soils. EPA classifies dioxin as a probable human carcinogen. However health data about low levels of exposure, similar to that experienced by contact with soil containing 1-50 parts per billion TEQ, are very limited.[4]

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[3]Estimating Exposure to Dioxin-Like Compounds, Volume I, Executive Summary, Review Draft, EPA/600/6-88/005Ca

[4]Health Assessment Document for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and related compounds. Review Draft EPA/600/8P-92/001c

Risk Calculation Equations

- A Incidental soil ingestion for the youth baseball player
- B Incidental soil ingestion for the youth soccer player
- C Dermal contact with soil, youth baseball player
- D Dermal contact with soil, youth soccer player
- E Incidental soil ingestion, adult coach
- F Incidental soil ingestion, adult coach during grass mowing
- G Dermal contact with soil, adult coach
- H Dermal contact with soil, adult coach during grass mowing

$$A = EF_{Baseball} \times ED \times CSF_{Oral} \times IR_{Youth}$$

$$B = EF_{Soccer} \times ED \times CSF_{Oral} \times IR_{Youth}$$

$$C = EF_{Baseball} \times ED \times CSF_{Dermal} \times SSA_{Baseball} \times SAF \times ABS$$

$$D = EF_{Soccer} \times ED \times CSF_{Dermal} \times SSA_{Soccer} \times SAF \times ABS$$

$$E = (EF_{Baseball} + EF_{Soccer}) \times ED \times CSF_{Oral} \times IR_{Adult}$$

$$F = EF_{Mowing} \times ED \times CSF_{Oral} \times IR_{Adult}$$

$$G = (EF_{Baseball} + EF_{Soccer}) \times ED \times CSF_{Dermal} \times SSA_{Coach} \times SAF \times ABS$$

$$H = EF_{Mowing} \times ED \times CSF_{Dermal} \times SSA_{Coach} \times SAF \times ABS$$

Receptor 1: $$Risk = \frac{C_{Soil} \times 10^{-6}\frac{kg}{mg} \times [A + C]}{BW_{Youth} \times AT}$$

Receptor 2: $$Risk = \frac{C_{Soil} \times 10^{-6}\frac{kg}{mg} \times [A + B + C + D]}{BW_{Youth} \times AT}$$

Receptor 3: $$Risk = \frac{C_{Soil} \times 10^{-6}\frac{kg}{mg} \times 2 \times [A + B + C + D]}{BW_{Youth} \times AT}$$

Receptor 4: $$Risk = \frac{C_{Soil} \times 10^{-6}\frac{kg}{mg} \times [E + F + G + H]}{BW_{Adult} \times AT}$$

Please let me know if you need any further help.

Attachments (4):

1. Letter from Mr. Kevin Shartzer of Beechmont Youth Sports regarding the exposure assumptions.
2. 3 Tables (4-6, 4-7 and 4-8) showing total body surface area of children and percentage by part
3. 4 Tables (5-5, 5-7, 5-8, 5-9) showing body weight for children 5 to 13 years
4. Table of Toxic Equivalency Factors for CDDs and CDFs

T.W. Simon/tws:4WD-OTS:28642/03/18/97/A:\DISK1\MAR97\NOS L_BF.EXP

BEECHMONT YOUTH SPORTS
LOUISVILLE, KY

March 18, 1997

Mr. Ted Simon
Region 4 E.P.A.
Atlanta, GA
(PH) 404 562-8642
(FX) 404 562-8566

Dear Ted:

The purpose of this memo is to confirm our conversation of yesterday morning concerning exposure of children to the Beechmont ball fields.

1. Beechmont operates summer sports programs (baseball/softball/T-ball) which run for approximately eight weeks; the season consists of two games per week (time limit of 1.5 hours per game on the average). Practice time at the fields consists of one hour per week for approximately one month prior to the start of the season. Once the season begins, field time is not available for practice.

2. Beechmont operates a fall soccer program which runs for approximately eight weeks; the season consists of two games per week (time limit of one hour per game on the average). Practice time at the fields consists of one hour per week for approximately one month prior to the start of the season. Once the season begins, field time is not available for practice.

3. Percentage of "repeat" (players which participate in both the summer programs and the fall soccer program) is approximately 50%.

4. Children spend additional time at the facility to attend sibling's activities; this amounts to approximately two hours per week.

5. Beechmont cuts the grass at the facility an average of one time per week from the months of April through November (less than once per week during hot summer months).

6. The facility is locked when games or practices are not in session. That is, the facility is not open to the general public as a "park". From the months of December through March, children are not on the premises.

Please advise if additional information would be beneficial. Thank you for your attention to this matter.

Sincerely,

BEECHMONT YOUTH SPORTS

Kevin Shartzer

Kevin Shartzer

Table 5-6. Weight in Kilograms for Males 6 Months-19 Years of Age--Number Examined, Mean, Standard Deviation, and Selected Percentiles, by Sex and Age: United States, 1976-1980[a]

Sex and Age	Number of Examined Persons	Mean	Standard Deviation	Percentile 5th	10th	15th	25th	35th	50th	65th	75th	85th
Male												
6-11 Months	179	9.4	1.3	7.5	7.6	8.2	8.6	9.4	10.1	10.7	10.9	11.4
1 years	378	11.6	1.9	9.6	10.0	10.3	10.8	11.7	12.6	13.1	13.6	14.4
2 years	373	13.6	1.7	11.1	11.6	11.8	12.6	13.5	14.5	15.2	15.8	16.5
3 years	416	15.7	2.0	12.9	13.5	13.9	14.4	15.4	16.8	17.4	17.9	19.1
4 years	404	17.8	2.5	14.1	15.0	15.3	16.0	17.6	19.0	19.9	20.9	22.2
5 years	397	19.8	3.0	16.0	16.8	17.1	17.7	19.4	21.3	22.9	23.7	25.4
6 years	333	23.0	4.0	18.6	19.2	19.8	20.3	22.0	24.1	26.4	28.3	30.1
7 years	148	25.1	3.9	19.7	20.8	21.2	22.2	24.8	26.9	28.2	29.6	33.9
8 years	147	28.2	6.2	20.4	21.7	23.6	24.6	27.5	29.9	33.0	35.5	39.1
9 years	145	31.1	6.3	24.0	25.6	26.0	27.1	30.2	33.0	35.4	38.6	43.1
10 years	157	36.4	7.7	27.2	28.2	29.6	31.4	34.8	39.2	43.5	46.3	53.4
11 years	155	40.3	10.1	26.6	28.8	31.8	33.5	37.3	46.4	52.0	57.0	61.0
12 years	145	44.2	10.1	30.7	32.5	35.4	37.8	42.3	48.6	52.6	58.9	67.3
13 years	173	49.9	12.3	35.4	37.0	38.3	40.1	48.4	56.3	59.8	64.2	69.9
14 years	166	57.1	11.0	41.0	44.5	46.4	49.8	56.4	63.3	66.1	68.9	77.0
15 years	184	61.0	11.0	46.2	49.1	50.6	54.2	60.1	64.9	68.7	72.8	81.3
16 years	178	67.1	12.4	51.4	54.3	56.1	58.7	64.4	73.6	78.1	82.2	91.2
17 years	173	66.7	11.5	50.7	53.4	54.8	578.7	65.8	72.0	76.8	82.3	88.9
18 years	164	71.1	12.7	54.1	56.6	60.3	61.9	70.4	76.6	80.0	83.5	95.3
19 years	148	71.7	11.6	55.9	57.9	60.5	63.8	69.5	77.9	84.3	86.8	92.1

[a] Includes clothing weight, estimated as ranging from 0.09 to 0.28 kilogram.

Source: National Center for Health Statistics, 1987.

Table 5-7. Weight in Kilograms for Females 6 Months-19 Years of Age--Number Examined, Mean, Standard Deviation, and Selected Percentiles, by Sex and Age: United States, 1976-1980*

Sex and Age	Number of Examined Persons	Mean	Standard Deviation	Percentile								
				5th	10th	15th	25th	50th	75th	85th	90th	95th
Female												
6-11 Months	177	8.8	1.2	6.6	7.3	7.5	7.9	8.9	9.4	10.1	10.4	10.9
1 years	336	10.8	1.4	8.8	9.1	9.4	9.9	10.7	11.7	12.4	12.7	13.4
2 years	336	13.0	1.5	10.8	11.2	11.6	12.0	12.7	13.8	14.5	14.9	15.9
3 years	366	14.9	2.1	11.7	12.3	12.9	13.4	14.7	16.1	17.0	17.4	18.4
4 years	396	17.0	2.4	13.7	14.3	14.5	15.2	16.7	18.4	19.3	20.2	21.1
5 years	364	19.6	3.3	15.3	16.1	16.7	17.2	19.0	21.2	22.8	24.7	26.6
6 years	135	22.1	4.0	17.0	17.8	18.6	19.3	21.3	23.8	26.6	28.9	29.6
7 years	157	24.7	5.0	19.2	19.5	19.8	21.4	23.8	27.1	28.7	30.3	34.0
8 years	123	27.9	5.7	21.4	22.3	23.3	24.4	27.5	30.2	31.3	33.2	36.3
9 years	149	31.9	8.4	22.9	25.0	25.8	27.0	29.7	33.6	39.3	43.3	48.4
10 years	136	36.1	8.0	25.7	27.5	29.0	31.0	34.5	39.5	44.2	45.8	49.6
11 years	140	41.8	10.9	29.8	30.3	31.3	33.9	40.3	45.8	51.0	56.6	60.0
12 years	147	46.4	10.1	32.3	35.0	36.7	39.1	43.4	52.6	58.0	60.5	64.3
13 years	162	50.9	11.8	35.4	39.0	40.3	44.1	49.6	55.2	60.9	66.4	78.3
14 years	178	54.8	11.1	40.3	42.8	43.7	47.4	53.1	60.3	65.7	67.6	75.2
15 years	143	55.1	9.8	44.0	45.1	46.5	48.2	53.3	59.6	62.2	63.5	76.6
16 years	170	58.1	10.1	44.1	47.3	48.9	51.3	55.6	62.5	68.9	73.3	76.8
17 years	134	59.6	11.4	44.5	48.9	50.5	52.2	58.4	63.4	68.4	71.6	81.8
18 years	170	59.0	11.1	45.3	49.5	50.8	52.8	56.4	63.0	66.0	70.1	78.0
19 years	158	60.2	11.0	48.5	49.7	51.7	53.9	57.1	64.4	70.7	74.8	78.1

* Includes clothing weight, estimated as ranging from 0.09 to 0.28 kilogram.

Source: National Center for Health Statistics, 1987.

Table 5-8. Statistics for Probability Plot Regression Analyses; Female's Body Weights 6 Months to 20 Years of Age

Lognormal Probability Plots		
	Linear Curve	
Age	μ_2[a]	σ_2[a]
6 months to 1	2.16	0.145
1 to 2	2.38	0.128
2 to 3	2.56	0.112
3 to 4	2.69	0.137
4 to 5	2.83	0.133
5 to 6	2.98	0.163
6 to 7	3.10	0.174
7 to 8	3.19	0.174
8 to 9	3.31	0.156
9 to 10	3.46	0.214
10 to 11	3.57	0.199
11 to 12	3.71	0.226
12 to 13	3.82	0.213
13 to 14	3.92	0.216
14 to 15	3.99	0.187
15 to 16	4.00	0.156
16 to 17	4.06	0.167
17 to 18	4.08	0.165
18 to 19	4.07	0.147
19 to 20	4.10	0.149

[a] μ_2, σ_2 - correspond to the mean and standard deviation, respectively, of the lognormal distribution.

Source: Burmaster et al., 1994.

