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Emeryville, California

INTERIM REPORT
PRELIMINARY SELECTION OF FACILITY AREA SOIL COPCs

RAMBOLL ENVIRON

Interim Report
Preliminary Selection of Facility Area Soil COPCs

Nevada Environmental Response Trust
(Former Tronox LLC Site)
Henderson, Nevada

Nevada Environmental Response Trust (Trust) Representative Certification
I certify that this document and all attachments submitted to the Division were prepared at the request of, or under the direction or supervision of the Trust. Based on my own involvement and/or my inquiry of the person or persons who manage the system(s) or those directly responsible for gathering the information or preparing the document, or the immediate supervisor of such person(s), the information submitted and provided herein is, to the best of my knowledge and belief, true, accurate, and complete in all material respects.

Office of the Nevada Environmental Response Trust

Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

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Signature: Jay A Steinberg, ________, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

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Date: May 5, 2015

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Responsible Certified Environmental Manager (CEM) for this project

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and, to the best of my knowledge, comply with all applicable federal, state and local statutes, regulations and ordinances.

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Date	**May 2015**
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	Preliminary Selection of Facility Area Soil COPCs

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ACRONYMS AND ABBREVIATIONS

AP	ammonium perchlorate
BCL	Basic Comparison Level
bgs	below ground surface
BHRA	baseline health risk assessment
BMI	Black Mountain Industrial
box plots	box-and-whisker plots
BTEX	benzene, toluene, ethyl benzene, and total xylenes
COPC	chemical of potential concern
CSM	conceptual site model
DVSR	Data Validation Summary Report
ECA	Excavation Control Area
EDA	exploratory data analysis
ENSR	ENSR Corporation
Facility Area	a subarea within the Site that excludes Parcels C, D, F, G, and H
GRAS	Generally Recognized as Safe
HRA	health risk assessment
IQR	interquartile range
LOU	Letter of Understanding
MTBE	methyl tertiary butyl ether
NDEP	Nevada Division of Environmental Protection
Neptune	Neptune and Company
NERT	Nevada Environmental Response Trust
Northgate	Northgate Environmental Management, Inc.
OCH	organochlorine herbicide
OCP	organochlorine pesticide
OPP	organophosphate pesticide
PAH	polycyclic aromatic hydrocarbon
PBT	persistent, bioaccumulative, and toxic
PCB	polychlorinated biphenyl
Phase A investigation	Phase A Source Area Investigation
Phase B investigation	Phase B Source Area Investigation
Q1	the first quartile (25th percentile) of a distribution
Q3	the third quartile (75th percentile) of a distribution
Ramboll Environ	Ramboll Environ US Corporation
RAW	removal action work plan
RI/FS	Remedial Investigation/Feasibility Study
RZ	remediation zone
Site	Nevada Environmental Response Trust site
SMP	Site Management Plan
SQL	sample quantitation limit
SRC	site-related chemical

SRG	soil remediation goal
SVOC	semivolatile organic compound
TEQ	toxicity equivalent
TPH	total petroleum hydrocarbons
Tronox	Tronox, LLC
Trust	Nevada Environmental Response Trust
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

Units

ft	feet
mg/d	milligram per day
mg/kg-d	milligram per kilogram per day
ppt	part per trillion

1. INTRODUCTION

This interim report presents the preliminary identification of chemicals of potential concern (COPCs) in soil for evaluation in the baseline health risk assessment (BHRA) being prepared for the Facility Area (defined below) at the Nevada Environmental Response Trust (NERT or the Trust) Site (the Site) located in Henderson, Nevada. This report has been prepared by ENVIRON International Corporation (ENVIRON) on behalf of the Trust.

The Facility Area comprises a 265-acre portion of the Site that excludes Parcels C, D, F, G, and H (Figure 1). Tronox, LLC (Tronox) currently leases from the Trust approximately 114 acres of the Site on which it operates a chemical manufacturing business. As shown on Figure 1, the Tronox leased area is within the Facility Area; three subtenants to Tronox also conduct operations within the Facility Area. Buildings, ponds, and other site features are shown on Figure 2. The Remedial Investigation/Feasibility Study (RI/FS) Work Plan (ENVIRON 2014b) for the Site includes detailed descriptions of the operational history, physical setting, climate, geology and hydrogeology, and surface water at the Site.

A key step of the BHRA is the selection of COPCs for which cancer risks and noncancer hazards will be quantitatively evaluated. The COPC selection process includes the application of steps identified in risk assessment guidance from the U.S. Environmental Protection Agency (USEPA 1989), but also includes elements of professional judgment. Given the size and complexity of the Site, the Trust would like to receive early input from the Nevada Division of Environmental Protection (NDEP) on this step before continuing with the quantitative steps of the BHRA, all of which depend on the selected COPCs.

A BHRA work plan for the Facility Area was submitted to NDEP on February 28, 2014, and approved by NDEP on May 20, 2014. Section 4.1 and Appendix B of the work plan (ENVIRON 2014a) describe the COPC selection process for soil and soil gas.[1] The scope of this interim report is the preliminary identification of COPCs for soils. In accordance with the NDEP-approved work plan, preliminary COPCs are selected using the "historical soil data" for the Facility Area, defined herein as the analytical results from soil samples collected from 2006 (beginning with the Phase A Source Area Investigation [Phase A investigation]) through August 2011, when the confirmation sampling for the 2011 interim soil removal action was completed. Samples excavated during the 2011 interim soil removal action (and samples associated with other activities at the Facility Area) that are no longer representative of current conditions are excluded from the data set that will be used for the BHRA, including COPC selection. The analytical results from soil samples collected as part of activities completed since August 2011, including those collected during the 2014-2015 RI data gap investigation (ENVIRON 2014c) are not included in the data set for this preliminary identification of COPCs, but will be included in the data set used for the final selection of COPCs presented in the BHRA.

The following elements are included in this interim report:

- Section 2 presents a summary of the soil investigations and interim soil removal actions that have been conducted at the Facility Area from 2006 through August 2011. As noted above, preliminary COPCs are identified using the analytical results from these investigations.

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[1] It is anticipated that for soil gas, all analytes detected in one or more samples will be identified as COPCs.

Contaminated soils identified during these investigations were removed pursuant to a 2009 NDEP Order (NDEP 2009e) requiring the removal of all impacted soil from the Site by the end of 2010 to minimize potential health risks. This preliminary selection of COPCs for the forthcoming BHRA is therefore based on sampling results from areas or soil depth intervals that were not removed (referred to as “remaining soil samples” or the “post-excavation data set”) and areas designated as Excavation Control Areas (ECAs). As discussed in previous reports (see for example, ENVIRON 2013a), access or other constraints precluded soil excavation in some areas of the Site that had been identified for excavation during the 2010-2011 interim soil removal action. These areas were designated as ECAs.

- Section 3 presents summary statistics for the “remaining soil samples.”
- Section 4 describes the COPC selection process and presents preliminary lists of COPCs. For this evaluation, COPCs are identified for two subareas within the Facility Area (see Figures 3 and 4):
  1. Outside ECA soils: These soils include noncontiguous areas that encompass approximately 47 acres comprising all areas of the Facility Area other than remediation zone (RZ)-A and the ECAs.
  2. Inside ECA soils: These soils include noncontiguous areas that encompass approximately 85 acres and include the 37 ECAs[2] identified in the Site Management Plan (SMP) (ENVIRON 2013a).

As described in Section 2.2, a health risk assessment (HRA) was previously conducted for RZ-A (134 acres);[3] this area will therefore not be included the BHRA. The division of the remainder of the Facility Area into two general subareas (i.e., outside ECA soils and inside ECA soils) reflects the different exposure pathways that will be evaluated for these areas. As identified in the conceptual site model (CSM) presented in the BHRA work plan, inhalation of soil particulates will be the only pathway evaluated for the ECAs.[4]

- Section 5 describes the process that will be used to identify exposure units (or subareas) in the BHRA and presents spatial plots for select COPCs.
- Section 6 summarizes the results of the preliminary COPC selection process.

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[2] Thirty-eight ECAs were designated following completion of the interim soil removal action. Following a soil removal action at ECA E-3 (Eastern End of the Beta Ditch) in October 2013 (ENVIRON 2014), this area is no longer identified as an ECA.

[3] The acreages of the outside and inside ECA area and RZ-A sum to 266 acres and not the total Facility Area acreage of 265 acres because of rounding.

[4] For reference, the CSM (Figure 3 from the BHRA work plan) is included in Appendix A of this interim report.

2. SOIL INVESTIGATIONS AND REMOVAL ACTIONS CONDUCTED SINCE 2005

The following sections provide an overview of soil investigations and soil interim removal actions conducted within the Facility Area from 2006 through August 2011. The BHRA will rely on the soil analytical results from these investigations (excluding all sampling results from soils that have been excavated during implementation of interim soil removal actions). The analytical results from soil samples collected after completion of the interim soil removal action in August 2011 (including samples collected as part of the ongoing 2014-2015 RI data gap investigation [ENVIRON 2014c]), are not included in the data set for this preliminary identification of COPCs, but will be included in the risk assessment data set used for the BHRA.

2.1 Soil Investigations

In 2005, a CSM report was prepared for the Site that integrated information from the soil and groundwater investigations conducted to date to document information on site-specific sources, release mechanisms, transport pathways, exposure routes, and potential receptors (ENSR Corporation [ENSR] 2005). Site investigations conducted since completion of the 2005 CSM have included primarily the Phase A and Phase B Source Area Investigations (Phase A and Phase B investigations) to further characterize soil, groundwater, and soil gas across the Site (ENSR 2007 and 2008; Neptune and Company [Neptune] 2010; and Northgate 2010a,b,c,e).

The objectives of the Phase A and B investigations were to refine the 2005 CSM, further characterize site conditions, and provide data for future risk assessments. To identify and characterize the distribution of site-related chemicals (SRCs) in soils, the investigation focused on soil conditions associated with 192 SRCs identified in the 2005 CSM report and their suspected source areas. A total of 127 soil samples were collected from 27 suspected source area locations in November and December 2007. The sample locations were selected based on results of past site investigations (ENSR 2005), information on chemical use at the Site, and the 70 Letter of Understanding (LOU) study areas identified by NDEP in 1994 (NDEP 1994). In addition to the 192 SRCs previously identified, 44 additional constituents were analyzed and reported by the laboratory.

During the Phase A investigation, soil samples were collected at depths of 0.5 to 1 ft, and at 10 ft intervals thereafter, until groundwater was encountered (ENSR 2006). The samples were analyzed for metals; volatile organic compounds (VOCs), including fuel oxygenates; semivolatile organic compounds (SVOCs); polychlorinated biphenyls (PCBs); dioxins and furans; total petroleum hydrocarbons (TPH as gasoline, diesel, and oil range organics); organochlorine herbicides (OCHs); organochlorine pesticides (OCPs); and organophosphate pesticides (OPPs). In addition, analyses were conducted for radionuclides, asbestos (surface soil samples only), and wet chemistry constituents. Not all samples were analyzed for all analytes, and at some locations, samples were collected at more frequent depth intervals. Samples were also collected from the manganese ore and tailings stockpile (Figure 2) for analysis of metals and radionuclides. In addition, two near surface (1.5 to 3 ft below ground surface [bgs]) soil samples were collected and analyzed for physical and geotechnical parameters.

The objective of the Phase B investigation was to further characterize and evaluate the LOUs in the Facility Area and their potential impact on soil conditions based on the results of the Phase A investigation. Samples were collected at initial soil depths of 0.5 and 10 ft bgs, at the capillary fringe, and the midpoint between the capillary fringe and 10 ft bgs, without exceeding 20 ft between each vertical sample (AECOM, Inc. 2008). Judgmental samples were collected at 0.5 and 10 ft bgs in locations where certain surface features were noted, including minor stains or above ground pipelines. Soil samples were analyzed for the following analytical groups and analytes: metals, VOCs, SVOCs, organic acids, PCBs and PCB congeners, dioxins/furans, OCPs, OPPs, TPH, chlorate, perchlorate, cyanide, hexavalent chromium, formaldehyde, and radionuclides. In addition, based on the findings of the Phase A investigation, samples collected from 0 to 2 inches bgs and analyzed for asbestos fibers, and samples collected from 0 to 0.5 ft bgs were analyzed for dioxins/furans. Samples for wet chemistry and geotechnical parameters were also collected (Northgate 2010a,b,c,e,f).