Table 5-9. Statistics for Probability Plot Regression Analyses; Male's Body Weights 6 Months to 20 Years of Age

	Lognormal Probability Plots	
	Linear Curve	
Age	μ_2[a]	σ_2[a]
6 months to 1	2.23	0.132
1 to 2	2.46	0.119
2 to 3	2.60	0.120
3 to 4	2.75	0.114
4 to 5	2.87	0.133
5 to 6	2.99	0.138
6 to 7	3.13	0.145
7 to 8	3.21	0.151
8 to 9	3.33	0.181
9 to 10	3.43	0.165
10 to 11	3.59	0.195
11 to 12	3.69	0.252
12 to 13	3.78	0.224
13 to 14	3.88	0.215
14 to 15	4.02	0.181
15 to 16	4.09	0.159
16 to 17	4.20	0.168
17 to 18	4.19	0.167
18 to 19	4.25	0.159
19 to 20	4.26	0.154

[a] μ_2, σ_2 - correspond to the mean and standard deviation, respectively, of the lognormal distribution.

Source: Burmaster et al., 1994.

Table 4-6. Total Body Surface Area of Male Children (; Square Meters[a]

Age (yr)[b]	Percentile								
	5	10	15	25	50	75	85	90	95
2 < 3	0.527	0.544	0.552	0.569	0.603	0.629	0.643	0.661	0.682
3 < 4	0.585	0.606	0.620	0.636	0.664	0.700	0.719	0.729	0.764
4 < 5	0.633	0.658	0.673	0.689	0.731	0.771	0.796	0.809	0.845
5 < 6	0.692	0.721	0.732	0.746	0.793	0.840	0.864	0.895	0.918
6 < 7	0.757	0.788	0.809	0.821	0.866	0.915	0.957	1.01	1.06
7 < 8	0.794	0.832	0.848	0.877	0.936	0.993	1.01	1.06	1.11
8 < 9	0.836	0.897	0.914	0.952	1.00	1.06	1.12	1.17	1.24
9 < 10	0.932	0.966	0.988	1.00	1.07	1.13	1.16	1.25	1.29
10 < 11	1.01	1.04	1.06	1.10	1.18	1.28	1.35	1.40	1.48
11 < 12	1.00	1.06	1.12	1.16	1.23	1.40	1.47	1.53	1.60
12 < 13	1.11	1.13	1.20	1.25	1.34	1.47	1.52	1.62	1.76
13 < 14	1.20	1.24	1.27	1.30	1.47	1.62	1.67	1.75	1.81
14 < 15	1.33	1.39	1.45	1.51	1.61	1.73	1.78	1.84	1.91
15 < 16	1.45	1.49	1.52	1.60	1.70	1.79	1.84	1.90	2.02
16 < 17	1.55	1.59	1.61	1.66	1.76	1.87	1.98	2.03	2.16
17 < 18	1.54	1.56	1.62	1.69	1.80	1.91	1.96	2.03	2.09
3 < 6	0.616	0.636	0.649	0.673	0.728	0.785	0.817	0.842	0.876
6 < 9	0.787	0.814	0.834	0.866	0.931	1.01	1.05	1.09	1.14
9 < 12	0.972	1.00	1.02	1.07	1.16	1.28	1.36	1.42	1.52
12 < 15	1.19	1.24	1.27	1.32	1.49	1.64	1.73	1.77	1.85
15 < 18	1.50	1.55	1.59	1.65	1.75	1.86	1.94	2.01	2.11

a Lack of height measurements for children <2 years in NHANES II precluded calculation of surface areas for this age group.
b Estimated values calculated using NHANES II data.

Source: U.S. EPA, 1985.

Table 4-7. Total Body Surface Area of Female Children in Square Meters[a]

Age (yr)[b]	Percentile								
	5	10	15	25	50	75	85	90	95
2 < 3	0.516	0.532	0.544	0.557	0.579	0.610	0.623	0.637	0.653
3 < 4	0.555	0.570	0.589	0.607	0.649	0.688	0.707	0.721	0.737
4 < 5	0.627	0.639	0.649	0.666	0.706	0.758	0.777	0.791	0.820
5 < 6	0.675	0.700	0.714	0.735	0.779	0.830	0.870	0.902	0.952
6 < 7	0.725	0.748	0.770	0.791	0.843	0.914	0.961	0.989	1.03
7 < 8	0.792	0.808	0.819	0.854	0.917	0.977	1.02	1.06	1.13
8 < 9	0.863	0.888	0.913	0.932	1.00	1.05	1.08	1.11	1.18
9 < 10	0.897	0.948	0.969	1.01	1.06	1.14	1.22	1.31	1.41
10 < 11	0.961	1.01	1.05	1.10	1.17	1.29	1.34	1.37	1.43
11 < 12	1.06	1.09	1.12	1.16	1.30	1.40	1.50	1.56	1.62
12 < 13	1.13	1.19	1.24	1.27	1.40	1.51	1.62	1.64	1.70
3 < 14	1.21	1.28	1.32	1.38	1.48	1.59	1.67	1.75	1.86
14 < 15	1.31	1.34	1.39	1.45	1.55	1.66	1.74	1.76	1.88
15 < 16	1.38	1.49	1.43	1.47	1.57	1.67	1.72	1.76	1.83
16 < 17	1.40	1.46	1.48	1.53	1.60	1.69	1.79	1.84	1.91
17 < 18	1.42	1.49	1.51	1.56	1.63	1.73	1.80	1.84	1.94
3 < 6	0.585	0.610	0.630	0.654	0.711	0.770	0.808	0.831	0.879
6 < 9	0.754	0.790	0.806	0.845	0.919	1.00	1.04	1.07	1.13
9 < 12	0.957	0.990	1.03	1.06	1.16	1.31	1.38	1.43	1.56
12 < 15	1.21	1.27	1.30	1.37	1.48	1.61	1.68	1.74	1.82
15 < 18	1.40	1.44	1.47	1.51	1.60	1.70	1.76	1.82	1.92

[a] Lack of height measurements for children <2 years in NHANES II precluded calculation of surface areas for this age group.
[b] Estimated values calculated using NHANES II data.

Source: U.S. EPA, 1985.

Table 4-8. Percentage of Total Body Surface Area by Part for Children

		Percent of Total											
		Head		Trunk		Arms		Hands		Legs		Feet	
Age (yr)	N M:F	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
< 1	2:0	18.2	18.2-18.5	35.7	34.6-36.6	13.7	12.4-15.1	5.3	5.21-5.39	20.6	18.2-22.9	6.54	6.49-6.59
1 < 2	1:1	16.5	16.5-16.5	35.5	34.5-36.6	13.0	12.8-13.1	5.68	5.57-5.78	23.1	21.1-24.8	6.27	5.84-6.70
2 < 3	1:0	14.2		36.5		11.8		5.30		23.2		7.07	
3 < 4	0:5	13.6	13.3-14.0	31.9	29.9-33.8	14.4	14.2-14.7	6.07	5.83-6.32	26.8	26.0-28.6	7.21	6.80-7.68
4 < 5	1:3	13.0	12.1-15.3	31.5	30.5-31.4	14.0	13.0-15.5	5.70	5.51-6.62	27.0	26.0-29.3	7.29	6.91-8.10
5 < 6													
6 < 7	1:0	13.1		33.1		13.1		4.71		27.1		6.90	
7 < 8													
8 < 9													
9 < 10	0:2	12.0	11.6-12.5	34.2	33.4-34.9	12.3	11.7-12.8	5.10	5.11-5.44	28.7	28.5-28.8	7.38	7.29-7.77
10 < 11													
11 < 12													
12 < 13	1:0	8.74		34.7		13.7		5.39		30.5		7.00	
13 < 14	1:0	9.97		32.7		12.1		5.11		32.0		8.02	
14 < 15													
15 < 16													
16 < 17	1:0	7.96		32.7		13.1		5.68		33.6		6.93	
17 < 19	1:0	7.58		31.7		17.5		5.13		30.8		7.28	

N: Number of subjects, male to female ratio.

Source: U.S. EPA 1985.

MEMORANDUM CH2MHILL

Inquiries on Typical Golfers

TO: Jeff Cox
PGA Section President
Germantown Country Club

FROM: Elizabeth Garland/ CH2M HILL Environmental Scientist

DATE: April 14, 1998

PLEASE RESPOND BY: Wednesday, April 15, 1998

I received your name and number from the Tournament Players Club (Kathy in Communications – PGA Tour). I am a human health risk assessor with the engineering consulting firm, CH2M HILL. I am developing a golfer exposure scenario for a federal client in Tennessee. An exposure scenario evaluates the type of activities and exposure to contaminants in a particular setting.

I would appreciate if you would be able to assist me with some information regarding typical golfers in the Tennessee area. Answers to the following questions will help develop a golfer exposure scenario for my risk assessment report:

- What is the average age/gender of a golfer?
- What type of clothing does the average golfer wear year-round?
- How long is the average golf game?
- How many games on average does a golfer play per week?
- What is the typical age range for golfers?
- For how many years does a typical golfer play?

Thank you for your help and any information you may be able to offer at this time. I can be reached at the office today, as well as on Wednesday, April 15, 1998 at (352) 335-7991, ext. 295. Please call if you have any questions regarding this memo.

CH2MHILL

TELEPHONE CONVERSATION RECORD

Call To:	TPC (Tournament Players Club)		Kathy - Communications - PGA tour
Phone No.:	1-904-273-3244	**Date:**	April 14, 1998
Call From:	Elizabeth Garland	**Time:**	01:30 PM
Message Taken By:	Betsey Garland		
Subject:	Inquiries on typical golfers/ golf courses		

Kathy was not able to provide any direct information, but was helpful in suggesting the NGF (National Golf Foundation) at 1-561-744-6006 for statistical information, and the PGA – section president for the Tennessee area, Jeff Cox, at the Germantown Country Club at 1-901-754-6453.

CH2MHILL

TELEPHONE CONVERSATION RECORD

Call To: PGA National - Mark

Phone No.: 1-800-832-6235 **Date:** April 14, 1998

Call From: Elizabeth Garland **Time:** 01:10 PM

Message Taken By: Betsey Garland

Subject: Inquiries on typical golfers

An employee of the PGA National, located in Palm Beach Gardens, Florida, was kind enough to give me some information from his experiences at the 5 courses located there.

A typical golf game can last from 4 to 5 hours. Your average golfer can play 2 to 5 games a week, year round. The maximum here will represent a retiree who will play more frequently. The average gender and age of a golfer can range from men/women in their 20's - 60's. The average duration a golfer will play can be anywhere from 10 to 30 years.

Typical clothing of a golfer was agreed to be shorts, short sleeve shirts, socks, shoes and hats. Golfers will be sticky from sweat and sunscreen lotions, will get dirty from playing/walking, and have been known to put golf balls and tees into their mouths.

Mark referred me to the TPC (Tournamnet Players Club) at Ponte Vedra, Florida for further information regarding golfers and golf courses located within Tennesse.

CH2MHILL

TELEPHONE CONVERSATION RECORD

Call To:	Germantown Country Club, TN -Gene		
Phone No.:	1-901-754-6453	**Date:**	April 16, 1998
Call From:	Elizabeth Garland	**Time:**	11:00 AM
Message Taken By:	Betsey Garland		
Subject:	Inquiries on golfer scenario		

An employee of the Germantown Country Club, Gene, was able to answer my questions which had been faxed to Jeff Cox recently. They are listed below:

- What is the average age/gender of a golfer? In the 50's; usually male
- What type of clothing does the average golfer wear year-round? Shorts, short sleeve shirts, socks, shoes, hats
- How long is the average golf game? 4 to 4 ½ hours per game
- How many games on average does a golfer play per week? 2 times a week; 5 times for retirees, but this is a minority at their course, not a majority
- What is the typical age range for golfers? 30-50, mostly in their 50's
- For how many years does a typical golfer play? 30 years
- How many months does the golf course operate during the year? Open 12 months

Gene informed me that Germantown is located east of Memphis, TN.

CH2MHILL

TELEPHONE CONVERSATION RECORD

Call To:	NGF (National Golfers Foundation)		Trish Davis
Phone No.:	1-561-744-6006	**Date:**	April 14, 1998
Call From:	Elizabeth Garland	**Time:**	01:40 PM
Message Taken By:	Betsey Garland		
Subject:	Inquiries on typical golfers/ statitical information		

Trish Davis was helpful in informing me of the statitical package that NGF offers that has regional information on the types of golfers, the average games, demographics of the golfers, etc. etc.

This package is available for the price of $250 for non-members, and can be sent to us directly.

I thanked her for her time and let her know that I would need approval from a supervisor in order to request the package.

TAB

Appendix E

Dose, Risk, and Hazard Index Calculations

Soil - Hypothetical Future Golfer Exposure Scenario
DDMT Report, 1998

Ingestion:

$$CDI = \frac{Cs * IRing * FI * EFDadj * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	RME	RME
IRing =	Ingestion Rate (mg/event)	50 a	50 a
FI =	Fraction Ingested (unitless)	100%	100%
EFDadj =	Time-adjusted Exposure Frequency (events, for 30 years)	4680 b	4680 b
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	9125 c

Dermal:

$$CDI = \frac{Cs * SA * AF * ABS * ET * EFDadj * CF}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	
SA =	Surface Area (cm^2/event)	4371 d	4371 d
AF =	Soil-Skin Adherence Factor (mg/cm^2)	1 e	1 e
ABS =	Absorption Factor (unitless)	(Chemical Specific) f	(Chemical Specific) f
ET =	Exposure Time (event/day)	0 083 g	0 083 g
EFDadj =	Time-adjusted Exposure Frequency (events, for 30 years)	4680 b	4680 b
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	9125 c

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EFDadj}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
PEF =	Particulate Emission Factor (m^3/kg)	1 32E+09 h	1 32E+09 h
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific) i	(Chemical Specific) i
IRinh =	Inhalation Rate (m^3/event)	1 67 j	1 67 j
EFDadj =	Time-adjusted Exposure Frequency (events, for 30 years)	4680 b	4680 b
BW =	Body Weight (kg)	70 c	70 c
AT =	Averaging Time (days)	25550 c	9125 c

References:

a = Best professional judgement based on a golfer's behavior, soil intake is assumed to 50 mg for a 2 hour golfing event

b = Golf activity over thirty years is assumed to be twice a week for twenty years, and five times a week for ten years, per best professional judgement This accumulates to 4680 days over thirty years
EFDadj = (104 days/yr x 20 yrs) + (260 days/yr x 10 yrs) = 4680 days

c = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors" OSWER Directive 9285 6-03, March 25, 1991.

d = Surface area of hands, 1/2 arms and 1/2 legs of an adult, adapted from CEHT, Technical Report. Soil Cleanup Target Levels, for FDEP, September 2, 1997

e = U S. EPA Dermal Exposure Assessment Principles and Application, January 1992.

f = Chemical-specific absorption factors are found in Appendix C.

g = Time spent outdoors playing golf per best professional judgement (2 hour event per 24 hour day).

h = Particulate emission factor (PEF), adapted from U S.EPA, Soil Screening Guidance. Technical Background Document, May 1996

i = Chemical-specific volatilization factors are found in Appendix C.

j = Inhalation rate is determined by 20 m^3/day divided by 24 hours/day, and multiplied by the 2 hours/event

Soil - Hypothetical Future Golfer Carcinogenic Scenario
DDMT Report, 1996

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFi**	**RME**	**ABS**	**VFres**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
	Metals and Pesticides												
MG/KG	ARSENIC	A	1.50E+00	1 51E+01	4 30E+01	0.001		5 63E-06	8E-06	4 09E-08	6E-08	1 42E-10	2E-09
MG/KG	CHROMIUM	A		4 20E+01	2 57E+01	0.001		3 36E-06		2 44E-08		8 50E-11	4E-09
MG/KG	COPPER	D			2 90E+01	0 001		3 80E-06		2 75E-08		9 58E-11	
MG/KG	LEAD	B2			1 23E+02	0 001		1 61E-05		1 17E-07		4 07E-10	
MG/KG	MANGANESE	D			1 86E+03	0 001		2 43E-04		1 77E-06		6 15E-09	
MG/KG	NICKEL				3 18E+01	0.001		4.16E-06		3 02E-08		1 05E-10	
MG/KG	ALPHA-CHLORDANE	B2	3.50E-01	3 50E-01	3 52E-01	0 04		4 61E-08	2E-08	1 34E-08	5E-09	1.16E-12	4E-13
MG/KG	GAMMA-CHLORDANE	B2	3 50E-01	3 50E-01	4.04E-01	0 04		5 28E-08	2E-08	1 53E-08	5E-09	1 33E-12	5E-13
MG/KG	DIELDRIN	B2	1 60E+01	1 61E+01	3 38E+00	0 03		4 43E-07	7E-06	9.63E-08	2E-06	1 12E-11	2E-10
MG/KG	DDE	B2	3.40E-01		1 10E+00	0 03		1 44E-07	5E-08	3 13E-08	1E-08	3 63E-12	
MG/KG	DDT	B2	3 40E-01	3 40E-01	1.49E+00	0 03		1 95E-07	7E-08	4 24E-08	1E-08	4 92E-12	2E-12
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7.30E-01	3 10E-01	2 26E-01	0.1	1 09E+07	2 96E-08	2E-08	2 14E-08	2E-08	9 11E-11	3E-11
MG/KG	BENZO(a)PYRENE	B2	7.30E+00	3 10E+00	2 32E-01	0 1	2 96E+07	3 04E-08	2E-07	2 21E-08	2E-07	3 50E-11	1E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3 10E-01	2.78E-01	0 1	5 72E+06	3 64E-08	3E-08	2 64E-08	2E-08	2 13E-10	7E-11
	Total Risk								2E-05		2E-06		6E-09

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration; ELCR = Excess Lifetime Cancer Risk

Total Risk = 2E-05

Soil - Hypothetical Future Golfer Non-carcinogenic Scenario
DDMT Report, 1998

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDi**	**RME**	**ABS**	**VFres**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		4 30E+01	0 001		1 58E-05	0 05	1 14E-07	0 0004	3 98E-10	
MG/KG	CHROMIUM	A	5 00E-03	5 71E-07	2 57E+01	0 001		9.42E-06	0 002	6 84E-08	0.00001	2 38E-10	0 0004
MG/KG	COPPER	D	3 50E+00		2 90E+01	0 001		1 06E-05	0 000003	7.71E-08	0 00000002	2 68E-10	
MG/KG	LEAD	B2			1 23E+02	0 001		4 51E-05		3 27E-07		1 14E-09	
MG/KG	MANGANESE	D	2 30E-02		1 86E+03	0.001		6 81E-04	0 03	4 94E-06	0 0002	1 72E-08	
MG/KG	NICKEL		2 00E-02		3 18E+01	0 001		1 16E-05	0 0006	8 45E-08	0 000004	2 94E-10	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04		3 52E-01	0 04		1 29E-07	0 0003	3 75E-08	0 00007	3 26E-12	
MG/KG	GAMMA-CHLORDANE	B2	5.00E-04		4 04E-01	0 04		1 48E-07	0 0003	4 29E-08	0 00009	3 74E-12	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	3 38E+00	0 03		1 24E-06	0 02	2 70E-07	0 005	3 13E-11	0 0000000000003
MG/KG	DDE	B2			1 10E+00	0 03		4 03E-07		8 77E-08		1 02E-11	
MG/KG	DDT	B2	5 00E-04		1 49E+00	0 03		5 45E-07	0 001	1 19E-07	0 0002	1 38E-11	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			2 26E-01	0 1	1.09E+07	8 28E-08		6 01E-08		2 55E-10	
MG/KG	BENZO(a)PYRENE	B2			2 32E-01	0.1	2 96E+07	8 51E-08		6 17E-08		9 80E-11	
MG/KG	BENZO(b)FLUORANTHENE	B2			2 78E-01	0 1	5 72E+06	1 02E-07		7 39E-08		5 96E-10	
	Hazard Index								0 1		0 006		0 0004
Notes.	WOE = Weight of Evidence, CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration, HQ = Hazard Quotient; HI = Hazard Index									**Total HI =**	**0.1**		

Soil - Hypothetical Future Ballplayer (Youth) Scenario
DDMT Report, 1998

Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	RME	RME
IRing =	Ingestion Rate (mg/event)	200 a	200 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	20 b	20 b
ED =	Exposure Duration (year)	8 c	8 c
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	30 d	30 d
AT =	Averaging Time (days)	25550 e	2920 e

Dermal:

$$CDI = \frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
SA =	Surface Area (cm^2/event)	2080 f	2080 f
AF =	Soil-Skin Adherence Factor (mg/cm^2)	1 g	1 g
ABS =	Absorption Factor (unitless)	(Chemical Specific) h	(Chemical Specific) h
ET =	Exposure Time (events/day)	0 0625 i	0.0625 i
EF =	Exposure Frequency (events/year)	20 b	20 b
ED =	Exposure Duration (year)	8 c	8 c
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	30 d	30 d
AT =	Averaging Time (days)	25550 e	2920 e

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
PEF =	Particulate Emission Factor (m^3/kg)	1.32E+09 j	1 32E+09 j
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific) k	(Chemical Specific) k
IRinh =	Inhalation Rate (m^3/event)	1 25 l	1 25 l
EF =	Exposure Frequency (events/year)	20 b	20 b
ED =	Exposure Duration (year)	8 c	8 c
BW =	Body Weight (kg)	30 d	30 d
AT =	Averaging Time (days)	25550 e	2920 e

References:

a = U S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285 6-03, March 25, 1991.
b = Outdoor activity assumed to be twice a week during season, plus practice games per U S EPA memo, March 1997 (total of 20 days/year)
c = Exposure duration of 8 years, per U.S. EPA memo, March 1997
d = Age-adjusted body weight for youth (age 5-13 years) at 50th percentile, per U S EPA memo, March 1997
e = Best professional judgement.
f = Surface area of 1/2 arms and head of a youth (5-13 years), adapted from CEHT, Technical Report Soil Cleanup Target Levels for FDEP, September 2, 1997.
g = U S EPA Dermal Exposure Assessment. Principles and Application, January 1992
h = Chemical-specific absorption factors are found in Appendix C
i = Time spent outdoors playing baseball per best professional judgement (1.5 hour event/24 hour day).
j = Particulate emission factor (PEF), adapted from U S EPA, Soil Screening Guidance: Technical Background Document, May 1996.
k = Chemical-specific volatilization factors are found in Appendix C
l = Inhalation rate is determined by 20 m^3/day divided by 24 hours/day, and multiplied by the 1 5 hours/event.