Supplemental sampling of shallow soils was conducted in December 2009 in accordance with two Tronox memoranda entitled, Scope for Additional Sampling of Area I and Scope for Additional Sampling of Area II (Northgate 2009a, Northgate 2009b, approved by NDEP on November 24, 2009 and December 14, 2009, respectively). A total of 129 soil samples were collected at Phase B locations where contaminants exceeded Nevada Basic Comparison Levels (BCLs) in order to provide information for excavation planning and to supplement post-excavation confirmation sampling (Neptune 2010).

2.2 Interim Soil Removal Actions

The results of the Phase A and B investigations identified a number of constituents within the upper 10 ft of soil with reported concentrations in excess of NDEP worker BCLs or modified risk-based goals (as agreed upon by NDEP), which were collectively referred to as “soil remediation goals” (SRGs). These constituents included metals; SVOCs, including hexachlorobenzene; PCBs; OCPs; dioxin toxicity equivalents (TEQs); asbestos; and perchlorate. Based on these findings, a detailed scope of work for a soil removal action was presented in the Removal Action Work Plan for Phase B Soil Remediation of Remediation Zones RZ-B through RZ-E (the RAW) (Northgate 2010j).

For purposes of soil excavation activities, the main contaminated portions of the Facility Area were divided into five separate RZs (see Figure 4) roughly based on geographic groupings of elevated detections of contaminants and CSM considerations (Northgate 2010f):

- RZ-A: the area on the southern portion of the Site;
- RZ-B: the area around the Unit Buildings;
- RZ-C: the ammonium perchlorate (AP) production area, Koch Materials area, pond and diesel storage tank area, and manganese tailings area;
- RZ-D: the former Trade Effluent ponds and AP pad/drum recycling area (including the former hazardous waste landfill); and
- RZ-E: the Beta Ditch.

For RZ-A, the results of a soil HRA (Northgate 2010i) indicated that exposures to residual chemicals in the upper 10 ft of soil were below NDEP’s point of departure for noncancer effects (i.e., a hazard index of 1) and cancer risks (i.e., a risk of one-in-a-million [1×10^{-6}]) for indoor commercial workers, outdoor commercial/industrial workers, and construction workers. The upper-bound estimated risks for death from lung cancer or mesothelioma for asbestos exposures to outdoor commercial/industrial workers were less than or equal to 1×10^{-6} for chrysotile and amphibole fibers. The best estimate and upper-bound estimates for asbestos exposures to construction workers were less than or equal to 1×10^{-6} for chrysotile fibers and ranged from zero to 6×10^{-5} for amphibole fibers. Based on the HRA results, RZ-A was not included in the interim soil removal program.

For RZ-B through RZ-E, Voronoi/Thiessen polygons were generated to define areas with SRG exceedances (Northgate 2010j). The general remediation strategy consisted of excavation of soils within designated polygons, sampling of discolored soil, removal of discolored soil if above SRGs or otherwise deemed appropriate to remove, and designation of ECAs for inaccessible areas, including certain areas with COPCs and/or discolored soil left in place.

To further define the polygons or areas identified for excavation, pre-confirmation sampling was conducted in spring 2010 in accordance with a pre-confirmation sampling work plan (Northgate 2010f). Two types of borings were advanced during the pre-confirmation sampling program, including (1) 84 borings at existing locations (adjacent to Phase A and B sampling locations) and (2) 91 borings at new locations. Data from “existing locations” were used to establish polygon depths, while data from “new locations” were used to define the horizontal extent and vertical delineation of excavation of near-surface soils (0 to 10 ft bgs).

Discolored soil was encountered in various locations during removal activities. Based on the location of the discolored soil, available analytical results from adjacent or nearby areas, the anticipated extent of discolored soil, and the excavation activities currently in progress, some areas of discolored soil were removed. Other areas of discolored soil were sampled and evaluated to determine if the soil should be removed or left in place in accordance with the *Work Plan for Evaluation of Discolored Soil and Confirmation Soil Sampling in Visually-Impacted Areas* (ENVIRON 2011). Following the removal of discolored soil, confirmation soil samples were collected to verify that remaining COPC soil concentrations were below SRGs. If the analytical results indicated that concentrations were above SRGs, additional soil was typically removed and additional confirmation soil sampling performed.

An interim removal action was also conducted at the manganese tailings pile area, as presented in *Manganese Tailings Removal Technical Memorandum* (Northgate 2012). The manganese tailings pile area is located in RZ-C within the Facility Area, north of the Manganese Leach Plant and south of the former Mn-1 Pond (Figure 2). The area is approximately 8.6 acres and was used from 1975 through 2004 for the disposal of manganese tailings from the leach plant process. Manganese tailings material from all locations at the Site were consolidated to this location and covered with soil sometime prior to 1985. Since 2004, manganese tailings from the Tronox operations (current tailings production) have been shipped to an off-site landfill.

A total of 284,232 tons of tailings and minor debris were removed from the manganese tailings pile. In accordance with a request from NDEP, a confirmation sampling program was implemented subsequent to tailings removal. Based on the results of the confirmation sampling program, additional shallow soil excavation was conducted concurrent with Phase B soil remediation in accordance with the RAW and Appendix A of the *Revised Excavation Plan for Phase B Soil Remediation of RZ-C, Addendum to the Remedial Action Work Plan* (Northgate 2010k). The post-confirmation sampling excavation was conducted to address soil that contained concentrations of arsenic, cobalt, manganese and/or asbestos that exceeded SRGs.

Overall, a total of approximately 500,000 cubic yards of tailings and soil up to a depth of 10 ft bgs were removed in 2010 and 2011 (ENVIRON 2014b).

Analytical results for soil samples in areas not removed during the interim soil removal actions and that remain representative of current conditions are being reviewed for usability in the BHRA. Specifically, these samples include any “remaining samples” from the current 0-10 ft depth interval collected as part of the Phase A and B investigations and the associated pre-confirmation sampling, and confirmation samples from the interim soil removal action and the manganese tailings removal program.

3. RISK ASSESSMENT DATA SET

This section describes the sources of the soil analytical data that are used for the preliminary selection of COPCs. For this interim report, the data usability evaluation step has not been completed and is therefore not presented. For the COPC selection step in the forthcoming BHRA, only data of appropriate quality to meet the specific objectives of the evaluations will be used. It is noted that given the large data set available for soils at the Facility Area, we do not anticipate that data quality issues will result in significant alteration of the preliminary lists of COPCs identified in this interim report.

3.1 Data Sources

The data set for soil comprises analytical results that are representative of current conditions at the Facility Area. Specifically, the data set includes “remaining” Phase A and B soil samples and pre-confirmation soil samples collected from the current 0 to 10 ft depth interval. In addition, remaining confirmation samples collected to inform the interim removal actions are included in the BHRA soil data set. As noted previously, analytical results for soil samples collected in 2014 and 2015 as part of the RI data gap investigation have not been included in the data set used for this preliminary identification of COPCs, but will be included in the data set used for the final selection of COPCs in the BHRA.

The analytical results from historical investigations are reported in the following:

- Phase A Source Area Investigation Results Report (ENSR 2007);
- Revised Data Validation Summary Report (DVSR) for Shallow Supplemental Soil Sampling in Areas I and II (Neptune 2010);
- Revised DVSR, Phase B Investigation Area I Soil (Northgate 2010a);
- DVSR, Phase B Investigation Area II Soil (Northgate 2010b);
- DVSR, Phase B Investigation Area III Soil (Northgate 2010c);
- Revised DVSR, Phase B Investigation Area IV Soil (Northgate 2010e);
- DVSR, Additional Pre-Confirmation Sampling (Northgate 2011);
- DVSR, Revision 4, February to August 2011 Soil Remediation Completion Sampling (ENVIRON 2013c); and
- DVSR for Asbestos Data Associated with the DVSR, February to August 2011, Soil Remediation Completion Sampling (ENVIRON 2013d).

3.2 Data Analysis

As described by NDEP (2010), the purpose of the data analysis step is to “use simple exploratory data analysis to compare data to the expectations of the CSM, to determine if the data adequately represent the source terms and exposure areas or evaluation areas.” As part of the data analysis step, ENVIRON completed a comprehensive review of the soil samples collected and reported in the data sources identified in Section 3.1. The review included identification of the areas and associated samples that were removed during the interim soil and manganese tailings removal actions described in Section 2.2. Sample depths (as reported in the original investigation) were then reviewed and the top and bottom depths were re-assigned, as needed, to reflect the post-excavation depth. For example, a sample with a pre-excavation top depth of 10 ft bgs in an area for which soil was excavated to 8 ft bgs and then backfilled with 5 ft of clean soil, was reassigned a top depth of 7 ft bgs.

Following the processing of the soil data, summary statistics were prepared for the soil data that remain representative of current conditions within the Facility Area. In developing the summary statistics, soil samples with primary and field duplicate results were treated as independent samples. This approach is consistent with Option 2 in NDEP’s guidance for field duplicates and field splits

(NDEP 2008a). As noted in the guidance, field duplicate samples represent a discrete and unique measurement of soil chemical conditions proximal to the primary sample (unlike split samples). Consistent with NDEP guidance, the field duplicates will be compared to the primary sample during the course of data validation and a determination will be made regarding whether it is reasonable to treat field duplicates as independent samples.

Separate tables of summary statistics were prepared for outside ECA soils and inside ECA soils (Figure 3), as presented in Tables 1 through 6. The information provided in each table is described below:

- Table 1 – presents summary statistics for the current 0 to 10 ft depth interval for chlorine oxyanions, metals, other inorganics, and radionuclides for outside ECA soils;
- Table 2 – presents summary statistics for the current 0 to 10 ft depth interval for all detected organic compounds, excluding dioxin, furan, and PCB congeners for outside ECA soils;[5]
- Table 3 – presents summary statistics for asbestos surface soil samples in outside ECA soils (*Table 3 is not included in this submittal*);[6]
- Table 4 – presents summary statistics for the current 0 to 2 ft depth interval for chlorine oxyanions, metals, other inorganics, and radionuclides for inside ECA soils;[7]
- Table 5 – presents summary statistics for the current 0 to 2 ft depth interval for organic compounds, excluding dioxin, furan, and PCB congeners for inside ECA soils;[2] and
- Table 6 – presents summary statistics for asbestos surface soil samples in inside ECA soils (*Table 6 is not included in this submittal)*.

For most analytes, the post-remediation data set for outside ECA soils (i.e., the 0-10 ft depth interval) includes results from 200 to over 500 samples, although for other analytes (particularly those not expected to be site-related) the analytical data set is much more limited. For inside ECA soils, results are available for approximately 65 to over 100 samples, depending on the specific analyte. A summary of the asbestos sampling results is not presented in this interim report, but will be included in the BHRA. As discussed in Section 4.4, asbestos is identified as a COPC based on our preliminary review of the data.

Sample locations are shown on Figures 5 and 6 for outside ECA soils and inside ECA soils, respectively.

Preliminary spatial plots of the data are presented in Section 5 for NDEP review and comment. Other elements of the data analysis step described in the BHRA work plan are not presented in this interim report but will be included in the BHRA report.

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[5] Tables 2 and 5 include summary statistics for dioxin TEQs; the TEQs include the contribution from PCB congeners with dioxin-like activity. The BHRA report will include an appendix that presents summary statistics for all analytes sampled (including nondetects) and the results of the PCB congener analyses.

[6] Ramboll Environ is currently reviewing the asbestos results. In the interim, asbestos is tentatively identified as a COPC.

[7] As described in Section 4, the inside ECA soil COPCs are identified based on the 0-2 ft depth interval.

4. PRELIMINARY IDENTIFICATION OF SOIL COPCS

COPCs are identified separately for outside ECA soils and inside ECA soils. For outside ECA soils, it is assumed that soil in the 0 to 10 ft depth interval could be brought to the surface during excavation or other activities. The CSM presented in the BHRA work plan identified the following pathways for quantitative evaluation: soil ingestion, dermal contact with soil, and inhalation of airborne particulates (ENVIRON 2014a). As stated previously in this report, COPCs for outside ECA soils are identified based on the analytical results for the current (post-remediation) 0 to 10 ft depth interval.

For inside ECA soils, inhalation of airborne soil particulates is the only pathway identified in the CSM for quantitative evaluation, in accordance with the NDEP-approved BHRA work plan. The SMP (ENVIRON 2013a) describes measures that are being implemented to mitigate risks to human health as related to potential exposure to any residual chemicals (i.e., COPCs) in ECA soils during periods of typical operations and nonconstruction activity. However, in unpaved ECA areas, these measures do not necessarily address the inhalation pathway (more specifically, inhalation of fugitive dusts). Although fugitive dusts are typically released from only the top few centimeters of exposed soils, the COPCs for inside ECA soils are conservatively identified based on the analytical results for the current (post-remediation) 0 to 2 ft depth interval. The impact of using this depth interval for COPC selection will be discussed in the uncertainties section of the forthcoming BHRA.