Soil - Hypothetical Future Ballplayer (Youth) Carcinogenic Scenario
DDMT Report, 1998

Units	Chemical	WOE	SFo	SFi	RME	ABS	VFres	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
	Metals and Pesticides												
MG/KG	ARSENIC	A	1.50E+00	1.51E+01	2.18E+01	0.001		9.10E-07	1E-06	5 92E-10	9E-10	4 31E-12	7E-11
MG/KG	CHROMIUM	A		4.20E+01	1 89E+01	0 001		7.89E-07		5 13E-10		3.74E-12	2E-10
MG/KG	COPPER	D			2.54E+01	0.001		1 06E-06		6 89E-10		5.02E-12	
MG/KG	LEAD	B2			4 86E+01	0.001		2 03E-06		1 32E-09		9 61E-12	
MG/KG	MANGANESE	D			9 70E+02	0.001		4 05E-05		2.63E-08		1 92E-10	
MG/KG	NICKEL				2 06E+01	0 001		8.60E-07		5 59E-10		4 07E-12	
MG/KG	DIELDRIN	B2	1 60E+01	1.61E+01	1 10E+00	0 03		4 59E-08	7E-07	8 95E-10	1E-08	2 17E-13	4E-12
MG/KG	DDE	B2	3 40E-01		8 60E-02	0 03		3.59E-09	1E-09	7 00E-11	2E-11	1 70E-14	
MG/KG	DDT	B2	3 40E-01	3 40E-01	7 10E-02	0 03		2 96E-09	1E-09	5 78E-11	2E-11	1 40E-14	5E-15
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7.30E-01	3 10E-01	7 60E-02	0 1	1 09E+07	3 17E-09	2E-09	2 06E-10	2E-10	1 83E-12	6E-13
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	3 10E+00	8 20E-02	0 1	2 96E+07	3 42E-09	2E-08	2 23E-10	2E-09	7 39E-13	2E-12
MG/KG	BENZO(b)FLUORANTHENE	B2	7.30E-01	3 10E-01	8 90E-02	0 1	5 72E+06	3 72E-09	3E-09	2 42E-10	2E-10	4 08E-12	1E-12
	Total Risk								2E-06		2E-08		2E-10
											Total Risk =		**2E-06**

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration, ELCR = Excess Lifetime Cancer Exposure

Soil - Hypothetical Future Ballplayer (Youth) Non-carcinogenic Scenario
DDMT Report, 1998

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDl**	**RME**	**ABS**	**VFres**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		2 18E+01	0 001		7 96E-06	0 03	5 18E-09	0 00002	3 77E-11	
MG/KG	CHROMIUM	A	5 00E-03	5 71E-07	1 89E+01	0 001		6 90E-06	0 001	4 49E-09	0 0000009	3 27E-11	0 00006
MG/KG	COPPER	D	3 50E+00		2 54E+01	0 001		9 28E-06	0 000003	6 03E-09	0 000000002	4 39E-11	
MG/KG	LEAD	B2			4 86E+01	0 001		1 78E-05		1 15E-08		8 41E-11	
MG/KG	MANGANESE	D	2 30E-02		9 70E+02	0 001		3 54E-04	0 02	2 30E-07	0 00001	1 68E-09	
MG/KG	NICKEL		2 00E-02		2 06E+01	0 001		7 53E-06	0 0004	4 89E-09	0 0000002	3 56E-11	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	1 10E+00	0 03		4 02E-07	0 008	7 84E-09	0 0002	1 90E-12	0 00000000000002
MG/KG	DDE	B2			8 60E-02	0 03		3 14E-08		6 13E-10		1 49E-13	
MG/KG	DDT	B2	5 00E-04		7 10E-02	0 03		2 59E-08	0 00005	5 06E-10	0 000001	1 23E-13	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			7 60E-02	0 1	1 09E+07	2 78E-08		1 80E-09		1 61E-11	
MG/KG	BENZO(a)PYRENE	B2			8 20E-02	0 1	2 96E+07	3 00E-08		1 95E-09		6 47E-12	
MG/KG	BENZO(b)FLUORANTHENE	B2			8 90E-02	0 1	5 72E+06	3 25E-08		2 11E-09		3 57E-11	
	Hazard Index								0 05		0 0002		0 00006
											Total HI=	**0.05**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration, HQ = Hazard Quotient, HI = Hazard Index

Soil - Hypothetical Future Residential Child Scenario
DDMT Report, 1998

Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

		Noncarcinogenic	
Cs =	Concentration in soil (mg/kg)	RME	
IRing =	Ingestion Rate (mg/event)	200	a
FI =	Fraction Ingested (unitless)	100%	
EF =	Exposure Frequency (events/year)	350	a
ED =	Exposure Duration (year)	6	a
CF =	Conversion Factor (kg/mg)	1.00E-06	
BW =	Body Weight (kg)	15	a
AT =	Averaging Time (days)	2190	a

Dermal:

$$CDI = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	
SA =	Surface Area (cm^2/event)	2394	b
AF =	Soil-Skin Adherence Factor (mg/cm^2)	1	c
ABS =	Absorption Factor (unitless)	(Chemical Specific)	d
EF =	Exposure Frequency (events/year)	350	a
ED =	Exposure Duration (year)	6	a
CF =	Conversion Factor (kg/mg)	1 00E-06	
BW =	Body Weight (kg)	15	a
AT =	Averaging Time (days)	2190	a

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	
PEF =	Particulate Emission Factor (m^3/kg)	1.32E+09	e
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific)	f
IRinh =	Inhalation Rate (m^3/event)	15	a
EF =	Exposure Frequency (events/year)	350	a
ED =	Exposure Duration (year)	6	a
BW =	Body Weight (kg)	15	a
AT =	Averaging Time (days)	2190	a

References:

a = U.S EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Def. Factors," OSWER Directive 9285.6-03, March 25, 1991
c = Surface area of hands, 1/2 arms, 1/2 legs and feet of a child (age 1-6 years), adapted Soil Cleanup Target Levels for FDEP, September 2, 1997
d = U.S. EPA Dermal Exposure Assessment. Principles and Application, January 1992.
e = Chemical-specific absorption factors are found in Appendix C
f = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance: T. Background Document, May 1996.
g = Chemical-specific volatilization factors are found in Appendix C.

Soil - Hypothetical Future Residential Child Non-carcinogenic Scenario
DDMT Report, 1998

								Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDI	RME	ABS	VFres	CDI	HQ	CDI	HQ	CDI	HQ
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		2 93E+01	0 001		3 75E-04	1 2	4 49E-06	0 01	2 13E-08	
MG/KG	CHROMIUM	A	3 50E+00	5 71E-07	2 15E+01	0 001		2 75E-04	0 00008	3 30E-06	0 0000009	1 56E-08	0 03
MG/KG	COPPER	D	3 50E+00		3 09E+01	0 001		3 95E-04	0 0001	4 73E-06	0 000001	2 25E-08	
MG/KG	MANGANESE	D	2 30E-02		9 83E+02	0 001		1 26E-02	0 5	1 50E-04	0 007	7 14E-07	
MG/KG	NICKEL		2 00E-02		2 59E+01	0 001		3 31E-04	0 02	3 96E-06	0 0002	1 88E-08	
MG/KG	LEAD	B2			7 59E+01	0 001		9 70E-04		1 16E-05		5 51E-08	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04		2 25E-01	0 04		2 88E-06	0 006	1 38E-06	0 003	1 64E-10	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04		2 68E-01	0 04		3 42E-06	0 007	1 64E-06	0 003	1 94E-10	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	2 21E+00	0 03		2 83E-05	0 6	1 02E-05	0 2	1 61E-09	0 00000000002
MG/KG	DDE	B2			8 05E-01	0 03		1 03E-05		3 70E-06		5 85E-10	
MG/KG	DDT	B2	5 00E-04		9 63E-01	0 03		1 23E-05	0 02	4 42E-06	0 009	6 99E-10	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			2 51E-01	0 1	1 09E+07	3 20E-06		3 83E-06		2 22E-08	
MG/KG	BENZO(a)PYRENE	B2			2 56E-01	0 1	2 96E+07	3 27E-06		3 91E-06		8 47E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2			2 83E-01	0 1	5 72E+06	3 61E-06		4 33E-06		4 76E-08	
	Hazard Index								2 4		0 2		0 03
											Total HI=	**2.7**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration, HQ = Hazard Quotient, HI = Hazard Index

Soil - Future Recreational Child Scenario - Playground
DDMT Report, 1998

Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	RME	RME
IRing =	Ingestion Rate (mg/event)	200 a	200 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	64 b	64 b
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1 00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Dermal:

$$CDI = \frac{Cs * SA * AF * ABS * ET * EF * ED * CF}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
SA =	Surface Area (cm^2/event)	2394 c	2394 c
AF =	Soil-Skin Adherence Factor (mg/cm^2)	1 d	1 d
ABS =	Absorption Factor (unitless)	(Chemical Specific) e	(Chemical Specific) e
ET =	Exposure Time (event/day)	0.167 f	0.167 f
EF =	Exposure Frequency (events/year)	64 b	64 b
ED =	Exposure Duration (year)	6 a	6 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
PEF =	Particulate Emission Factor (m^3/kg)	1.32E+09 g	1 32E+09 g
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific) h	(Chemical Specific) h
IRinh =	Inhalation Rate (m^3/event)	2.5 i	2.5 i
EF =	Exposure Frequency (events/year)	64 b	64 b
ED =	Exposure Duration (year)	6 a	6 a
BW =	Body Weight (kg)	15 a	15 a
AT =	Averaging Time (days)	25550 a	2190 a

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.
b = Best professional judgement. Child visiting park 2 days/wk during 8 (warmer) months of the year
c = Surface area of hands, 1/2 arms, 1/2 legs and feet of a child (age 1-6 years), adapted from CEHT, Technical Report. Soil Cleanup Target Levels for FDEP, September 2, 1997.
d = U S. EPA Dermal Exposure Assessment: Principles and Application, January 1992
e = Chemical-specific absorption factors are found in Appendix C.
f = Time spent outdoors, best professional judgement (4 hour event/24 hour day).
g = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance: Technical Background Document, May 1996.
h = Chemical-specific volatilization factors are found in Appendix C.
i = Inhalation rate is determined by 15 m^3/day divided by 24 hours/day, and multiplied by the 4 hours/event.

Soil - Future Recreational Child Carcinogenic Scenario -Playground

DDMT Report, 1996

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**SFo**	**SFi**	**RME**	**ABS**	**VFres**	**CDI**	**ELCR**	**CDI**	**ELCR**	**CDI**	**ELCR**
	Metals and Pesticides												
MG/KG	ARSENIC	A	1 50E+00	1 51E+01	1.94E+01	0 001		3 89E-06	6E-06	7 76E-09	1E-08	3 68E-11	6E-10
MG/KG	CHROMIUM	A		4 20E+01	1 63E+01	0 001		3 27E-06		6 52E-09		3 09E-11	1E-09
MG/KG	COPPER	D			5 54E+01	0 001		1 11E-05		2 21E-08		1 05E-10	
MG/KG	LEAD	B2			6 88E+01	0.001		1.38E-05		2 75E-08		1 31E-10	
MG/KG	MANGANESE	D			8 99E+02	0 001		1.80E-04		3 59E-07		1 71E-09	
MG/KG	NICKEL				2 11E+01	0 001		4 23E-06		8 44E-09		4 00E-11	
MG/KG	DIELDRIN	B2	1 60E+01	1 61E+01	7 10E-01	0 03		1.42E-07	2E-06	8 52E-09	1E-07	1 35E-12	2E-11
MG/KG	DDE	B2	3 40E-01		4.30E-01	0 03		8 62E-08	3E-08	5.16E-09	2E-09	8 16E-13	
MG/KG	DDT	B2	3 40E-01	3 40E-01	2.00E-01	0 03		4 01E-08	1E-08	2.40E-09	8E-10	3 80E-13	1E-13
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7.30E-01	3 10E-01	5 70E-01	0 1	1 09E+07	1 14E-07	8E-08	2 28E-08	2E-08	1 32E-10	4E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	3 10E+00	4 40E-01	0 1	2 96E+07	8 82E-08	6E-07	1 76E-08	1E-07	3 81E-11	1E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3 10E-01	4 60E-01	0 1	5 72E+06	9 22E-08	7E-08	1 84E-08	1E-08	2 02E-10	6E-11
	Total Risk								9E-06		3E-07		2E-09
											Total Risk =	**9E-06**	

Notes. WOE = Weight of Evidence, CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration, ELCR = Excess Lifetime Cancer Exposure

Soil - Future Recreational Child Non-carcinogenic Scenario - Playground

DDMT Report, 1998

								Ingestion		Dermal		Inhalation	
Units	**Chemical**	**WOE**	**RfDo**	**RfDI**	**RME**	**ABS**	**VFres**	**CDI**	**HQ**	**CDI**	**HQ**	**CDI**	**HQ**
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		1 94E+01	0 001		4 54E-05	0 2	9 05E-08	0 0003	4 30E-10	
MG/KG	CHROMIUM	A	5 00E-03	5 71E-07	1 63E+01	0 001		3 81E-05	0 008	7 60E-08	0 00002	3 61E-10	0 0006
MG/KG	COPPER	D	3 50E+00		5 54E+01	0 001		1 30E-04	0 00004	2 58E-07	0 00000007	1 23E-09	
MG/KG	LEAD	B2			6 88E+01	0 001		1 61E-04		3 21E-07		1 52E-09	
MG/KG	MANGANESE	D	2 30E-02		8 99E+02	0 001		2 10E-03	0 09	4 19E-06	0 0002	1 99E-08	
MG/KG	NICKEL		2 00E-02		2 11E+01	0 001		4 93E-05	0 002	9 84E-08	0 000005	4 67E-10	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	7 10E-01	0 03		1 66E-06	0 03	9 93E-08	0 002	1 57E-11	0 0000000000002
MG/KG	DDE	B2			4 30E-01	0 03		1 01E-06		6 02E-08		9 52E-12	
MG/KG	DDT	B2	5 00E-04		2 00E-01	0 03		4 68E-07	0 0009	2 80E-08	0 00006	4 43E-12	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			5 70E-01	0 1	1 09E+07	1 33E-06		2 66E-07		1 54E-09	
MG/KG	BENZO(a)PYRENE	B2			4 40E-01	0 1	2 96E+07	1 03E-06		2 05E-07		4 44E-10	
MG/KG	BENZO(b)FLUORANTHENE	B2			4 60E-01	0 1	5 72E+06	1 08E-06		2 15E-07		2 36E-09	
	Hazard Index								0 3		0 003		0 0006
											Total HI=	**0.3**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration, HQ = Hazard Quotient, HI = Hazard Index

Soil - Hypothetical Future Residential Adult Scenario
DDMT 1998

		Carcinogenic	Noncarcinogenic
Ingestion:			
Intake for non-carcinogenic compounds		Age-specific intake (for carcinogenic compounds only)	
CDI =	$\frac{Cs * IR * FI * EF * ED * CF}{BW * AT}$	$CDI_{adj} = \frac{Cs * FI * EF * CF * IR_{adj}}{AT}$	
Cs =	Concentration in soil (mg/kg)	RME	RME
IR_{adj} =	Age-Specific Factor (ingestion) (mg - year)/(kg - day)	114 29 g	na
IRing =	Ingestion Rate (mg/event)	na	100 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	350 a	350 a
ED =	Exposure Duration (year)	na	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	na	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dermal:			
CDI =	$\frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	RME	RME
SA =	Surface Area (cm^2/event)	n/a	5419 b
SA_{adj} =	Age-adjusted Surface Area (cm^2-y/kg)	1574 h	n/a
AF =	Soil-Skin Adherence Factor (mg/cm^2)	1 c	1 c
ABS =	Absorption Factor (unitless)	(Chemical Specific) d	(Chemical Specific) d
EF =	Exposure Frequency (events/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1 00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a
Dust Inhalation:			
CDI =	$\frac{* ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$		
Cs =	Concentration in soil (mg/kg)	RME	RME
PEF =	Particulate Emission Factor (m^3/kg)	1 32E+09 e	1 32E+09 e
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific) f	(Chemical Specific) f
IRinh =	Inhalation Rate (m^3/event)	n/a	20 a
IR_inh_a	Age-adjusted inhalation rate (m3-y/kg-day)	12 86 I	n/a
EF =	Exposure Frequency (events/year)	350 a	350 a
ED =	Exposure Duration (year)	30 a	30 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	10950 a

References:

a U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.

b Surface area of hands, 1/2 arms, 1/2 legs and feet of an adult, adapted from CEHT, Technical Report: Soil Cleanup Target Levels for FDEP, September 2, 1997

c U.S EPA Dermal Exposure Assessment Principles and Application, January 1992

d Chemical-specific absorption factors are found in Appendix C

e Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance. Technical Background Document, May 1996.

f Chemical-specific volatilization factors are found in Appendix C

g Age-adjusted ingestion rate for adults, adjusted for body weight and time for carcinogenic exposure.

$$IRadj = \frac{IRc \times EDc}{BWc} + \frac{IRa \times (EDa - EDc)}{BWa} = \frac{200 \times 6}{15} + \frac{100 \times (30-6)}{70}$$

$$= 114.29 \text{ (mg-year)/(kg-day)}$$

h Age-adjusted surface area (SAadj)

SAadj = (SAcxEDc/BWc)+(SAa X EDa/BWa) = (1418x6/15)+(2936x24/70)=1574 (cm2-year/kg)

I Age-adjusted inhalation rate (IR_Inh_adj)

IR_Inh_adj = (IR_InhcxEDc/BWc)+(IR_InhaxEDa)/BWa) = (20x6/15)+(20x24/70) = 12 86 (m3-year/kg-day)

Soil - Hypothetical Future Residential Adult Scenario

DDMT Report, 1998

Chemical	Reasonable Maximum Exposure (mg/kg)	Carcinogenic Effects TR = 1E-06 (mg/kg)	TR = 1E-05 (mg/kg)	TR = 1E-04 (mg/kg)	Noncarcinogenic Effects THI =0.1 (mg/kg)	THI =1 (mg/kg)	THI =10 (mg/kg)
Metals and Pesticides							
ARSENIC	2.93E+01	1.E+00	1.E+01	1.E+02	2.E+01	2.E+02	2.E+03
CHROMIUM	2.15E+01	4.E+02	4.E+03	4.E+04	4.E+02	4.E+03	4.E+04
COPPER	3.09E+01				3.E+05	3.E+06	3.E+07
MANGANESE	9.83E+02				2 E+03	2.E+04	2.E+05
NICKEL	2 59E+01				1.E+03	1.E+04	1.E+05
LEAD	7.59E+01						
ALPHA-CHLORDANE	2.25E-01	3 E+00	3.E+01	3 E+02	2 E+01	2.E+02	2 E+03
GAMMA-CHLORDANE	2.68E-01	3.E+00	3.E+01	3.E+02	2.E+01	2 E+02	2 E+03
DIELDRIN	2 21E+00	7.E-02	7 E-01	7.E+00	2.E+00	2 E+01	2.E+02
DDE	8 05E-01	3 E+00	3.E+01	3 E+02			
DDT	9.63E-01	3.E+00	3.E+01	3 E+02	2 E+01	2.E+02	2.E+03
Semivolatiles							
BENZO(a)ANTHRACENE	2 51E-01	9.E-01	9.E+00	9.E+01			
BENZO(a)PYRENE	2.56E-01	9.E-02	9 E-01	9 E+00			
BENZO(b)FLUORANTHENE	2 83E-01	9 E-01	9 E+00	9 E+01			

Carcinogenic calculation

$$\text{RBC (mg/kg)} = \frac{TR \times BW \times ATc}{EF \times ED \times (A+B+C)}$$

Noncarcinogenic calculation

$$\text{RBC (mg/kg)} = \frac{THI \times BW \times ATnc}{EF \times ED \times (A+B+C)}$$

Where:

Ac = (SFo x IRing x FI x CF)
Bc = (SFo x SA x AF x ABS x CF)
Cc = (SFi x IRinh x ((1/VF)+(1/PEF))
TR = 1.00E-06

An = ((1/RfDo) x IRing x FI x CF)
Bn = ((1/RfDo) x SA x AF x ABS x CF)
Cn = ((1/RfDi) x IRinh x ((1/VF)+(1/PEF)))
THI = 1.0

Soil - Future Hypothetical Residential Adult Carcinogenic Scenario

DDMT Report, 1996

Units	Chemical	WOE	SFo	SFi	RME	ABS	VFres	Ingestion		Dermal		Inhalation	
								CDI_{adj}	ELCR	CDI	ELCR	CDI	ELCR
	Metals and Pesticides												
MG/KG	ARSENIC	A	1 50E+00	1 51E+01	2 93E+01	0 001		4 59E-05	7E-05	6 32E-07	9E-07	3 91E-09	6E-08
MG/KG	CHROMIUM	A		4 20E+01	2.15E+01	0.001		3 37E-05		4.64E-07		2 87E-09	1E-07
MG/KG	COPPER	D			3 09E+01	0 001		4.84E-05		6 67E-07		4 13E-09	
MG/KG	MANGANESE	D			9 83E+02	0.001		1 54E-03		2 12E-05		1 31E-07	
MG/KG	NICKEL				2 59E+01	0 001		4 05E-05		5 58E-07		3 45E-09	
MG/KG	LEAD	B2			7 59E+01	0 001		1 19E-04		1 64E-06		1 01E-08	
MG/KG	ALPHA-CHLORDANE	B2	3.50E-01	3 50E-01	2.25E-01	0.04		3 53E-07	1E-07	1 94E-07	7E-08	3 01E-11	1E-11
MG/KG	GAMMA-CHLORDANE	B2	3.50E-01	3 50E-01	2 68E-01	0.04		4 19E-07	1E-07	2 31E-07	8E-08	3 57E-11	1E-11
MG/KG	DIELDRIN	B2	1.60E+01	1 61E+01	2 21E+00	0 03		3 47E-06	6E-05	1 43E-06	2E-05	2 96E-10	5E-09
MG/KG	DDE	B2	3.40E-01		8.05E-01	0 03		1.26E-06	4E-07	5 21E-07	2E-07	1 07E-10	
MG/KG	DDT	B2	3.40E-01	3 40E-01	9 63E-01	0 03		1 51E-06	5E-07	6 23E-07	2E-07	1 29E-10	4E-11
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	3 10E-01	2 51E-01	0 1	1.09E+07	3.92E-07	3E-07	5 40E-07	4E-07	3 34E-11	1E-11
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	3 10E+00	2 56E-01	0 1	2 96E+07	4 01E-07	3E-06	5 52E-07	4E-06	3 41E-11	1E-10
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3 10E-01	2 83E-01	0 1	5 72E+06	4 43E-07	3E-07	6 10E-07	4E-07	3 77E-11	1E-11
	Total Risk								1E-04		3E-05		2E-07
											Total Risk =		**2E-04**

Notes WOE = Weight of Evidence; CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration, ELCR = Excess Lifetime Cancer Exposure

Soil - Hypothetical Future Residential Adult Non-carcinogenic Scenario

DDMT Report, 1998

Units	Chemical	WOE	RfDo	RfDi	RME	ABS	VFres	Ingestion CDI	Ingestion HQ	Dermal CDI	Dermal HQ	Inhalation CDI	Inhalation HQ
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		2 93E+01	0 001		4 02E-05	0 1	2 18E-06	0 007	6 08E-09	
MG/KG	CHROMIUM	A	3 50E+00	5 71E-07	2 15E+01	0 001		2 95E-05	0 000008	1 60E-06	0 0000005	4 47E-09	0 008
MG/KG	COPPER	D	3 50E+00		3 09E+01	0 001		4 24E-05	0 00001	2 30E-06	0.0000007	6 42E-09	
MG/KG	MANGANESE	D	2 30E-02		9 83E+02	0 001		1 35E-03	0 06	7 30E-05	0 003	2 04E-07	
MG/KG	NICKEL		2 00E-02		2 59E+01	0 001		3 54E-05	0 002	1 92E-06	0 0001	5 37E-09	
MG/KG	LEAD	B2			7 59E+01	0 001		1 04E-04		5 63E-06		1 57E-08	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04		2 25E-01	0 04		3 09E-07	0 0006	6 69E-07	0 001	4 68E-11	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04		2 68E-01	0 04		3 67E-07	0 0007	7 95E-07	0 002	5 55E-11	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	2 21E+00	0 03		3 03E-06	0 06	4 93E-06	0 1	4 60E-10	0 000000000005
MG/KG	DDE	B2			8 05E-01	0 03		1 10E-06		1 79E-06		1 67E-10	
MG/KG	DDT	B2	5 00E-04		9 63E-01	0 03		1 32E-06	0 003	2 14E-06	0 004	2 00E-10	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			2 51E-01	0 1	1 09E+07	3 43E-07		1 86E-06		5 20E-11	
MG/KG	BENZO(a)PYRENE	B2			2 56E-01	0 1	2 96E+07	3 50E-07		1 90E-06		5 31E-11	
MG/KG	BENZO(b)FLUORANTHENE	B2			2 83E-01	0 1	5 72E+06	3 87E-07		2 10E-06		5 87E-11	
	Hazard Index								0 3		0 1		0 008
											Total HI=	**0.4**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration, HQ = Hazard Quotient, HI = Hazard Index