For both outside and inside ECA soils, the COPC selection process is based on those analytes detected in one or more soil samples. A discussion of the uncertainties in the risk estimates resulting from the exclusion of chemicals reported as less than detection limits in all soil samples will be included in the uncertainties discussion of the BHRA.

The same steps are used to identify COPCs for both outside ECA and inside ECA soils, as follows:

- Step 1: Background evaluation – for metals and radionuclides, a background evaluation is conducted to evaluate site concentrations relative to background levels. Consistent with USEPA guidance (USEPA 1989), metals and radionuclides are eliminated as COPCs if concentrations are consistent with background levels. Metals and radionuclides present at concentrations greater than background are further screened under Step 2.
- Step 2: Concentration/Toxicity screen – a concentration/toxicity screen is conducted to identify those chemicals that could contribute significantly to the cancer risk and noncancer hazard estimates, considering both the maximum detected concentration in soil and chemical-specific toxicity. Chemicals that “fail” this screen (i.e., are present at concentrations above screening criteria) and those that do not have screening criteria are further screened under Step 3. Chemicals that “pass” this screen are eliminated as COPCs.
- Step 3: Chemical-specific evaluation – for chemicals not eliminated based on Steps 1 and 2, additional analyses are conducted on a case-by-case basis to evaluate whether a chemical can be excluded based on consideration of frequency of detection and other factors. In addition, metals for which a background data set is not available (such that the metal cannot be screened under Step 1) and chemicals for which BCLs are not available (such that a concentration/toxicity screen cannot be conducted) are evaluated for possible exclusion.

Each of these steps is described in the following sections.

4.1 Step 1 – Background Evaluation

Consistent with USEPA guidance (1989, 1992a,b), analytical results for metals and radionuclides were evaluated relative to background concentrations to identify those constituents present at concentrations consistent with background levels and those present at concentrations greater than background levels. Separate background evaluations were performed for outside ECA and inside ECA soils.[8]

RZ-A analytical results for 0-10 ft soils are used as the background data set for metals, consistent with the background data set identified in the NDEP-approved BHRA work plan (ENVIRON 2014a). A detailed discussion of this data set is presented in the Revised Technical Leaching Memorandum (Northgate 2010l). In summary, 31 samples were collected from 14 borings in RZ-A as part of the Phase B investigation; 16 of these samples were collected between 0 and 2 ft bgs and 15 samples were collected between 10 and 11.5 ft bgs. Consistent with the background evaluation conducted for Parcels C, D, F, G, and H (Northgate 2014), one Phase A boring (SA02) and five Phase B borings (RSAU4, RSAU5, SA28, SA146, and SA147) were excluded from the RZ-A background set. Concentrations of boron and other metals (arsenic, chromium, cobalt, iron, molybdenum, nickel, platinum, and sodium) were elevated in these samples, located in LOU 62 (former State Industries, Inc., identified as a boron source area).[9]

The RZ-A samples identified for the metals background evaluation are also used for the radionuclide background evaluation. We note that the NDEP-approved BHRA work plan stated that the McCullough background data set presented in Background Shallow Soil Summary Report, BMI Complex and Common Area Vicinity (Basic Remediation Company and Titanium Metals Corporation 2007) would be used for the radionuclide background evaluation. However, in recent NDEP comments on the Parcels HRA (NDEP 2015b), NDEP clarified that the RZ-A data set should also be used for the radionuclide background evaluation.

Exploratory data analysis was performed using summary statistics (NDEP 2008b), normal and log-normal quantile to quantile (Q-Q) plots, and side-by-side box-and-whisker plots. These plots are included in Appendix C. Normal and log-normal Q-Q plots provide a visual assessment of how closely the data follow a normal or log-normal distribution. Data points that fall roughly on a straight line may be considered to follow a normal or log-normal distribution. Both background and site data are included on these plots such that the Q-Q plots provide a direct visual comparison of the two distributions. A curve that is higher in the vertical direction indicates a higher distribution of values (USEPA 2002). The Shapiro-Wilk test was used to more formally evaluate the consistency of each data set with a normal or log-normal distribution.

Side-by-side box-and-whisker plots (box plots) provide a visual comparison between outside ECA and inside ECA soil data and background data. For each data set, the “box” in the box-and-whisker plot encompasses the central 50 percent of the results (i.e., the results from the 25th to 75th percentiles, or equivalently, between quartile 1 [Q1] and quartile 3 [Q3]). Substantial overlap between the boxes for background and site data indicates that the site data may not be significantly different from background. The whiskers demarcate one “step” above the 75th percentile and one step below the 25th percentile. One “step” is defined as 1.5 times the interquartile range (IQR, the difference between the 75th and 25th percentiles). Data points above and below the whiskers are considered

[8] As described in Section 1, there are currently a 37 ECAs at the Site. The 37 ECAs are treated as a single exposure unit for COPC selection.

[9] Although metals concentrations in these samples were elevated relative to background, the results of the RZ-A HRA indicated that exposures to residual chemicals in the upper 10 ft of soil were below risk levels of concern (see Section 2.2 of this interim report).

potential outliers from the distribution and are shown on the plots as open circles for non-detected values and as crosses for detected values. As used here, "outliers" may indicate potential hotspots for spatial analysis.

The computer statistical software program Guided Interactive Statistical Decision Tools (GiSdT®) was used to perform all statistical tests.10 Specifically, statistical background comparisons were performed using the t-test, Gehan test, Quantile test, and Slippage test. This suite of tests is sometimes referred to as "Gilbert's Toolbox." The t-test is a parametric test, i.e., an underlying condition is that the data or log-transformed data are normally distributed. In contrast, the Gehan test, Quantile test, and Slippage test are nonparametric, and thus do not require that the data are normally or log normally distributed (USEPA 2002; NDEP 2009c). These tests are described below:

- The two-sample t-test tests for equality of the means of site and background concentrations. An underlying assumption of the test is that concentrations are normally distributed for both data sets.
- The Gehan test is a modification of the Wilcoxon Rank Sum test that evaluates the difference between the sums of the ranks for two populations. This is a nonparametric method for assessing differences in the centers of the distributions that relies on the relative rankings of data values. This test has less power than the two-sample t-test when the data are normally distributed, but the assumptions are not as restrictive. The GiSdT® version of the Gehan test uses the Mantel approach for ranking the data, which is equivalent to using the Gehan ranking system. The Gehan ranking system is used to rank non-detects with the detected concentrations (NDEP 2009c).
- The Quantile test evaluates "tail effects" that are not specifically considered in the Wilcoxon Rank Sum test. The Quantile test looks for differences in the right tails (upper end of the distribution), rather than evaluating central tendency. The Quantile test was performed using a defined quantile of 0.80, consistent with the approach used in the Parcels HRA.
- The Slippage test looks for a shift to the right in the extreme right tail of the background data set as compared with the extreme right tail of the site data set. This test determines whether the number of site samples with concentrations greater than the maximum background concentration is greater than would be expected statistically if the site and background distributions were the same.

For this preliminary screen, primary samples and field duplicates were treated as independent samples. NDEP guidance (2008a) recommends including field duplicates in a data set when the variance of the duplicates is similar to the variance of the primary samples. The assumption of similar variance has not yet been examined, but will be reviewed prior to submittal of the BHRA report. Consistent with NDEP guidance (NDEP 2008b, NDEP 2009c), non-detect results are set equal to one-half the limit of detection for the parametric tests and equal to the detection limit for the non-parametric tests. Substitution is not required for the non-parametric tests, which use the Gehan ranking scheme to rank non-detects. For the *t*-test, the Gehan ranking scheme cannot be used; in comments on Revision 2 of the Parcels C, D, F, G, and H HRA, NDEP stated that the value of one-half the detection limit for non-detects is preferred (NDEP 2013X). For all tests, the sample quantitation limit (SQL) is used as the detection limit, as recommended in NDEP guidance (NDEP 2008b).

4.1.1 Metals

The background (RZ-A) data set includes results for 32 metals. The background evaluation for these metals is presented in Appendix C, as follows:

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[10] Neptune provided Ramboll Environ with a copy of the GiSdT® program used for the statistical evaluation.

- Table C1 presents summary statistics for each metal, including the total number of samples, number of detections, percent detections, minimum detected value, maximum detected value, median, mean, and standard deviation. Consistent with NDEP guidance (NDEP 2008b), the median, mean, and standard deviation are calculated based on detected concentrations only. The results of the Shapiro-Wilk test are also presented.
- Table C2 includes the p-values for the four statistical tests and the overall determination as to whether outside ECA and inside ECA soil concentrations are greater than background levels. (Five results are shown in the tables because the *t*-test was performed twice, once on the raw data set and once on the log-transformed data set).
- Figures C1-1 through C1-32 present the boxplots for metals in background soils, inside ECA soils (upper 2 ft) and outside ECA soils (upper 10 ft).
- Figures C2-1A through C2-32B present normal and lognormal Q-Q plots for metals in background soils, inside ECA soils (upper 2 ft), and outside ECA soils (upper 10 ft).

For metals with highly censored data sets (antimony, boron, chromium VI, selenium, silver, and tin), visual inspection of the box plots and Q-Q plots was an important component of the background evaluation, in addition to the Gilbert's Toolbox tests. A default significance level of alpha = 0.05 is used to evaluate the statistical significance of the Gilbert's Toolbox results (NDEP 2009c). As part of Step 3 of the COPC selection process, the value of 0.05 is revisited for all metals and radionuclides not excluded in Step 2 (the concentration/toxicity screen). This additional review recognizes that as more statistical tests are performed, the probability of making a Type I error would be greater than 0.05 (NDEP 2009c), i.e., it is more likely that a statistically significant result will be obtained purely by chance.

As noted above, the background evaluation was performed separately for outside ECA soils and inside ECA soils. For each area, all metals identified as being greater than background are evaluated further in the COPC selection process (Section 4.2) and all metals identified as being consistent with background are excluded as COPCs. Finally, all metals (or other reported elements) for which a background data set was not available are carried through to the next step of the COPC selection process.

As noted previously, NDEP identified the RZ-A data set as appropriate for the background evaluation and this data set was set was used for the Parcels C, D, F, G, and H background evaluation. However, in reviewing the box-and-whisker plots, and in particular, the Q-Q plots, it became apparent that for some metals, "outliers" in the background data set impacted the evaluation. For example, for antimony, lead, and copper, visual observation suggests that one or more data points in the background data set should be excluded. Further, visual observation of the plots for the site data suggests that for some metals, concentrations are elevated above background although the statistical tests indicate that concentrations are consistent with background. For purposes of COPC selection, several metals were carried forward to Step 2 of the COPC selection process even though statistical testing (presented in Table C.2) indicated that the metals were present at levels consistent with background. The impact of this conservative approach is discussed in Section 6.1.

The results for Step 1 of the COPC selection process (i.e., the Background Evaluation) for metals are summarized in Table 7. The table identifies those metals that have been excluded as COPCs and those that are carried forward to Step 2 (Concentration/Toxicity screen) of the COPC selection process for outside ECA soils and inside ECA soils.

4.1.2 Radionuclides

The background (RZ-A) data set includes results for the long-lived radionuclides in the uranium (U)-238 decay series (U-238, U-234, thorium [Th]-230, and radium [Ra]-226) and in the Th-232 series (Th-232, Th-228, and Ra-228). The RZ-A background data set also includes data for U-235, but not for the U-235 decay chain. NDEP guidance (2009a) notes that most isotopes of the U-235 decay chain are barely discernable from the minimal detectable concentrations.

The background evaluation of these radionuclides is presented in Appendix C, as follows:

- Table C3 presents summary statistics for each radionuclide, including the total number of samples, number of detections, percent detections, minimum detected value, maximum detected value, median, mean, and standard deviation. Consistent with NDEP guidance (NDEP 2008b), the median, mean, and standard deviation are calculated based on detected concentrations only. The results of the Shapiro-Wilk test are also presented.
- Table C4 includes the p-values for the four statistical tests and the overall determination as to whether outside ECA and inside ECA soil concentrations are greater than background levels.
- Tables C5a and C5b present the results of the equivalence testing for secular equilibrium of the uranium decay series (U-238 chain) and thorium decay series (Th-232 chain), respectively.
- Table C6 presents the correlation matrices for the uranium decay series and the thorium decay series;
- Figures C1-33 through C1-40 present the boxplots for radionuclides in background soils, inside ECA soils (upper 2 ft) and outside ECA soils (upper 10 ft).
- Figures C2-33A through C2-40B present normal and lognormal Q-Q plots for radionuclides in background soils, inside ECA soils (upper 2 ft), and outside ECA soils (upper 10 ft).