Soil - Hypothetical Future On-site Worker Scenario
DDMT Report, 1998

Ingestion:

$$CDI = \frac{Cs * IRing * FI * EF * ED * CF}{BW * AT}$$

		Carcinogenic	Noncarcinogenic
Cs =	Concentration in soil (mg/kg)	RME	RME
IRing =	Ingestion Rate (mg/event)	50 a	50 a
FI =	Fraction Ingested (unitless)	100%	100%
EF =	Exposure Frequency (events/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1 00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Dermal:

$$CDI = \frac{Cs * SA * AF * ABS * EF * ED * CF}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
SA =	Surface Area (cm^2/event)	2458 b	2458 b
AF =	Soil-Skin Adherence Factor (mg/cm^2)	1 c	1 c
ABS =	Absorption Factor (unitless)	(Chemical Specific) d	(Chemical Specific) d
EF =	Exposure Frequency (events/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
CF =	Conversion Factor (kg/mg)	1.00E-06	1.00E-06
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

Dust Inhalation:

$$CDI = \frac{Cs * ((1/VF)+(1/PEF)) * IRinh * EF * ED}{BW * AT}$$

Cs =	Concentration in soil (mg/kg)	RME	RME
PEF =	Particulate Emission Factor (m^3/kg)	1.32E+09 e	1.32E+09 e
VF =	Volatilization Factor (m^3/kg)	(Chemical Specific) f	(Chemical Specific) f
IRinh =	Inhalation Rate (m^3/event)	20 a	20 a
EF =	Exposure Frequency (events/year)	250 a	250 a
ED =	Exposure Duration (year)	25 a	25 a
BW =	Body Weight (kg)	70 a	70 a
AT =	Averaging Time (days)	25550 a	9125 a

References:

a = U.S. EPA, Human Health Evaluation Manual, Supplemental Guidance. "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 25, 1991.
b = Surface area of hands, 1/2 arms and 1/2 head (face) of an adult worker, adapted from CEHT, Technical Report. Soil Cleanup Target Levels for FDEP, September 2, 1997.
c = U.S. EPA Dermal Exposure Assessment: Principles and Application, January 1992.
d = Chemical-specific absorption factors are found in Appendix C.
e = Particulate emission factor (PEF), adapted from U.S.EPA, Soil Screening Guidance· Technical Background Document, May 1996.
f = Chemical-specific volatilization factors are found in Appendix C.

Soil - Future Hypothetical On-Site Worker Carcinogenic Scenario
DDMT Report, 1996

Units	Chemical	WOE	SFo	SFi	RME	ABS	VFres	Ingestion CDI	Ingestion ELCR	Dermal CDI	Dermal ELCR	Inhalation CDI	Inhalation ELCR
	Metals and Pesticides												
MG/KG	ARSENIC	A	1 50E+00	1.51E+01	2 93E+01	0 001		5 12E-06	8E-06	2.52E-07	4E-07	1 55E-09	2E-08
MG/KG	CHROMIUM	A		4 20E+01	2.15E+01	0.001		3 76E-06		1.85E-07		1 14E-09	5E-08
MG/KG	COPPER	D			3 09E+01	0 001		5 40E-06		2 66E-07		1.64E-09	
MG/KG	MANGANESE	D			9 83E+02	0 001		1 72E-04		8 44E-06		5 20E-08	
MG/KG	NICKEL				2 59E+01	0 001		4.52E-06		2 22E-07		1 37E-09	
MG/KG	LEAD	B2			7.59E+01	0 001		1 33E-05		6.52E-07		4 02E-09	
MG/KG	ALPHA-CHLORDANE	B2	3 50E-01	3 50E-01	2.25E-01	0.04		3 94E-08	1E-08	7 74E-08	3E-08	1 19E-11	4E-12
MG/KG	GAMMA-CHLORDANE	B2	3.50E-01	3 50E-01	2 68E-01	0.04		4 68E-08	2E-08	9 19E-08	3E-08	1 42E-11	5E-12
MG/KG	DIELDRIN	B2	1 60E+01	1.61E+01	2 21E+00	0 03		3 87E-07	6E-06	5 71E-07	9E-06	1.17E-10	2E-09
MG/KG	DDE	B2	3 40E-01		8.05E-01	0.03		1 41E-07	5E-08	2.07E-07	7E-08	4 26E-11	
MG/KG	DDT	B2	3.40E-01	3 40E-01	9 63E-01	0 03		1.68E-07	6E-08	2 48E-07	8E-08	5.10E-11	2E-11
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2	7 30E-01	3.10E-01	2 51E-01	0.1	1 09E+07	4 38E-08	3E-08	2 15E-07	2E-07	1 62E-09	5E-10
MG/KG	BENZO(a)PYRENE	B2	7 30E+00	3 10E+00	2 56E-01	0 1	2 96E+07	4 47E-08	3E-07	2 20E-07	2E-06	6 18E-10	2E-09
MG/KG	BENZO(b)FLUORANTHENE	B2	7 30E-01	3 10E-01	2 83E-01	0 1	5 72E+06	4 94E-08	4E-08	2 43E-07	2E-07	3 47E-09	1E-09
	Total Risk								1E-05		1E-05		8E-08
											Total Risk =		**3E-05**

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake; RME = Reasonable Maximum Exposure Concentration, ELCR = Excess Lifetime Cancer Exposure

Soil - Hypothetical Future On-site Worker Non-carcinogenic Scenario

DDMT Report, 1998

								Ingestion		Dermal		Inhalation	
Units	Chemical	WOE	RfDo	RfDi	RME	ABS	VFres	CDI	HQ	CDI	HQ	CDI	HQ
	Metals and Pesticides												
MG/KG	ARSENIC	A	3 00E-04		2 93E+01	0 001		1 43E-05	0 05	7 05E-07	0 002	4 35E-09	
MG/KG	CHROMIUM	A	3 50E+00	5 71E-07	2 15E+01	0 001		1 05E-05	0 000003	5 18E-07	0 0000001	3 19E-09	0 006
MG/KG	COPPER	D	3 50E+00		3 09E+01	0 001		1 51E-05	0 000004	7 44E-07	0 0000002	4 59E-09	
MG/KG	MANGANESE	D	2 30E-02		9 83E+02	0 001		4 81E-04	0 02	2 36E-05	0 001	1 46E-07	
MG/KG	NICKEL		2 00E-02		2 59E+01	0 001		1 27E-05	0 0006	6 22E-07	0 00003	3 84E-09	
MG/KG	LEAD	B2			7 59E+01	0 001		3 71E-05		1 82E-06		1 12E-08	
MG/KG	ALPHA-CHLORDANE	B2	5 00E-04		2 25E-01	0 04		1 10E-07	0 0002	2 17E-07	0 0004	3 34E-11	
MG/KG	GAMMA-CHLORDANE	B2	5 00E-04		2 68E-01	0 04		1 31E-07	0 0003	2 57E-07	0 0005	3 97E-11	
MG/KG	DIELDRIN	B2	5 00E-05	1 00E+02	2 21E+00	0 03		1 08E-06	0 02	1 60E-06	0 03	3 28E-10	0 000000000003
MG/KG	DDE	B2			8 05E-01	0 03		3 94E-07		5 81E-07		1 19E-10	
MG/KG	DDT	B2	5 00E-04		9 63E-01	0 03		4 71E-07	0 0009	6 95E-07	0 001	1 43E-10	
	Semivolatiles												
MG/KG	BENZO(a)ANTHRACENE	B2			2 51E-01	0 1	1 09E+07	1 23E-07		6 02E-07		4 53E-09	
MG/KG	BENZO(a)PYRENE	B2			2 56E-01	0 1	2 96E+07	1 25E-07		6 15E-07		1 73E-09	
MG/KG	BENZO(b)FLUORANTHENE	B2			2 83E-01	0 1	5 72E+06	1 38E-07		6 80E-07		9 72E-09	
	Hazard Index								0 09		0 04		0 006
											Total HI=	**0 1**	

Notes WOE = Weight of Evidence, CDI = Chronic Daily Intake, RME = Reasonable Maximum Exposure Concentration, HQ = Hazard Quotient, HI = Hazard Index

TAB

Appendix F

Exposure Point Concentration (UCL 95%)
Methodology

Appendix F: RADB Statistics

This section describes the statistics used in the RADB toolset. The reasonable maximum exposure (RME) is calculated in the RADB toolset. The RME is defined as the highest exposure that is reasonably expected to occur at a site (EPA, 1989). The RME is used to ~~to~~ calculate the potential risk posed by a site and is calculated using EPA guidance for statistical analysis of groundwater monitoring data (EPA, 1989 and EPA, 1992a), where appropriate.

The specific statistical methodology used to evaluate the RME is described below. Section 1.1 describes the methodology for small data sets (data sets with less than 4 analytical results). Section 1.2 describes the basic tests and equations used to select the statistical protocol. Section 1.3 describes the specific statistical tests used to evaluate the normality of the data set, thereby selecting the appropriate equations for calculating the RME. Section 1.4 presents the references that serve as the basis of the statistical protocol.

1.1 The RME for Data Sets with Less than 4 Analytical Results

For data sets consisting of three or less valid analytical results, the maximum detected concentration is used as the RME.

1.2 The RME for Data Sets with 4 or More Analytical Results

For data sets with 4 or more analytical results, the methodology used for calculating the RME is described below.

There are two different ways to calculate the RME in the RADB toolset, using a frequency of non-detect analysis or a simple RME calculation. The methodology for the simple RME calculation used for NASA MSFC_RI is presented graphically in Figure 1-1.

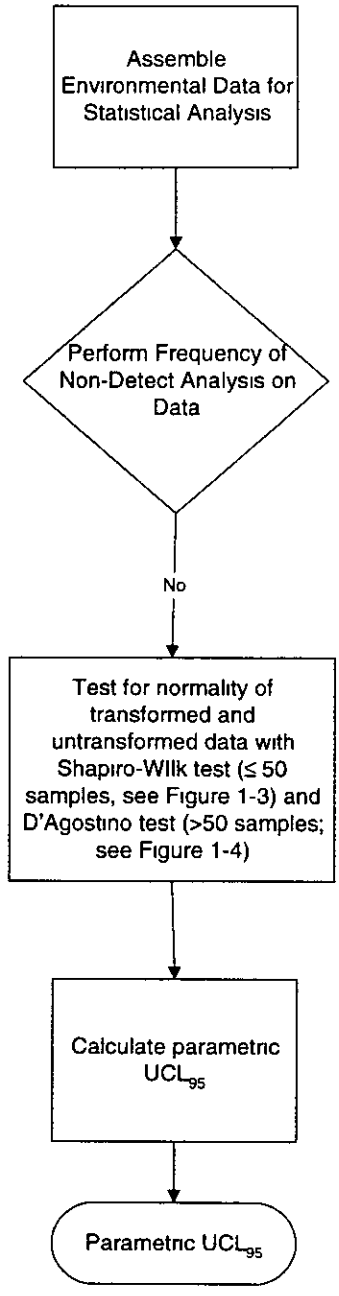

FIGURE 1-1
Overview of Statistical Protocol

1.2.1 Calculation of 95% Upper Confidence Limit (UCL_{95})

If the data set was distributed normally, the 95 percent UCL was calculated using the following formula (EPA, 1992a):

$$UCL = \bar{x} + t\left(\frac{s}{\sqrt{n}}\right) \quad (1)$$

Where:

UCL = upper confidence limit

$\bar{x}$ = mean of the untransformed data

t = Student-t statistic (e.g., from Table A2 published in Gilbert, 1987)

s = standard deviation of the untransformed data

n = number of samples

If the data set was distributed lognormally, the 95 percent UCL was calculated using the following formula (EPA, 1992a):

$$UCL = e^{\left(\bar{x}+0.5s^2+sH/\sqrt{n-1}\right)} \quad (2)$$

Where:

UCL = upper confidence limit

e = constant (base of the natural log, equal to 2.718)

$\bar{x}$ = mean of the log-transformed data

s = standard deviation of the log-transformed data

H = H-statistic (Table A12 in Gilbert, 1987)

n = number of samples

If the Shapiro-Wilk test indicated that the data for data sets between 3 and 50 samples follow both normal and lognormal distributions, the distribution with the largest W-test statistic was selected, and the 95 percent UCL was calculated using either Equation 1 or Equation 2, as appropriate.