The decision framework outlined in Figure 1 of *Guidance for Evaluating Radionuclide Data for the BMI Plant Sites and Common Area Projects* (NDEP 2009a) was applied to the radionuclide COPC selection process. (For reference, Figure 1 of the guidance is presented in Appendix D of this interim report.) The first step is the evaluation of secular equilibrium in accordance with *Guidance for Evaluating Secular Equilibrium at the BMI Complex and Common* Areas (NDEP 2009b). Secular equilibrium is defined by the International Union of Pure and Applied Chemicals (IUPAC) as “Radioactive equilibrium where the half-life of the precursor isotope is so long that the change of its activity can be ignored during the period of interest and all activities remain constant” (IUPAC 1997). In other words, the activity of each radionuclide within an isotope decay chain is essentially the same.

The results of the equivalence test for secular equilibrium of radionuclides are presented in Tables C5a and C5b. The tables include the *p*-value, a conclusion about secular equilibrium, the delta used, the sample size, the number of missing data pairs (if any), the mean proportions of radioactivity, lower and upper 95% confidence intervals, and data shifts (the value by which all negative activities are shifted upward toward zero, if this setting was used). The equivalence test analysis was performed using Neptune’s GiSdT® statistical analysis tool. The null hypothesis is that the radionuclides within a decay series are not in secular equilibrium. Per NDEP guidance (NDEP 2009b), the delta value (maximum deviation from equal proportions) was set to 0.10 based on NDEP evaluations of background data sets; a decay series was considered to be in secular equilibrium if the p-value was less than 0.05. As noted in the GiSdT® software documentation, the upper and lower confidence intervals are included primarily to show which radioisotopes are producing more/less radioactivity than the others, in case secular equilibrium is not shown. As shown in Tables C5a and C5b, the equivalence test indicates that the uranium decay series and thorium decay series are each in approximate secular equilibrium in soils outside ECA soil (from 0-10 ft bgs) and inside ECA soils (from 0-2 ft bgs), with one exception, the thorium decay series in inside ECA soils (from 0-2 ft bgs).

Based on the outcome of the evaluation of secular equilibrium, the decision framework was followed to identify radionuclide COPCs. It is noted that analytical methods were not identified as an issue for either the background or site data sets. Specifically, consistent with NDEP guidance (NDEP 2009a,b): (1) samples in both data sets were digested with hydrofluoric acid, (2) uranium and thorium isotopes and Ra-226 were analyzed using alpha spectroscopy, and (3) Ra-228 was analyzed using beta spectroscopy.

Table 8 summarizes the results of each step of the radionuclide selection process and identifies the radionuclides that are carried forward to Step 2 of the COPC selection process.

4.2 Step 2 – Concentration / Toxicity Screen

As outlined in the BHRA work plan, the concentration/toxicity screen considers the toxicity of a chemical (specifically, whether it is a known human carcinogen) and whether it has been identified as a PBT (i.e., a chemical that is persistent, bioaccumulative, and toxic). It also considers the ratio of the maximum detected concentration to the worker BCL. Specifically,

- Chemicals that are human carcinogens or identified as a PBT: the chemical is excluded as a COPC if the ratio of the maximum detected concentration to the lower of the indoor and outdoor worker BCL is <0.01; all carcinogens/PBTs for which the ratio of the maximum detected concentration to the BCL is ≥0.01 are carried into Step 3 of the COPC selection process.
- All other chemicals: the chemical is excluded as a COPC if the ratio of the maximum detected concentration to the BCL is <0.1; all chemicals for which the ratio of the maximum detected concentration to the BCL is ≥0.1 are carried into Step 3 of the COPC selection process.

BCLs were not available for all chemicals detected in soils. Surrogates were identified for most, but not all chemicals for which a BCL was not available, as follows:

COPC	Surrogate
• Chromium (total)	Chromium III
• Phosphorus	Phosphorous acid
• m,p-Xylene	m-Xylene
• gamma-Chlordane	Chlordane
• 2,4'-DDE	4,4'-DDE
• Endosulfan I	Endosulfan
• Endosulfan sulfate	Endosulfan
• Endrin ketone	Endrin
• Tetrachlorvinphos	Stirophos
• Ethyl tert-butyl ether	Methyl tert-butyl ether

Additionally, for the following chemicals regional screening levels from USEPA (2015) were used in the absence of an NDEP BCL.

- 1,2,3-Trichlorobenzene
- 1-Methylnaphthalene
- 2-Methylnaphthalene
- Dimethoate

All chemicals for which a BCL or surrogate BCL was not available are carried forward to Step 3.

4.2.1 Outside ECA Soils

Table 9 lists all chemicals that were positively identified in at least one soil sample within the area outside of ECA soils, with some exceptions. Specifically, the metals and radionuclides determined to be present at concentrations consistent with background were not carried forward to Table 9. In addition, petroleum indicators (e.g., TPH) were not carried forward to Table 9, consistent with NDEP guidance (NDEP 2015a). NDEP recommends evaluating indicator chemicals for petroleum hydrocarbon mixtures (i.e., benzene, toluene, ethyl benzene, and total xylenes, frequently referred to as BTEX; methyl tertiary butyl ether (MTBE); and polycyclic aromatic hydrocarbons [PAHs]). These indicator chemicals were included in the analyses conducted for outside ECA soils. As shown in Table 2, over 500 samples were analyzed for PAHs and over 250 samples were analyzed for toluene and ortho-xylene. Not shown in Table 2 (because all results were reported as less than detection limits) are the results for benzene, ethyl benzene, and MTBE, which were also analyzed for in over 250 samples. These results will be provided in an appendix in the forthcoming BHRA.

Table 9 identifies whether the chemical is a carcinogen and/or PBT and the worker BCL. For each chemical, the ratio of the maximum detected concentration to the BCL is presented, and the final column indicates whether the chemical “passed” or “failed” the concentration/toxicity screen. Chemicals failing the screen and chemicals that could not be screened in the absence of a BCL are retained for screening in Step 3, and chemicals passing the screen are eliminated as COPCs. Of the 122 chemicals listed in Table 9, 85 chemicals passed, 30 chemicals failed, and 7 chemicals did not have a BCL. The 37 chemicals that failed or that did not have a BCL are further screened in Step 3.

4.2.2 Inside ECA Soils

Table 10 presents the same information as included in Table 9, but for inside ECA soils. Of the 77 chemicals listed in Table 10, 56 chemicals passed, 16 chemicals failed, and 5 chemicals did not have a BCL. For inside ECA soils, the 21 chemicals that failed or that did not have a BCL are further screened, as described below.

A second concentration/toxicity screen was conducted for the chemicals that failed the initial screen using the worker BCLs.[11] For the second screen, chemicals were screened against the inhalation BCLs for outdoor workers. Although this step was not identified in the NDEP-approved BHRA work plan, it is considered a defensible step for inside ECA soils for which inhalation of airborne soil particulates is the only pathway that will be quantitatively evaluated in the BHRA. As noted previously, the SMP identifies measures that are being implemented to mitigate risks to human health as related to potential exposures to COPCs in ECA soils during periods of typical operations and nonconstruction activity. These measures apply to direct contact pathways for soils (i.e., soil ingestion and dermal contact with soil), but do not specifically address the inhalation pathway.

Conceptually, the concentration/toxicity screen using inhalation BCLs for inside ECA soils is identical to the concentration/toxicity screen for outside ECA soils. For the two areas, the BCLs used for screening correspond to the area-specific exposure pathways that will be evaluated in the quantitative risk assessment conducted for that specific area.

The screen against inhalation BCLs is presented in Table 11. Of the 21 chemicals listed in Table 11, 7 chemicals passed, 4 chemicals failed, and 10 chemicals did not have an inhalation BCL. The 14

[11] The worker BCLs were derived based on ingestion of soils, dermal contact with soils, and inhalation of airborne soil particulates.

chemicals that failed or that did not have a BCL are further screened in Step 3 of the COPC selection process.

4.3 Step 3 – Chemical-specific Evaluations

Under this final step of the preliminary COPC selection process, each chemical not deleted in Steps 1 or 2 is examined individually to evaluate whether the chemical could be deleted based on consideration of other factors, e.g., low toxicity or low detection frequency. Most chemicals were retained as a COPC based on this evaluation, with only eight additional chemicals deleted (from outside and/or inside ECA soils), as discussed below.

Low toxicity: Some of the chemicals retained through this step of the COPC selection process are essential macronutrients or micronutrients, and/or are listed on the Generally Recognized as Safe (GRAS) list developed by the U.S. Food and Drug administration.[12] NDEP specifically identifies three such elements (calcium, potassium, and sodium) and notes that these elements typically do not need to be included in a risk assessment because of their low toxicity (NDEP 2013). Several chemicals (in addition to potassium and sodium) that were carried forward to Step 3 of the COPC selection process are also essential nutrients and/or on the GRAS list, as identified below:

- **Magnesium** (essential macronutrient, required in relatively large quantities; GRAS); although magnesium failed the concentration toxicity screen, the BCL of 100,000 milligrams per kilogram (mg/kg) is not based on toxicity, but instead is a predetermined "maximum" value for relatively nontoxic compounds. The calculated toxicity-based BCL is >1,000,000 milligram per kilogram per day (mg/kg-d) for outdoor workers. In addition, USEPA (1989) identifies magnesium as an essential nutrient that can be eliminated as a COPC based on its low toxicity);
- **Phosphate (total)** and **ortho-phosphate** (essential macronutrient, required in relatively large quantities; GRAS);
- **Potassium** (essential nutrient, GRAS);
- **Silicon** (essential nutrient; present in foods at a level of approximately 2 percent, with a typical dietary intake of 20-30 mg/d);
- **Sodium** (essential macronutrient, required in large quantities; GRAS); and
- **Sulfur, sulfate** (essential macronutrients, required in large quantities; high consumption from foods; GRAS).

Each of the above chemicals is excluded as a COPC based on its low toxicity.

No BCL/inadequate toxicity information: For outside and inside ECA soils, only two chemicals – palladium and octachlorostyrene – remain for which (1) a worker BCL (for all soil pathways) is not available to conduct the concentration/toxicity screen and (2) available toxicity information is inadequate to otherwise eliminate the analyte as a COPC. In addition, for inside ECA soils, for which the list of preliminary COPCs is based on inhalation BCLs, inhalation BCLs were not available for several chemicals. These chemicals are therefore retained as COPCs. In the absence of toxicity values, they will be evaluated qualitatively in the uncertainties assessment in the BHRA.

Low detection frequency: Although USEPA risk assessment guidance (USEPA 1989) allows for consideration of low frequency of detection (e.g., less than 5 percent) when identifying COPCs, low-frequency chemicals are retained pending spatial analysis and the identification of the subareas or exposure units that will be evaluated in the BHRA.

[12] http://www.fda.gov/food/ingredientspackaginglabeling/foodadditivesingredients/ucm091048.htm.

4.4 Asbestos and Dioxin Toxicity Equivalents

Summaries of the asbestos results in remaining soils samples are being compiled and will be presented in the forthcoming BHRA. Given that asbestos fibers have been reported in remaining soil samples, asbestos is identified as a COPC for both outside ECA soils and inside ECA soils.

As outlined in the NDEP-approved BHRA work plan, dioxin TEQs are identified as a COPC if residual TEQ concentrations exceed the site-specific target remediation goal of 2,700 parts per trillion (ppt). Northgate (2010g) derived this value based on results presented in *Results of Bioaccessibility Study for Dioxins/Furans in Soil*. The target value of 2,700 ppt was approved by NDEP as a site-specific, risk-based concentration for dioxin TEQs (Northgate 2010g) and replaces the target goal of 1 part per billion (ppb) (equivalent to 1,000 ppt) identified in the 2010 HRA Work Plan (see Appendix B of ENVIRON 2014a). To ensure consistency across data collected during different investigations and reported by different laboratories, Ramboll Environ calculated (or recalculated) dioxin TEQs for this data (specifically, using the results for dioxins, furans, and dioxin-like PCBs) using the World Health Organization (2005) toxicity equivalency factors (TEFs) scheme (van den Berg et al. 2006). Non-detects were addressed using the Kaplan-Meier approach from USEPA's TEQ calculator.[13]

4.5 Preliminary COPCs

The preliminary COPCs identified for outside ECA soils and inside ECA soils are listed in Table 12. For outside ECA soils, cancer risks and noncancer hazards will be quantitatively estimated for the 29 COPCs (chemicals and radionuclides) for which toxicity values are available or a surrogate toxicity value has been identified. For the two COPCs for which no toxicity values are available (palladium and octachlorostyrene), potential health risks will be discussed qualitatively in the uncertainties section of the BHRA. Asbestos is also identified as a preliminary COPC.

For inside ECA soils, cancer risks and noncancer hazards will be quantitatively estimated for the five COPCs for which inhalation toxicity values are available. The potential risks for the five COPCs for which inhalation toxicity values are not available will be discussed qualitatively in the BHRA uncertainties section.[14] Asbestos is also identified as a preliminary COPC for inside ECA soils. Radionuclides are not identified as COPCs for inside ECA soils given that radionuclide concentrations were consistent with background levels.

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[13] http://www.epa.gov/superfund/health/contaminants/dioxin/pdfs/About_the_TEQ_Calculators.pdf

[14] Ramboll Environ would appreciate receiving NDEP recommendations as to surrogate BCLs and/or toxicity values.

5. IDENTIFICATION OF EXPOSURE UNITS

Ramboll Environ is currently developing spatial plots to assess the need to divide outside ECA soils and inside ECA soils into exposure units or subareas. An exposure unit is defined as an area over which receptors are expected to integrate exposure when routinely present at a site. A subarea (in contrast to an exposure area) represents spatially contiguous areas or areas where statistical analysis of the data set identifies a hot spot or identifies an area in which statistical analysis of the data indicate the data are from of a single population.

It is anticipated that outside ECA soils will be divided into two or more subareas (or exposure units) for evaluation in the BHRA and that inside ECA soils will be evaluated as a single exposure unit. As outlined in the NDEP-approved BHRA work plan, the following approach will be used to identify the subareas:

1. Statistical and spatial analyses of the site-wide COPC data set will be conducted following the development of the "final" list of COPCs based on the preliminary lists presented in this interim report, updated to incorporate the results from the ongoing RI/FS data gap investigation.
2. Identification of subareas and/or exposure units based on consideration of the spatial distribution of individual and co-located COPCs as well as current and projected work areas and site cover (e.g., building footprints and pavement).

Figures 7 through 12 present preliminary spatial plots for six COPCs (arsenic, benzo[a]pyrene, hexachlorobenzene, manganese, perchlorate, and uranium). These figures are included for NDEP's review and comment. Each figure presents the following information:

- Areas occupied by ECAs;
- Areas excavated during the interim soil removal actions;
- A grid overlay, using 200 × 200 ft squares;
- Chemical concentrations: the concentration shown in each square is the maximum detected concentration for all samples within the square (from 0-10 ft bgs for outside ECA soils and from 0-2 ft bgs for inside ECA soils)[15]; concentrations are binned as follows:
  - dark green: concentrations <Q1;
  - light green: concentrations within the IQR;
  - gold: concentrations >Q3 and <(Q3 + 1.5 × IQR); and
  - orange: concentrations >(Q3 + 1.5 × IQR).
- Locations within the grid where concentrations are greater than worker BCLs.

It is emphasized that the plots are intended to be used only to support the identification of exposure units or subareas. It is anticipated that for those chemicals showing spatial patterns based on the initial set of plots, additional spatial evaluation would be conducted, for example, separate plots would be prepared by depth interval and the results for all samples would be presented.

[15] For this interim report, figures are provided for only the outside ECA area.

6. SUMMARY AND DISCUSSION

This interim report identifies preliminary lists of soil COPCs for evaluation in the forthcoming BHRA for the Facility Area. The preliminary COPCs were developed separately for outside ECA soils and inside ECA soils, following the approach outlined in the NDEP-approved BHRA work plan, except as noted below. The preliminary COPCs were selected based on the results from historical soil samples collected from 2006 through August 2011 (at the completion of sampling activities associated with the interim soil removal action). The final selection of COPCs in the BHRA will be based on both the historical samples and those collected since August 2011, with most of the additional data coming from the RI data gap investigation. The preliminary COPCs include chlorine oxyanions, metals, radionuclides, SVOCs, PAHs, PCBs, dioxin TEQs, and organochlorine pesticides.

6.1 Background Evaluation

As discussed in Section 4.1, NDEP requested that the RZ-A data set be used for background evaluations conducted at the Site (NDEP 2009e); the RZ-A data set was used for the Parcels C, D, F, G, and H background evaluation, as presented in Northgate 2013 and 2014. However, in reviewing the box-and-whisker plots, and in particular, the Q-Q plots for the background data sets, multiple populations and/or outliers were observed. That is, concentrations representative of background are expected to fall on a straight line on the Q-Q plots, with gaps or inflection points suggesting the presence of more than one population, and/or the presence of outliers. Typically, data points above the first inflection point on the plot would be eliminated from the background data set. Ramboll Environ's review of the plots suggests that this review and identification of possible outliers did not occur. For example, the normal and log-transformed Q-Q plots for antimony, copper, mercury, and molybdenum suggest that data indicative of the presence of multiple populations and/or outliers were not removed from the background data set.[16]

A second issue relates to highly censored data sets (i.e., data sets with a high percentage of non-detects). For these metals (for example, antimony, boron, tin), there is increased uncertainty in the statistical testing for background.

Recognizing the limitations in the background evaluation, more weight was placed on visual review of the box plots and Q-Q plots with some metals carried forward to Step 2 of the COPC selection process (the concentration-toxicity screen), even if statistical tests indicated that the metals were at levels consistent with background. This is a conservative approach, although it was recognized that most metals (unless significantly elevated above background levels) would be eliminated in Step 2 of the COPC selection process. That is, from a health perspective, most metal concentrations of concern are significantly above background levels. The notable exception is arsenic, which even when present at typical background levels, exceeds risk levels of concern. A careful review of the plots and statistical results for arsenic indicates that concentrations in some samples clearly exceed background.

6.2 COPCs for Inside ECA Soils

A second concentration/toxicity screen was conducted for the chemicals that failed the initial screen using the worker BCLs, in which chemicals were screened against more stringent (lower) of the outdoor and indoor worker inhalation BCLs. Although this step was not identified in the NDEP-approved BHRA work plan, it is considered a defensible step for inside ECA soils for which inhalation of airborne soil particulates is the only pathway that will be quantitatively evaluated in the BHRA. The SMP identifies measures that are being implemented to mitigate risks to human health as related to potential exposures to COPCs in ECA soils during periods of typical operations and non-construction activity. These measures apply to direct contact pathways for soils (i.e., soil ingestion

[16] For this interim report, Ramboll Environ did not remove data points from the background data set pending discussion with NDEP.

and dermal contact with soil), but do not specifically apply to the inhalation pathway. For this reason, the CSM identifies only the inhalation pathway for quantitative evaluation.

Conceptually, the concentration/toxicity screen using inhalation BCLs for inside ECA soils is identical to the concentration/toxicity screen for outside ECA soils. For the two areas, the BCLs used for screening correspond to the area-specific exposure pathways that will be evaluated in the quantitative risk assessment conducted for that specific area.

It is noted that inhalation toxicity values are not available for five of the inside ECA COPCs. Current USEPA guidance (USEPA 2009) does not recommend route-to-route extrapolation of toxicity values from the oral to inhalation exposure route. Potential risks associated with COPCs for which inhalation toxicity values are not available will be discussed qualitatively in the BHRA uncertainties assessment.

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TABLES

TABLE 1. Outside ECA Soils (0-10 ft bgs): Summary Statistics for Perchlorate, Metals, Other Inorganics and Radionuclides
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Nondetects		Detects						
						Minimum	Maximum	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation	Location of Maximum
Chlorine Oxyanions	Chlorate	mg/kg	248	187	75	0.16	5.8	0.045	21000	2.9	260	1700	6.5	SA106
	Perchlorate	mg/kg	350	333	95	0.044	0.43	0.012	4900	8.0	160	520	3.3	SSAM5-05
Metals	Aluminum	mg/kg	254	254	100	--	--	5100	12000	8900	8700	1400	0.16	SA43
	Antimony	mg/kg	248	82	33	0.063	2.4	0.11	2.4	0.18	0.50	0.61	1.2	SA114
	Arsenic	mg/kg	594	594	100	--	--	0.57	39	3.3	3.9	2.8	0.73	EE-D02-1
	Barium	mg/kg	254	254	100	--	--	80	1800	170	190	110	0.61	SA123
	Beryllium	mg/kg	254	254	100	--	--	0.073	0.71	0.47	0.47	0.077	0.16	SA86
	Boron	mg/kg	254	78	31	1.4	13	1.5	1500	13	65	240	3.6	SA62
	Cadmium	mg/kg	254	168	66	0.0050	0.11	0.040	8.9	0.13	0.23	0.70	3.0	SA103
	Calcium	mg/kg	254	254	100	--	--	9900	62000	28000	28000	9000	0.32	RSAM2
	Chromium (total)	mg/kg	256	256	100	--	--	1.3	100	8.3	11	12	1.1	SA106
	Chromium VI	mg/kg	472	89	19	0.11	0.51	0.11	110	0.79	6.0	18	3.0	SA106
	Cobalt	mg/kg	302	302	100	--	--	3.2	280	7.4	12	27	2.3	RSAO8
	Copper	mg/kg	254	254	100	--	--	8.0	77	17	18	6.3	0.35	RSAO8
	Iron	mg/kg	254	254	100	--	--	7000	21000	15000	14000	2500	0.17	RSAO8
	Lead	mg/kg	327	327	100	--	--	3.6	270	8.7	12	18	1.5	SA92
	Lithium	mg/kg	14	12	86	0.66	0.66	10	22	13	14	3.9	0.28	TSB-GJ-02
	Magnesium	mg/kg	306	306	100	--	--	5300	71000	9800	11000	5100	0.47	DS-C39B-1
	Manganese	mg/kg	410	410	100	--	--	130	29000	370	890	2200	2.4	CS-C44-1
	Mercury	mg/kg	256	214	84	0.0067	0.040	0.0030	0.31	0.012	0.019	0.029	1.5	SA165
	Molybdenum	mg/kg	254	229	90	0.052	0.34	0.17	3.2	0.48	0.56	0.37	0.66	SA204
	Nickel	mg/kg	254	254	100	--	--	6.6	160	15	16	9.8	0.63	RSAO8
	Niobium	mg/kg	14	1	7	0.76	1.5	9.2	9.2	9.2	9.2	--	--	TSB-GR-02
	Palladium	mg/kg	12	12	100	--	--	0.33	0.79	0.48	0.49	0.12	0.24	TSB-GJ-07
	Phosphorus (total)	mg/kg	224	224	100	--	--	410	1300	810	820	160	0.20	RSAO2
	Platinum	mg/kg	254	148	58	0.010	0.24	0.0050	0.16	0.010	0.014	0.015	1.1	SA64
	Potassium	mg/kg	254	254	100	--	--	1200	4200	2100	2200	530	0.24	RSAO6
	Selenium	mg/kg	254	9	4	0.16	4.7	0.80	1.2	1.0	0.96	0.12	0.13	RSAM6
	Silicon	mg/kg	14	14	100	--	--	72	520	130	170	130	0.73	TSB-CJ-09
	Silver	mg/kg	254	66	26	0.021	0.60	0.020	7.6	0.12	0.25	0.93	3.7	SA201
	Sodium	mg/kg	254	254	100	--	--	200	12000	760	1200	1200	1.0	SA106
	Strontium	mg/kg	254	254	100	--	--	72	800	200	220	91	0.42	SA15
	Sulfur	mg/kg	14	9	64	22	210	450	1600	680	880	420	0.47	TSB-GJ-07
	Thallium	mg/kg	254	219	86	0.10	0.26	0.016	8.4	0.099	0.16	0.57	3.5	SA180
	Tin	mg/kg	254	47	19	8.7	12	0.40	12	0.52	1.3	2.2	1.7	RSAK8
	Titanium	mg/kg	254	254	100	--	--	340	1300	740	730	180	0.24	SA166
	Tungsten	mg/kg	254	218	86	0.10	0.65	0.033	8.5	0.23	0.39	0.72	1.8	RSAK8
	Uranium (total)	mg/kg	254	254	100	--	--	0.19	3.9	1.0	1.2	0.59	0.48	SA149