If the D'Agostino test indicated that the data of sets with more than 50 samples fit both normal and lognormal distributions, the assumption was that the data was distributed lognormally and the 95 percent UCL was calculated using log-transformed data and Equation 2. This assumption was based on Gilbert's *Statistical Methods for Environmental Pollution Monitoring* (1987) and the Resource Conservation and Recovery Act (RCRA) guidance for statistical analysis of data (EPA, 1989). These references state that, in general, environmental data most closely follow a lognormal distribution. The RCRA guidance explains that pollutant sources are randomly and repeatedly diluted by mixing in the environmental media, which leads mathematically to a lognormal distribution of

concentrations. Therefore, the lognormal distribution is usually more appropriate as a default statistical model than the normal distribution.

If either test (Shapiro-Wilk or D'Agostino) indicated that the data set did not fit either the normal or lognormal distributions, a nonparametric confidence interval was calculated according the methodology in the RCRA guidance (EPA, 1989) described in Section 1.3.3 below.

All calculated 95 percent UCLs were compared to the maximum detected concentration, and if the 95 percent UCL was greater than the maximum detected concentration, then the maximum detected concentration was used as the EPC.

1.3 Statistical Tests for Calculating Sample Set Normality

The statistical tests used to evaluate the normality of the sample set are described below. The normality of the sample set was used for selecting the most representative equation for calculating the EPC.

1.3.1 Shapiro-Wilk Test (4 to 50 Analytical Results)

The Shapiro-Wilk test (W-test) was used for data sets with 4 to 50 analytical results. The W-test is based on the assumption that if a set of data (or the natural log values of a data set) is normally distributed, the ordered values should be highly correlated with corresponding quantiles taken from a normal distribution. The W-test gives substantial weight to evidence of non-normality in the tails of the distribution, where the robustness of statistical tests based on the normality assumption is most severely affected (EPA, 1992b).

The methodology used to calculate the EPC based on the W-test is presented graphically in Figure 1-2. The following steps were followed to calculate the W-test statistic:

1. Begin with the log transformed data set and order the data from smallest to largest concentration $\left(x_{(i)}\right)$ and from largest to the smallest concentration $\left(x_{(n-i+1)}\right)$; where n is the number of observations.

2. Compute the differences $x_{(n-i+1)} - x_{(i)}$.

3. Compute k as the greatest integer less than or equal to $n/2$, where n is the number of samples and k is used to identify the coefficients for the W-test.

4 Look up the coefficient a_{n-i+1} from Table A-1 in the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Addendum to Interim Final Guidance* (EPA, 1992b).

5. Compute the mean ($\bar{x}$) and standard deviation (SD) of the log transformed data set using the following formulas:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad (3)$$

Where:

n	=	total number of observations
x_i	=	i^{th} observation
$\bar{x}$	=	mean of the log transformed data

and

$$SD = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}} \qquad (4)$$

Where:

SD	=	standard deviation of the log transformed data
x_i	=	i^{th} observation
$\bar{x}$	=	mean of the log transformed data (from Equation 3)
n	=	total number of observations

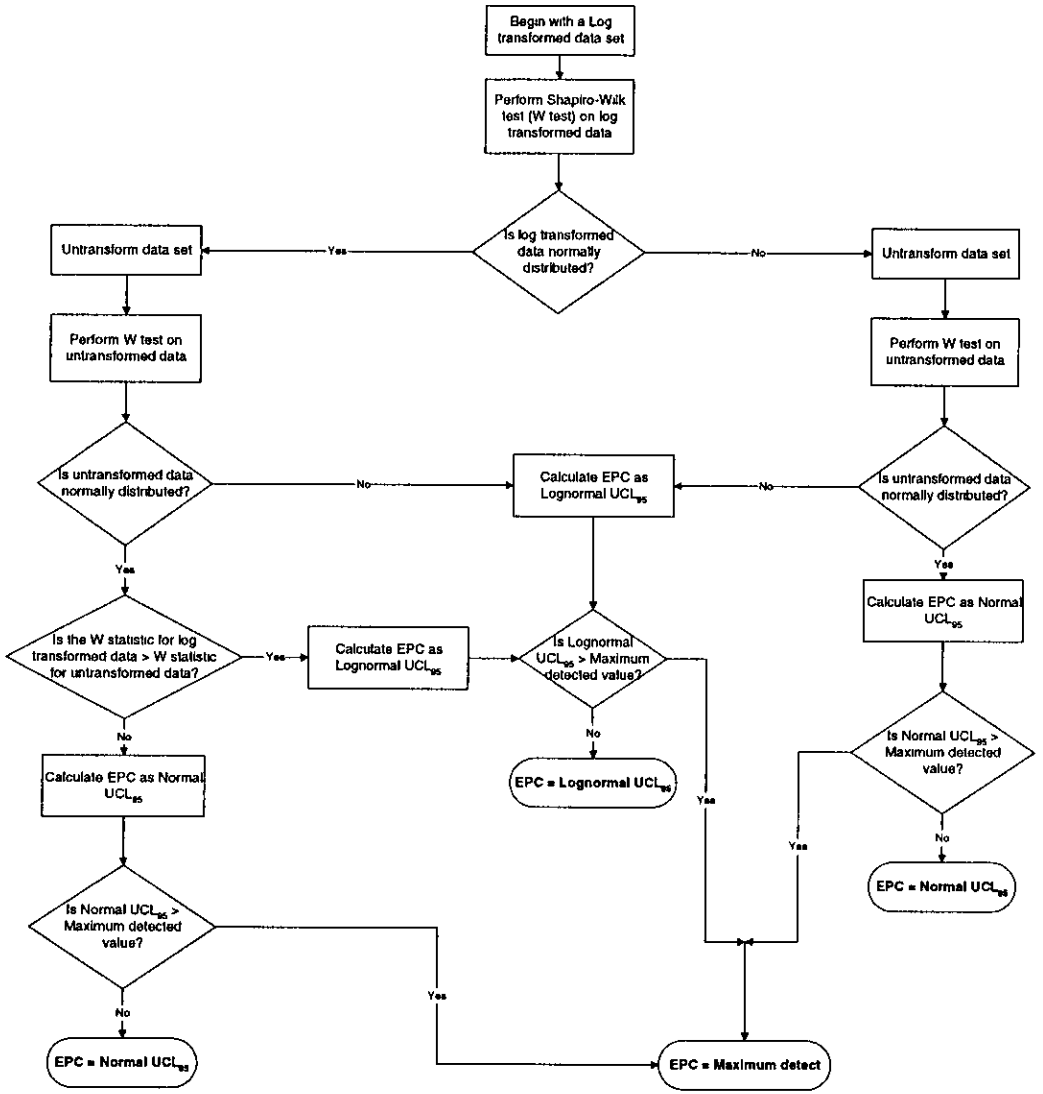

FIGURE 1-2
Shapiro-Wilk test (W test) Protocol

6. Calculate the W-test statistic using the following equation:

$$W = \left[\frac{b}{SD\sqrt{n-1}}\right]^2 \quad (5)$$

and

$$b = \sum_{i=1}^{k} a_{n-i+1}\left(x_{(n-i+1)} - x_{(i)}\right) \quad (6)$$

Where:

SD	=	standard deviation of the log transformed data
n	=	total number of observations
a_{n-i+1}	=	coefficient for the W-test

7. Compare the W-test statistic to the 5 percent critical value for sample size n in Table A-2 of *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Addendum to Interim Final Guidance* (EPA, 1992b). If the W-statistic is greater than the critical value, the data set is considered normally distributed.

8. The same tests for normality are conducted on the untransformed data using the methods described above. If both the untransformed data set and log-transformed data set had W-test statistics greater than the critical value, the distribution with the greater test statistic was selected for calculating the 95 percent UCL.

9. If the W-test indicated that the data set deviated from both the normal and lognormal distributions, a nonparametric UCI was calculated according to methodology described in Section 1.3.3.

1.3.2 D'Agostino's Test (More than 50 Analytical Results)

The D'Agostino test was used to evaluate the normality of the data sets with more than 50 samples. The methodology used to calculate the EPC based on the D'Agostino test is presented graphically in Figure 1-3. The test uses the following steps (Gilbert, 1987):

1. Order the data from smallest to largest.

2. Compute the D statistic from the following equation:

$$D = \frac{\sum_{i=1}^{n}\left[i - \frac{1}{2}(n+1)\right]x_{[i]}}{n^2 s} \quad (7)$$

where

$$s = \left[\frac{1}{n}\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2\right]^{\frac{1}{2}} \quad (8)$$

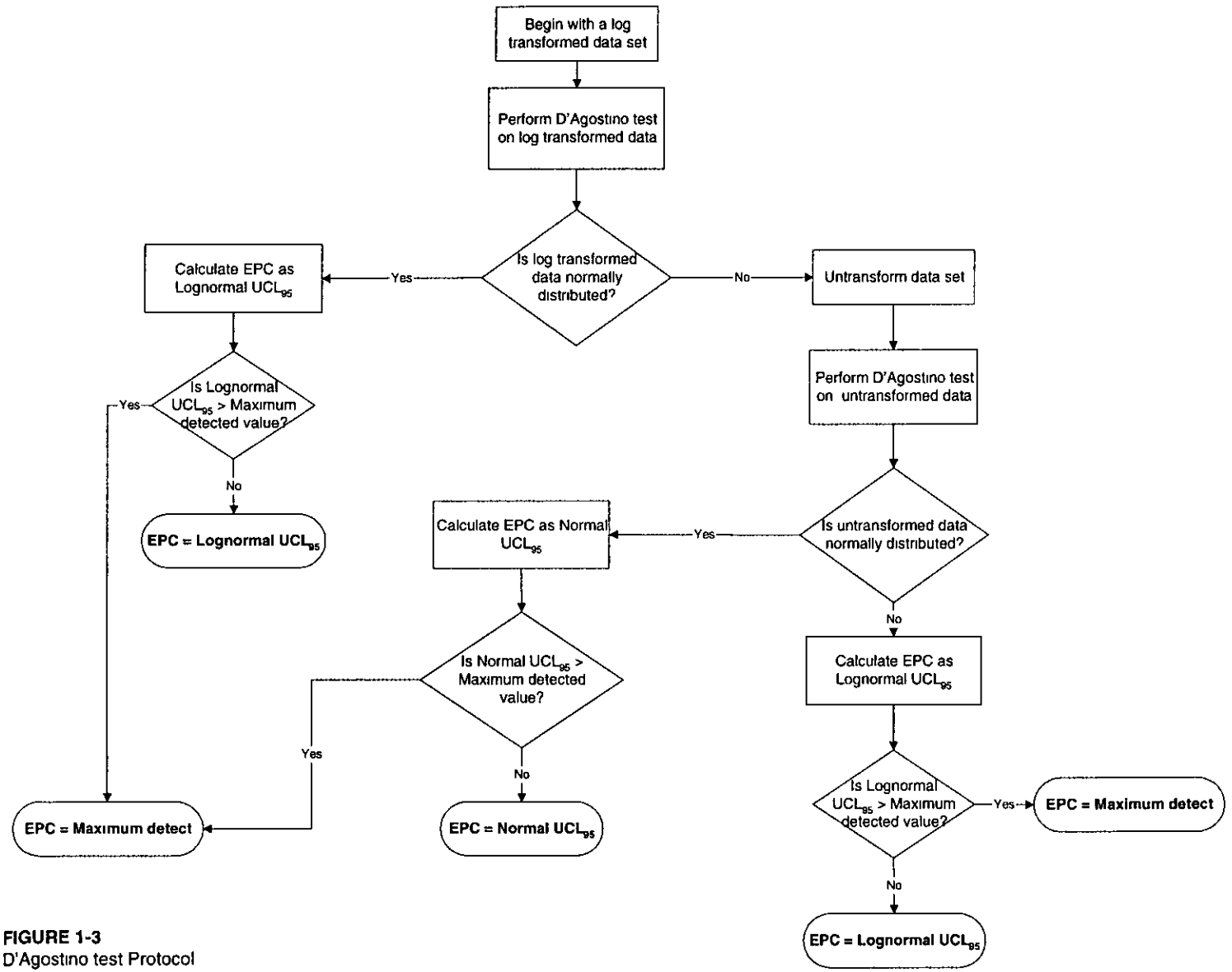

FIGURE 1-3
D'Agostino test Protocol

and

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad (9)$$

3. Transform the D statistic to the statistic Y by computing:

$$Y = \frac{D - 0.28209479}{0.02998598 / \sqrt{n}} \qquad (10)$$

If n is large and the data are drawn from a normal distribution, then the expected value of Y is zero. For nonnormal distributions, Y will tend to be either less than or greater than zero, depending on the particular distribution. This fact necessitates a two-tailed test.