TABLE 1. Outside ECA Soils (0-10 ft bgs): Summary Statistics for Perchlorate, Metals, Other Inorganics and Radionuclides
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Nondetects		Detects						
						Minimum	Maximum	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation	Location of Maximum
Metals	Vanadium	mg/kg	254	254	100	--	--	22	78	42	42	8.7	0.21	RSAK8
	Zinc	mg/kg	254	254	100	--	--	18	270	32	34	18	0.54	RSAL5
	Zirconium	mg/kg	14	14	100	--	--	18	25	22	22	2.0	0.090	TSB-CJ-09
Other Inorganics	Ammonia	mg/kg	233	24	10	0.51	6.5	0.16	560	1.8	58	140	2.5	RSAM5
	Bromide	mg/kg	248	35	14	0.062	28	0.20	83	0.90	3.6	14	3.9	SA15
	Chloride	mg/kg	247	231	94	2.1	85	0.90	6700	78	360	760	2.1	RSAJ2
	Cyanide (total)	mg/kg	174	3	2	0.13	1.2	0.48	1.3	0.60	0.79	0.44	0.56	RSAJ2
	Fluoride	mg/kg	14	4	29	0.10	0.25	0.52	8.2	0.67	2.5	3.8	1.5	TSB-CJ-09
	Nitrate	mg/kg	14	14	100	--	--	0.52	52	5.7	16	19	1.2	TSB-GR-02
	Nitrate (as N)	mg/kg	237	211	89	0.048	6.1	0.21	520	4.2	14	42	3.1	SA15
	Nitrite	mg/kg	238	44	18	0.020	22	0.090	77	0.44	3.0	12	3.8	SA64
	ortho-Phosphate	mg/kg	41	7	17	0.50	57	2.4	2900	7.2	420	1100	2.6	SA11
	Sulfate	mg/kg	251	248	99	2.1	22	6.7	15000	200	790	2100	2.7	SA65
Radionuclides	Radium-226	pCi/g	249	241	97	0.23	0.50	0.20	2.8	0.94	0.99	0.40	0.41	SA189
	Radium-228	pCi/g	249	237	95	0.45	2.3	0.38	3.3	1.3	1.3	0.50	0.38	SA70
	Thorium-228	pCi/g	252	252	100	--	--	0.48	4.9	1.7	1.7	0.40	0.23	TSB-CJ-09
	Thorium-230	pCi/g	252	252	100	--	--	0.43	15	1.1	1.3	1.0	0.79	RSAO2
	Thorium-232	pCi/g	252	252	100	--	--	0.54	2.5	1.6	1.6	0.33	0.21	SA189
	Uranium-234	pCi/g	252	252	100	--	--	0.27	4.3	1.1	1.2	0.51	0.43	SA189
	Uranium-235	pCi/g	252	176	70	0.0092	0.90	0.011	0.25	0.063	0.076	0.040	0.53	RSAK6
	Uranium-238	pCi/g	252	237	94	1.0	2.9	0.24	4.0	0.98	1.1	0.49	0.44	SA189

Notes:
-- = No value
bgs = below ground surface
ft = feet
mg/kg = milligram per kilogram
pCi/g = picocuries per gram
ECA = Excavation control area
Listed analytes include only those detected in one or more samples; Appendix B presents summary statistics for all analytes (i.e., detected analytes and analytes reported as less than sample quantitation limits in all samples).

TABLE 2. Outside ECA Soils (0-10 ft bgs): Summary Statistics for Organic Compounds

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Nondetects		Detects						
						Minimum	Maximum	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation	Location of Maximum
VOCs	Acetone	µg/kg	279	128	46	1.7	41	2.7	150	14	21	24	1.1	SA106
	Bromodichloromethane	µg/kg	279	2	1	0.11	10	0.40	0.69	0.54	0.54	0.21	0.38	SSAO8-10
	Bromoform	µg/kg	279	1	0	0.059	10	1.7	1.7	1.7	1.7	--	--	SA102
	2-Butanone	µg/kg	279	95	34	0.87	20	0.65	27	1.7	3.2	5.1	1.6	SSAO7-06
	Carbon tetrachloride	µg/kg	279	2	1	0.20	10	0.63	0.93	0.78	0.78	0.21	0.27	RSAO2
	Chlorobenzene	µg/kg	279	6	2	0.11	10	0.64	1.9	1.1	1.1	0.44	0.39	SA15
	Chloroform	µg/kg	279	106	38	0.10	9.1	0.31	150	1.9	7.4	21	2.9	SA11
	p-Cymene	µg/kg	279	1	0	0.12	10	0.55	0.55	0.55	0.55	--	--	SSAN8-04
	1,2-Dichlorobenzene	µg/kg	279	6	2	0.12	10	0.26	0.39	0.38	0.35	0.059	0.17	RSAM4
	1,4-Dichlorobenzene	µg/kg	279	6	2	0.11	10	0.32	16	0.96	3.4	6.2	1.8	SA08
	1,1-Dichloroethane	µg/kg	279	3	1	0.070	10	1.9	3.0	3.0	2.6	0.64	0.24	SA21
	1,1-Dichloroethene	µg/kg	279	4	1	0.12	10	0.55	1.2	0.77	0.82	0.28	0.34	SSAN8-04
	Ethyl tert-butyl ether	µg/kg	265	2	1	2.2	10	0.38	0.40	0.39	0.39	0.014	0.036	RSAO2
	Formaldehyde	µg/kg	4	1	25	210	220	1000	1000	1000	1000	--	--	SA85
	Methylene chloride	µg/kg	279	73	26	0.69	10	0.34	40	1.3	2.1	4.7	2.2	SA21
	Styrene	µg/kg	279	1	0	0.17	10	0.28	0.28	0.28	0.28	--	--	SA55
	Tetrachloroethene	µg/kg	279	3	1	0.087	10	0.68	1.5	0.73	0.97	0.46	0.47	SA149
	Toluene	µg/kg	279	68	24	0.13	10	0.23	5.1	0.77	0.93	0.67	0.72	RSAO2
	1,2,3-Trichlorobenzene	µg/kg	279	2	1	0.38	10	0.81	1.3	1.1	1.1	0.35	0.33	SA11
	1,2,4-Trichlorobenzene	µg/kg	279	6	2	0.33	10	0.65	3.7	1.2	1.7	1.2	0.71	SA11
	1,1,1-Trichloroethane	µg/kg	279	2	1	0.10	10	0.54	0.95	0.74	0.74	0.29	0.39	SA08
	Trichloroethene	µg/kg	279	2	1	0.10	10	0.42	0.50	0.46	0.46	0.057	0.12	RSAI7
	Trichlorofluoromethane	µg/kg	279	5	2	0.22	10	0.35	1.7	1.6	1.3	0.57	0.44	RSAN6
	1,2,4-Trimethylbenzene	µg/kg	279	7	3	0.13	10	0.42	1.4	0.82	0.79	0.34	0.42	SSAO8-11
	1,3,5-Trimethylbenzene	µg/kg	279	1	0	0.097	10	0.50	0.50	0.50	0.50	--	--	SSAO8-11
	Vinyl chloride	µg/kg	279	1	0	0.11	10	0.28	0.28	0.28	0.28	--	--	RSAM7
	m,p-Xylene	µg/kg	42	4	10	0.17	1.0	0.64	1.5	1.1	1.1	0.37	0.34	SSAO8-11
	o-Xylene	µg/kg	252	2	1	0.076	10	0.46	0.57	0.52	0.52	0.078	0.15	SSAO8-11
	4-Methyl-2-pentanone	µg/kg	279	1	0	0.29	20	3.5	3.5	3.5	3.5	--	--	RSAO2
	tert Butyl alcohol	µg/kg	265	1	0	5.2	200	7.6	7.6	7.6	7.6	--	--	RSAM4
SVOCs	Butylbenzylphthalate	µg/kg	529	9	2	33	4600	2.5	110	5.6	26	36	1.4	SSAQ6-02
	Di-n-butylphthalate	µg/kg	529	38	7	27	3100	35	7500	68	530	1300	2.5	SSAP4-01
	Di-n-octylphthalate	µg/kg	529	3	1	13	2800	70	88	84	81	9.5	0.12	SSAO4-01
	Diethylphthalate	µg/kg	529	6	1	24	2800	32	350	53	99	120	1.2	SA86
	Dimethylphthalate	µg/kg	529	66	12	22	2800	1.5	790	42	110	160	1.4	BDT-1-S-10
	Hexachlorobenzene	µg/kg	983	524	53	0.28	10000	0.32	55000	58	300	2400	8.2	RSAI3
	Hexachlorobutadiene	µg/kg	279	5	2	0.28	33	0.95	4.5	2.0	2.2	1.4	0.64	SA11
	1-Methylnaphthalene	µg/kg	8	4	50	0.26	0.49	0.62	5600	2.2	1400	2800	2.0	EE-C25-1

TABLE 2. Outside ECA Soils (0-10 ft bgs): Summary Statistics for Organic Compounds

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Nondetects		Detects						
						Minimum	Maximum	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation	Location of Maximum
SVOCs	2-Methylnaphthalene	µg/kg	545	12	2	0.31	2000	0.77	7900	7.6	670	2300	3.4	EE-C25-1
	Octachlorostyrene	µg/kg	535	90	17	6.7	6100	2.1	2100	53	110	240	2.2	SSAK3-05
	bis(2-Ethylhexyl)phthalate	µg/kg	529	111	21	33	4900	57	61000	100	720	5800	8.0	SSAP4-01
PAHs	Acenaphthene	µg/kg	545	9	2	0.16	1100	0.62	700	17	94	230	2.4	EE-C25-1
	Acenaphthylene	µg/kg	545	9	2	0.17	1800	0.66	220	2.4	29	72	2.5	EE-C25-1
	Anthracene	µg/kg	545	18	3	0.67	1800	0.55	300	4.8	26	69	2.6	EE-C25-1
	BaPEq*	µg/kg	533	53	10	1.2	2400	7.6	830	24	66	140	2.1	SSAQ6-02
	Benzo(g,h,i)perylene	µg/kg	544	56	10	1.1	1700	1.4	510	18	49	92	1.9	SSAQ6-02
	Fluoranthene	µg/kg	545	79	14	1.0	3900	1.4	1700	11	67	210	3.2	SSAQ6-02
	Fluorene	µg/kg	545	5	1	0.47	1900	0.52	1100	6.0	220	490	2.2	EE-C25-1
	Naphthalene	µg/kg	810	36	4	0.32	3300	0.40	3100	1.4	150	610	4.0	EE-C25-1
	Phenanthrene	µg/kg	545	73	13	1.1	1800	1.7	1500	8.0	65	220	3.4	EE-C25-1
	Pyrene	µg/kg	545	102	19	1.1	1300	1.1	1300	13	67	190	2.9	EE-C25-1
PCBs	Aroclor-1248	µg/kg	56	1	2	4.9	370	91	91	91	91	--	--	RSAS5
	Aroclor-1260	µg/kg	56	1	2	2.7	370	34	34	34	34	--	--	RSAS5
Dioxins/Furans	Dioxin/Furan TEQ*	µg/kg	483	477	99	0.044	20	0.000055	31	0.015	0.34	1.6	4.9	RSAI7
Pesticides - OCPs	Aldrin	µg/kg	308	2	1	0.088	92	0.49	0.52	0.51	0.51	0.021	0.042	SSAL2-05
	alpha-BHC	µg/kg	308	16	5	0.096	92	0.24	12	0.61	1.8	3.1	1.7	RSAQ4
	beta-BHC	µg/kg	308	173	56	0.19	150	0.72	870	9.5	39	94	2.4	SA67
	delta-BHC	µg/kg	308	8	3	0.083	92	0.48	1.5	0.70	0.87	0.41	0.47	SA86
	gamma-BHC	µg/kg	308	4	1	0.083	110	0.83	1.9	1.5	1.4	0.46	0.32	RSAQ4
	Chlordane (total)	µg/kg	299	1	0	0.21	450	3.0	3.0	3.0	3.0	--	--	SA66
	gamma-Chlordane	µg/kg	305	2	1	0.086	92	2.4	5.3	3.8	3.8	2.1	0.53	TSB-CJ-09
	4,4'-DDD	µg/kg	308	10	3	0.089	180	1.4	32	4.6	7.8	9.3	1.2	SSAL3-04
	2,4'-DDE	µg/kg	14	3	21	0.089	0.20	1.8	42	9.7	18	21	1.2	TSB-GJ-04
	4,4'-DDE	µg/kg	308	155	50	0.19	180	0.40	6000	15	260	820	3.1	SSAM3-01
	4,4'-DDT	µg/kg	308	121	39	0.20	180	0.66	2300	13	100	270	2.7	SSAM2-01
	Dieldrin	µg/kg	308	4	1	0.073	180	0.27	59	16	23	28	1.2	SSAM2-01
	Endosulfan I	µg/kg	308	2	1	0.083	92	0.24	1.5	0.87	0.87	0.89	1.0	SSAL3-01
	Endosulfan sulfate	µg/kg	308	2	1	0.12	180	4.2	16	10	10	8.3	0.83	BDT-4-S-15
	Endrin	µg/kg	308	2	1	0.083	180	0.70	5.4	3.1	3.1	3.3	1.1	SA180
Pesticides - OCPs	Endrin ketone	µg/kg	308	11	4	0.16	180	0.61	20	1.3	3.4	5.6	1.6	SA86
	Heptachlor epoxide	µg/kg	308	1	0	0.12	98	37	37	37	37	--	--	CS-E08B-1
	Methoxychlor	µg/kg	308	16	5	0.32	920	0.50	380	2.1	64	120	1.9	SSAM2-01
	Toxaphene	µg/kg	308	1	0	5.8	3600	620	620	620	620	--	--	SSAL3-04
Pesticides - OPPs	Dimethoate	µg/kg	44	3	7	22	26	11	13	12	12	1.0	0.083	SA05
	Stirophos	µg/kg	44	1	2	15	19	41	41	41	41	--	--	SA166

TABLE 2. Outside ECA Soils (0-10 ft bgs): Summary Statistics for Organic Compounds

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Nondetects		Detects						
						Minimum	Maximum	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation	Location of Maximum
Petroleum Indicators	Oil Range Organics	µg/kg	212	4	2	26000	530000	42000	130000	92000	89000	37000	0.41	SA103
Other Organics	Phthalic acid	µg/kg	43	1	2	250	500	400	400	400	400	--	--	TSB-CJ-09

Notes:

-- = No value

bgs = below ground surface

ft = feet

µg/kg = microgram per kilogram

ECA = Excavation control area

VOC = Volatile organic compound

SVOC = Semivolatile organic compound

PAH = Polycyclic aromatic hydrocarbons

PCB = Polychlorinated biphenyl

OCP = Organochlorine pesticides

OPP = Organophosphorus pesticides

TEQ = Toxicity equivalents

BaPEq = Benzo(a)pyrene equivalent

* Methodology for equivalent calculations explained in text

Listed analytes include only those detected in one or more samples; Appendix B presents summary statistics for all analytes (i.e., detected analytes and analytes reported as less than sample quantitation limits in all samples).

TABLE 3. Outside ECA Soils: Sampling Results for Asbestos

Nevada Environmental Response Trust Site, Henderson, Nevada

Not included in this submittal

TABLE 4. Inside ECA Soils (0-2 ft bgs): Summary Statistics for Perchlorate, Metals, Other Inorganics, and Radionuclides

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Nondetects		Detects						
						Minimum	Maximum	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation	Location of Maximum
Chlorine Oxyanions	Chlorate	mg/kg	65	43	66	0.21	1.2	0.046	600	3.5	23	91	3.9	SA124
	Perchlorate	mg/kg	93	90	97	0.054	0.056	0.084	9500	3.1	310	1200	3.8	SSAM6-05
Metals	Aluminum	mg/kg	67	67	100	--	--	4000	12000	8500	8500	1500	0.17	RSAQ8
	Antimony	mg/kg	67	29	43	1.7	2.2	0.12	30	0.80	2.8	7.0	2.5	SA130
	Arsenic	mg/kg	129	129	100	--	--	1.3	590	3.0	17	69	4.1	EE-C23-1
	Barium	mg/kg	67	67	100	--	--	120	6800	180	350	880	2.5	SA56
	Beryllium	mg/kg	67	67	100	--	--	0.30	2.2	0.46	0.52	0.28	0.54	SA130
	Boron	mg/kg	67	26	39	4.2	11	2.8	110	11	16	21	1.3	RSAJ5
	Cadmium	mg/kg	67	52	78	0.10	0.11	0.060	2.7	0.17	0.32	0.45	1.4	SA130
	Calcium	mg/kg	67	66	99	56	56	12000	51000	25000	26000	8500	0.33	SA193
	Chromium (total)	mg/kg	67	67	100	--	--	4.4	37	8.2	9.7	5.5	0.57	RSAJ7
	Chromium VI	mg/kg	124	29	23	0.11	0.44	0.12	5.2	0.59	1.2	1.3	1.1	SA124
	Cobalt	mg/kg	69	69	100	--	--	1.7	190	7.7	12	23	1.9	RSAQ8
	Copper	mg/kg	67	67	100	--	--	12	170	20	31	31	1.0	SA130
	Iron	mg/kg	67	67	100	--	--	6900	21000	16000	15000	2800	0.18	SA172
	Lead	mg/kg	73	73	100	--	--	6.0	3600	12	79	420	5.4	EE-C23-1
	Magnesium	mg/kg	75	74	99	56	56	6300	190000	9300	22000	41000	1.9	DS-DB-1
	Manganese	mg/kg	90	90	100	--	--	77	77000	430	5100	15000	3.0	EE-C23-1
	Mercury	mg/kg	67	60	90	0.016	0.041	0.0070	0.80	0.020	0.063	0.14	2.2	SA33
	Molybdenum	mg/kg	67	66	99	0.56	0.56	0.19	82	0.49	2.3	10	4.5	SA56
	Nickel	mg/kg	67	67	100	--	--	10	98	15	17	11	0.64	RSAQ8
	Phosphorus (total)	mg/kg	59	59	100	--	--	610	2500	840	900	270	0.30	SA61
	Platinum	mg/kg	67	38	57	0.095	0.24	0.0050	0.057	0.010	0.016	0.013	0.79	SA130
	Potassium	mg/kg	67	66	99	11	11	1500	4200	2400	2500	590	0.23	RSAR3
	Selenium	mg/kg	67	4	6	0.55	50	0.90	1.1	0.95	0.97	0.096	0.098	SA113
	Silver	mg/kg	67	15	22	0.40	0.60	0.028	9.6	0.15	0.95	2.4	2.6	SA130
	Sodium	mg/kg	67	66	99	22	22	200	5700	620	930	930	0.99	SA124
	Strontium	mg/kg	67	65	97	0.56	210	84	1200	160	190	140	0.75	SA56
	Thallium	mg/kg	67	65	97	0.22	0.23	0.063	62	0.10	1.3	7.7	6.0	SA56
	Tin	mg/kg	67	8	12	8.6	12	0.49	6.6	0.68	2.1	2.7	1.3	SA172
	Titanium	mg/kg	67	67	100	--	--	310	1200	760	760	180	0.24	SA61
	Tungsten	mg/kg	67	60	90	0.10	0.58	0.11	70	0.24	2.7	11	4.1	SA130
	Uranium (total)	mg/kg	67	66	99	0.11	0.11	0.59	7.6	0.89	1.1	0.89	0.81	SA56
	Vanadium	mg/kg	67	67	100	--	--	18	110	45	45	14	0.31	SA130
	Zinc	mg/kg	67	67	100	--	--	25	510	36	50	63	1.3	SA130

TABLE 4. Inside ECA Soils (0-2 ft bgs): Summary Statistics for Perchlorate, Metals, Other Inorganics, and Radionuclides
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Nondetects		Detects						
						Minimum	Maximum	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation	Location of Maximum
Other Inorganics	Ammonia	mg/kg	64	6	9	0.51	5.5	0.59	130	1.9	27	53	2.0	SA72
	Bromide	mg/kg	65	4	6	0.55	11	0.70	1.2	1.1	1.0	0.24	0.23	SA107
	Chloride	mg/kg	65	65	100	--	--	1.5	1900	30	140	280	2.0	SA130
	Cyanide (total)	mg/kg	43	1	2	0.13	1.1	0.86	0.86	0.86	0.86	--	--	SA190
	Nitrate (as N)	mg/kg	65	59	91	0.047	5.5	0.33	81	4.3	12	18	1.6	SA72
	Nitrite	mg/kg	65	15	23	0.050	5.6	0.090	5.7	0.35	1.2	1.8	1.5	SA13
	ortho-Phosphate	mg/kg	6	1	17	1.1	11	3.2	3.2	3.2	3.2	--	--	SA13
	Sulfate	mg/kg	65	64	98	22	22	13	32000	180	1700	5000	2.9	SA130
Radionuclides	Radium-226	pCi/g	65	61	94	0.50	0.50	0.34	1.6	0.79	0.83	0.29	0.35	SA107
	Radium-228	pCi/g	65	62	95	0.50	0.50	0.45	4.8	1.1	1.2	0.61	0.50	SA167
	Thorium-228	pCi/g	65	65	100	--	--	0.85	3.1	1.6	1.6	0.37	0.22	SA172
	Thorium-230	pCi/g	65	65	100	--	--	0.65	3.3	0.95	1.0	0.39	0.38	SA130
	Thorium-232	pCi/g	65	65	100	--	--	0.74	2.1	1.4	1.4	0.33	0.23	SA20
	Uranium-234	pCi/g	65	65	100	--	--	0.71	2.9	0.97	1.1	0.36	0.33	SA130
	Uranium-235	pCi/g	65	40	62	0.040	0.29	0.032	0.16	0.057	0.063	0.028	0.45	SA130
	Uranium-238	pCi/g	65	61	94	1.0	1.6	0.71	2.8	0.91	1.0	0.34	0.33	SA130

Notes:
-- = No value
bgs = below ground surface
ft = feet
mg/kg = milligram per kilogram
pCi/g = picocuries per gram
ECA = Excavation control area
Listed analytes include only those detected in one or more samples; Appendix B presents summary statistics for all analytes (i.e., detected analytes and analytes reported as less than sample quantitation limits in all samples).