If Y is less than the $\alpha/2$ (i.e., 0.025) quantile or greater than the 1-$\alpha/2$ (i.e., 0.975) quantile of the distribution of Y (Table A8 in Gilbert, 1987), the untransformed data do not fit a normal distribution at the 95 percent significance level (or α = 0.05).

If the data do not follow a normal distribution, then the values are transformed by taking the natural logarithm of each concentration value to check if the data are distributed lognormally. The same tests for distribution fit were conducted on the log-transformed data using the methods described above. If the test indicated the untransformed data set and log transformed data set do not follow a normal distribution, a nonparametric upper confidence interval is evaluated (Section 1.3.3).

1.3.3 Nonparametric Upper Confidence Interval (50 to 90 Percent Nondetect Values)

A nonparametric UCI was calculated for data sets containing between 50 and 90 percent nondetects. The steps described below were followed for determining the nonparametric UCI:

1. Order the n data by value from least to greatest denoting the data by $x_1 \le x_2 \le x_3 \le ... \le x_n$ where n is the total number of observations.

2. Calculate M from the following equation:

$$M = n/2 + 1 + Z_{0.99}\sqrt{n/4} \qquad (11)$$

Where:

n = number of observations
$Z_{0.99}$ = 99th percentile from the normal distribution (Table 4, Appendix B in EPA, 1989) and equals 2.33.

3. Take values of the M[th] data point $\left[X_{(M)}\right]$ as the upper confidence interval.

4. Use the maximum detected value in the UCI if M was a nondetect.

1.4 References

EPA, 1989. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Interim Final Guidance.* Office of Solid Waste Management Division. PB89-151047. April.

EPA, 1992a. *Supplemental Guidance to RAGS: Calculating the Concentration Term.* Office of Solid Waste and Emergency Response. Publication 9285.7-081. May.

EPA, 1992b. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Addendum to Interim Final Guidance.* Office of Solid Waste, Permits and State Programs Division. June.

Gilbert, 1987. R.O. Gilbert. *Statistical Methods for Environmental Pollution Monitoring.* Van Nostrand Reinhold. New York.

TAB

Appendix G

Response to Comments, June 9, 1998

MEMORANDUM **CH2MHILL**

PREPARED FOR: Dorothy Richards/CEHNC

PREPARED BY: Vijaya Mylavarapu/CH2M HILL/GNV
Greg Underberg/CH2M HILL/ORO

DATE: July 27, 1998

This memo includes response to comments received on Technical Memorandum, Streamlined Risk Assessment, Parcel 3, DDMT–dated June 9, 1998. Responses to the comments from EPA, State of Tennessee, and DDMT are addressed separately.

EPA Comments
Comment 1
RA needs a conceptual site model

Response: A conceptual site model will be included as part of the introduction, before COPC Selection, in the revised report. A flow chart presenting the potential sources, primary and secondary release pathways/mechanisms, potential exposure pathways, and receptors will be included in the revised report.

Comment 2
The use of exposure time per event in Table 2 is confusing, especially with fractional events/day. ET is usually given in hours.

Response: Comment noted. The exposure time (ET) presented in Table 2 is not the same ET as that indicated in RAGS Part A. This ET represents the fraction of the day spent (2hr/(golf) event divided by 24 hr/day) in the contaminated area; and exposure frequency (EF) presents the number of days in a year spent at the site (contaminated area). This was applied for dermal and inhalation route intake estimates. The ET will be presented as hrs/day, as suggested.

Comment 3
In many tables, concentrations were expressed in scientific notation. Generally, it is preferred to express concentrations in number format.

Response: Concentrations will be presented in number format in the revised report.

Comment 4
In general, the tables in this document were extremely difficult to read.

Response: An attempt will be made to re-format tables for easier reading.

Comment 5
TEFs for PAHs should be applied to concentrations rather than to slope factors per Region 4 guidance. PAHs should be assessed together as benzo(a)pyrene concentration equivalents rather than as individual PAHs.

Response: Comment noted. The resulting risks from either applying the TEF to the toxicity factor or the concentration will be the same. Since the TEFs stand for the potency variation in the toxicity, it is assumed to apply to the toxicity factors in current risk assessment practices (although slope factors are statistical estimates). EPA Region III RBC tables include the CSF factors included in this RA for the PAH compounds. The EPA's Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (EPA/600/R-93/089) includes relative potency factors for differences in the toxicity. Applying the TEFs to concentrations converts all the PAHs into benzo(a)pyrene, which could become a issue for the risk management and public communication, as often BaP concentrations much lower than the other less toxic PAHs. Thus for practical reasons such ease of risk documentation and risk management, the TEFs are applied to the toxicity factors.

Comment 6
On page 16, under the future golfer scenario, the risks to current maintenance workers is discussed. I assume this is a typo.

Response: The typographical error will be corrected in the revised report.

Comment 7
On page 18, cancer risk to the lifetime resident should be assessed as the sum of childhood risk for 6 years and adult risk for 24 years.

Response: The age adjusted intake factors for soil ingestion (which accounts for majority of the dose) is meant to be the same as estimating risk for child with an ingestion rate of 200 mg/day for 6 years and as an adult at 100 mg/day for 24 years. However, age-adjusted factors were not used for dermal and inhalation exposure assumptions. The revised report will include age-adjusted assumptions for these pathways also, following the existing guidance from the State of Florida, which derives its factors from EPA's exposure factors handbook. However, the overall risk estimates to a future hypothetical resident are not anticipated to change significantly due to these modifications.

Comment 8
On page 18, the screening level for lead in soil of 400 mg/kg is termed an RBC. This is incorrect. It is most correctly a screening level.

Response: The reference to the 400 mg/kg will be made as screening level in the revised report.

Comment 9

On page 19, the second sentence of the second paragraph under Remedial Goal Options. I think what is meant is "unacceptable risks" rather than "acceptable risks."

Response: Agree with the comment. Suggested correction will be made in the revised report.

State of Tennessee Comments

Comment 1: Page 4, Line
I would like to see a copy of the Data Quality Evaluation (DQE) memorandum for Parcel 3.

Response: A DQE memorandum will be prepared and submitted as part of the Main Installation RI.

Comment 2: Page 7 paragraph2
It is stated that the Golf Course Pond...was found to contain an abundance of goldfish and bullfrogs. In the Baseline Risk Assessment for Golf Course Impoundments at the Defense Distribution Depot, Memphis, Tennessee prepared by Radian in December, 1997, the only fish caught were Arkansas shiners. The source for the aquatic animals should be disclosed for an adequate assessment of the Pond.

Response: The statement refers to the observations made during site visit by the ecologist. These are qualitative field observations and represent seasonal variation in the aquatic species observed in the pond. Further details of the field notes will be included in the revised report.

Comment 3: Table 5 After Page 16
This table summarizes the risks and hazards. There are arithmetic errors made in summing the excess lifetime cancer risks and noncarcinogenic hazard index. The cancer risks and noncancer hazards across all media add up to 4.35×10^{-4} and 7.27, instead of 2×10^{-4} and 1.0 as shown on the table.

Response: The last row in Table 5 will be eliminated in the revised report, as it has no practical meaning. Also, it is not correct to add TOTAL and individual values for the pathway, as totals are sum of the individual pathway risks and HIs. The total cancer risks and the HI per receptor are presented as a "TOTAL" in the last row of each receptor category summary, with a list of risk drivers in the table, which is what is discussed in the text.

Comment 4: Page 18 Line 16
For the future hypothetical resident scenario, the age-adjusted ingestion rate was calculated to estimate the adult cancer risk. The equation was shown in Appendix E, but the calculated age adjusted ingestion rate was not. The inhalation exposure pathways also has inhalation rates that are different for adult and children. This calculation for inhalation cancer risks should be adjusted.

Response: The age-adjusted soil ingestion rate is 114.29 (mg-kg/event-year), as listed in Table 2.0. An age-adjusted factor will be used for dermal contact and inhalation in the revised report.

Comment 5: Page 18 Sources of Uncertainty for Parcel 3
In discussing the uncertainty of the risk assessment for dieldrin, it is stated that the available toxicity information is based on dose estimates from experimental studies or occupational

exposures using pure chemicals. These points by no means cover the range of available information on dieldrin in soil. When these points are made, they need to be accompanied by cited references. The chemicals of potential concern also include arsenic and benzo(a)pyrene, the uncertainties associated with these chemicals need to be specifically addressed.

Response: The uncertainty section is a qualitative evaluation of the factors influencing the risks and HIs calculated. The uncertainty section presented some of the uncertainties associated with each risk assessment step. The presented uncertainty section is not exhaustive of all the factors that could influence the risk numbers. However important factors will be attempted to be included in the revised report. Reference for the dieldrin toxicity factors related statement is from EPA's toxicity profile from IRIS, 1998. While dieldrin bioavailability from soil is not known, generally chemicals in the solid matrix are less bioavailable than when present in pure chemical form or dissolved in aqueous media. The toxicity factors for arsenic and benzo(a) pyrene (BaP) are also from drinking water (arsenic) and occupational exposures and experimental exposures (BaP) to higher concentrations. These additional uncertainty discussions will be added to the revised report.

Comment 6: Page 19 Risk Characterization
The cancer risks and noncancer hazards for each exposure scenario have been discussed. But the total cancer risks and noncancer hazards have not been summarized in the text. In view of the updated cancer risks and noncancer hazards shown in the comment for Table 5 and the proximity of Parcel 3 to the residents, we need to discuss acceptable residential cancer risks and subsequent PRGs.

Response: Risks are summed across all the pathways for each receptor. We can not sum risks across receptors (please refer to the response to Comment 3 above) and the last row of this table was presented in error. The sum of the risks and hazard index to a receptor from each of the chemicals is provided in Table 5, as well as in Appendix E and discussed in the risk characterization text. This is in accordance with the current EPA's risk assessment guidelines. An acceptable risk for the site should be decided based on the cancer risks and non-cancer hazard index presented for each receptor, and by choosing the most appropriate land use for this Golf Course.

DDMT- Shawn Phillips

Comment 1
Provide a table of contents

Response: A table of contents will be included in the revised report.

Comment 2
Page 7, second paragraph. Refer to the September 1997 angling and trapping sampling event and how no fish were recovered except for Arkansas Shiners. Also refer to the planned upcoming electroshocking event to certify that there are in fact no game species present in Lake Danielson.

Response: The referenced paragraph is based on the historical records of the pond and the field observations during the site visit by an ecologist. The results (or lack thereof) of the 1997 angling and trapping event will also be referenced. The planned upcoming electroshocking event will be referred to as an upcoming opportunity to verify the assumption—based on previous observations and reports—that no game fish are present.

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