TABLE 5. Inside ECA Soils (0-2 ft bgs): Summary Statistics for Organic Compounds

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Nondetects		Detects						
						Minimum	Maximum	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation	Location of Maximum
VOCs	Acetone	µg/kg	66	27	41	1.5	24	5.1	54	17	19	11	0.59	SA160
	Benzene	µg/kg	66	1	2	0.27	7.0	0.82	0.82	0.82	0.82	--	--	SA10
	2-Butanone	µg/kg	66	23	35	1.5	14	0.93	5.5	1.4	1.8	1.0	0.58	SA33
	Chlorobenzene	µg/kg	66	1	2	0.30	7.0	5.5	5.5	5.5	5.5	--	--	SA10
	Chloroform	µg/kg	66	9	14	0.27	7.0	0.41	22	1.0	4.6	7.1	1.5	SA56
	1,2-Dichlorobenzene	µg/kg	66	1	2	0.67	7.0	0.56	0.56	0.56	0.56	--	--	SA10
	1,4-Dichlorobenzene	µg/kg	66	5	8	0.82	7.0	1.3	17	9.1	8.3	6.7	0.81	SA19
	2-Hexanone	µg/kg	66	2	3	0.77	14	0.66	0.66	0.66	0.66	0.00	0.00	SA33
	Methylene chloride	µg/kg	66	10	15	0.88	7.0	0.41	1.7	0.85	0.94	0.43	0.45	SA61
	Toluene	µg/kg	66	14	21	0.64	7.0	0.28	3.2	0.82	1.0	0.84	0.80	RSAJ7
	1,2,4-Trichlorobenzene	µg/kg	66	2	3	2.9	7.0	1.1	1.5	1.3	1.3	0.28	0.22	EE-E14A-1
	Trichlorofluoromethane	µg/kg	66	1	2	0.36	7.0	0.40	0.40	0.40	0.40	--	--	RSAR6
	1,2,4-Trimethylbenzene	µg/kg	66	1	2	0.53	7.0	0.59	0.59	0.59	0.59	--	--	SA179
	4-Methyl-2-pentanone	µg/kg	66	1	2	0.96	14	1.6	1.6	1.6	1.6	--	--	RSAJ7
SVOCs	Butylbenzylphthalate	µg/kg	107	5	5	40	3800	2.8	15000	4.3	3000	6700	2.2	DS-C24-1
	Di-n-butylphthalate	µg/kg	107	8	7	27	3800	41	120	52	63	27	0.43	SA46
	Di-n-octylphthalate	µg/kg	107	1	1	14	3800	82	82	82	82	--	--	SSAP4-03
	Dimethylphthalate	µg/kg	107	7	7	23	3800	1.1	140	22	47	56	1.2	SSAR4-04
	Hexachlorobenzene	µg/kg	173	98	57	1.8	460	0.63	300000	280	11000	41000	3.7	SA127
	Hexachlorobutadiene	µg/kg	66	2	3	2.9	7.0	1.1	2.2	1.7	1.7	0.78	0.47	EE-E14A-1
	1-Methylnaphthalene	µg/kg	7	5	71	0.58	18	1.1	27	21	17	11	0.64	EE-C24-2
	2-Methylnaphthalene	µg/kg	117	9	8	0.55	440	1.3	56	3.5	16	20	1.2	EE-C24-2
	Octachlorostyrene	µg/kg	108	29	27	6.7	410	11	9300	120	590	1700	2.9	RSAJ7
	bis(2-Ethylhexyl)phthalate	µg/kg	107	18	17	45	3800	67	650	91	140	150	1.0	SSAR3-01
PAHs	Acenaphthene	µg/kg	117	2	2	0.56	430	5.4	12	8.7	8.7	4.7	0.54	SSAP5-03
	Acenaphthylene	µg/kg	117	9	8	0.39	440	1.4	52	22	22	18	0.78	SA190
	Anthracene	µg/kg	117	9	8	0.47	440	2.9	80	17	33	29	0.87	SA190
	BaPEq*	µg/kg	112	23	21	2.8	2200	1.2	1400	27	150	320	2.2	DS-C24-2
	Benzo(g,h,i)perylene	µg/kg	117	35	30	1.2	410	4.2	1100	18	150	280	1.9	SSAP5-03
	Fluoranthene	µg/kg	117	47	40	6.9	410	1.8	1600	23	160	340	2.1	DS-C24-2
	Naphthalene	µg/kg	183	10	5	0.40	420	1.4	49	5.6	11	15	1.3	EE-C24-2
	Phenanthrene	µg/kg	117	33	28	6.9	480	1.8	590	10	62	120	1.9	DS-C24-2
	Pyrene	µg/kg	117	55	47	6.9	410	1.4	1700	20	150	350	2.3	DS-C24-2
PCBs	Aroclor-1260	µg/kg	21	5	24	34	41	51	510	270	260	170	0.67	SA33
Dioxins/Furans	Dioxin/Furan TEQ*	µg/kg	136	131	96	0.043	0.046	0.000038	73	0.027	3.3	12	3.5	SA127

TABLE 5. Inside ECA Soils (0-2 ft bgs): Summary Statistics for Organic Compounds

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Nondetects		Detects						
						Minimum	Maximum	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation	Location of Maximum
Pesticides - OCPs	beta-BHC	µg/kg	35	12	34	0.76	18000	1.0	1300	57	270	470	1.8	EE-E08A-1
	gamma-Chlordane	µg/kg	33	2	6	0.30	18000	7.5	31	19	19	17	0.86	SA107
	4,4'-DDE	µg/kg	35	4	11	0.27	35000	2.0	140	41	56	61	1.1	SA107
	4,4'-DDT	µg/kg	35	5	14	0.68	35000	2.1	120	11	42	52	1.3	SA107
	Heptachlor	µg/kg	35	1	3	0.25	18000	930	930	930	930	--	--	EE-E08A-1
	Methoxychlor	µg/kg	35	1	3	0.52	180000	7.6	7.6	7.6	7.6	--	--	SA13
Petroleum Indicators	Oil Range Organics	µg/kg	47	13	28	28000	44000	35000	390000	54000	93000	98000	1.0	RSAQ8

Notes:

-- = No value

bgs = below ground surface

ft = feet

µg/kg = microgram per kilogram

ECA = Excavation control area

VOC = Volatile organic compound

SVOC = Semivolatile organic compound

PAH = Polycyclic aromatic hydrocarbons

PCB = Polychlorinated biphenyl

OCP = Organochlorine pesticides

OPP = Organophosphorus pesticides

TEQ = Toxicity equivalents

BaPEq = Benzo(a)pyrene equivalent

* Methodology for equivalent calculations explained in text

Listed analytes include only those detected in one or more samples; Appendix B presents summary statistics for all analytes (i.e., detected analytes and analytes reported as less than sample quantitation limits in all samples).

TABLE 6. Inside ECA Soils: Sampling Results for Asbestos

Nevada Environmental Response Trust Site, Henderson, Nevada

Not included in this submittal

TABLE 7. Summary of the Soils Background Evaluation for Metals

Nevada Environmental Response Trust Site, Henderson, Nevada

Metal	Background Comparison		Carry Forward to Step 2?	
	Outside ECA	Inside ECA	Outside ECA	Inside ECA
Aluminum	~ Bkg	~ Bkg	No	No
Antimony	~ Bkg	> Bkg	No	**Yes**
Arsenic	> Bkg	> Bkg	**Yes**	**Yes**
Barium	> Bkg	> Bkg	**Yes**	**Yes**
Beryllium	~ Bkg	> Bkg	No	**Yes**
Boron	> Bkg	> Bkg	**Yes**	**Yes**
Cadmium	> Bkg	> Bkg	**Yes**	**Yes**
Calcium	~ Bkg	~ Bkg	No	No
Chromium (total)	> Bkg	> Bkg	**Yes**	**Yes**
Chromium VI	> Bkg	> Bkg	**Yes**	**Yes**
Cobalt	> Bkg	> Bkg	**Yes**	**Yes**
Copper	> Bkg	> Bkg	**Yes**	**Yes**
Iron	~ Bkg	~ Bkg	No	No
Lead	> Bkg	> Bkg	**Yes**	**Yes**
Magnesium	> Bkg	> Bkg	**Yes**	**Yes**
Manganese	> Bkg	> Bkg	**Yes**	**Yes**
Mercury	> Bkg	> Bkg	**Yes**	**Yes**
Molybdenum	~ Bkg	> Bkg	No	**Yes**
Nickel	> Bkg	> Bkg	**Yes**	**Yes**
Platinum	> Bkg	> Bkg	**Yes**	**Yes**
Potassium	~ Bkg	> Bkg	No	**Yes**
Selenium	~ Bkg	~ Bkg	No	No
Silver	> Bkg	> Bkg	**Yes**	**Yes**
Sodium	> Bkg	> Bkg	**Yes**	**Yes**
Strontium	~ Bkg	~ Bkg	No	No
Thallium	> Bkg	> Bkg	**Yes**	**Yes**
Tin	~ Bkg	~ Bkg	No	No
Titanium	~ Bkg	~ Bkg	No	No
Tungsten	> Bkg	> Bkg	**Yes**	**Yes**

TABLE 7. Summary of the Soils Background Evaluation for Metals

Nevada Environmental Response Trust Site, Henderson, Nevada

Metal	Background Comparison		Carry Forward to Step 2?	
	Outside ECA	Inside ECA	Outside ECA	Inside ECA
Uranium	> Bkg	~ Bkg	**Yes**	No
Vanadium	~ Bkg	> Bkg	No	**Yes**
Zinc	> Bkg	> Bkg	**Yes**	**Yes**

Notes:

ECA = Excavation control area

~ Bkg = Area concentrations are consistent with background levels

> Bkg = Area concentrations are greater than background levels

TABLE 8. Summary of the Soils Background Evaluation for Radionuclides

Nevada Environmental Response Trust Site, Henderson, Nevada

Area	Chain	Secular Equilibrium?	Background Evaluation		Hydrofluoric Acid Digestion?	Radionuclides Carried Forward to COPC Selection Step 2
Outside ECA	U-238	Yes	U-238	> Bkg	Yes	U-238
			U-234	> Bkg		U-234
			Th-230	> Bkg		Th-230
			Ra-226	> Bkg		Ra-226
	Th-232	Yes	Th-232	> Bkg	Yes	Th-232
			Th-228	~ Bkg		Th-228 [a]
			Ra-228	> Bkg		Ra-228
	U-235	Not evaluated	U-235	> Bkg	Yes	U-235
Inside ECA	U-238	Yes	U-238	~ Bkg	Yes	None
			U-234	~ Bkg		
			Th-230	~ Bkg		
			Ra-226	~ Bkg		
			U (metal)	~ Bkg		
	Th-232	No	Th-232	~ Bkg	Yes	None
			Th-228	~ Bkg		
			Ra-228	~ Bkg		
	U-235	Not evaluated	U-235	> Bkg	Yes	U-235

Notes:

ECA = Excavation control area

~ Bkg = Area concentrations are consistent with background levels

> Bkg = Area concentrations are greater than background levels

[a] = per NDEP guidance, if one radionuclide in a decay chain is greater than background, then all radionuclides in the decay chain are retained as COPCs

TABLE 9. Outside ECA Soils (0-10 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker BCLs

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Detects		PBT	Class A Carcinogen	BCLs			Toxicity Screen
						Maximum	Location of Maximum			BCL or Site Specific Value	Number >BCL	Ratio of Maximum Value to BCL	
Chlorine Oxyanions	Chlorate	mg/kg	248	187	75	21000	SA106	No	No	38900	0	0.54	Fail
	Perchlorate	mg/kg	350	333	95	4900	SSAM5-05	No	No	908	18	5.4	Fail
Metals	Arsenic	mg/kg	594	594	100	39	EE-D02-1	No	Yes	7.2	23	5.4	Fail
	Barium	mg/kg	254	254	100	1800	SA123	No	No	100000	0	0.018	Pass
	Boron	mg/kg	254	78	31	1500	SA62	No	No	100000	0	0.015	Pass
	Cadmium	mg/kg	254	168	66	8.9	SA103	Yes	No	1270	0	0.0070	Pass
	Chromium (total)	mg/kg	256	256	100	100	SA106	No	No	100000	0	0.0010	Pass
	Chromium VI	mg/kg	472	89	19	110	SA106	No	Yes	1230	0	0.086	Fail
	Cobalt	mg/kg	302	302	100	280	RSAO8	No	No	385	0	0.74	Fail
	Copper	mg/kg	254	254	100	77	RSAO8	No	No	48200	0	0.0016	Pass
	Lead	mg/kg	327	327	100	270	SA92	Yes	No	800	0	0.33	Fail
	Lithium	mg/kg	14	12	86	22	TSB-GJ-02	No	No	2600	0	0.0084	Pass
	Magnesium	mg/kg	306	306	100	71000	DS-C39B-1	No	No	100000	0	0.71	Fail
	Manganese	mg/kg	410	410	100	29000	CS-C44-1	No	No	28100	1	1.0	Fail
	Mercury	mg/kg	256	214	84	0.31	SA165	Yes	No	208	0	0.0015	Pass
	Nickel	mg/kg	254	254	100	160	RSAO8	No	Yes	24700	0	0.0066	Pass
	Niobium	mg/kg	14	1	7	9.2	TSB-GR-02	No	No	130	0	0.071	Pass
	Palladium	mg/kg	12	12	100	0.79	TSB-GJ-07	No	No	--	--	--	--
	Phosphorus (total)	mg/kg	224	224	100	1300	RSAO2	No	No	100000	0	0.013	Pass
	Platinum	mg/kg	254	148	58	0.16	SA64	No	No	649	0	0.00025	Pass
	Silicon	mg/kg	14	14	100	520	TSB-CJ-09	No	No	--	--	--	--
	Silver	mg/kg	254	66	26	7.6	SA201	No	No	6490	0	0.0012	Pass
	Sodium	mg/kg	254	254	100	12000	SA106	No	No	--	--	--	--
	Sulfur	mg/kg	14	9	64	1600	TSB-GJ-07	No	No	--	--	--	--
	Thallium	mg/kg	254	219	86	8.4	SA180	No	No	85.7	0	0.098	Pass
	Tungsten	mg/kg	254	218	86	8.5	RSAK8	No	No	9730	0	0.00087	Pass
	Zinc	mg/kg	254	254	100	270	RSAL5	No	No	100000	0	0.0027	Pass
	Zirconium	mg/kg	14	14	100	25	TSB-CJ-09	No	No	104	0	0.24	Fail

TABLE 9. Outside ECA Soils (0-10 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker BCLs

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Detects		PBT	Class A Carcinogen	BCLs			Toxicity Screen
						Maximum	Location of Maximum			BCL or Site Specific Value	Number >BCL	Ratio of Maximum Value to BCL	
Other Inorganics	Ammonia	mg/kg	233	24	10	560	RSAM5	No	No	100000	0	0.0056	Pass
	Bromide	mg/kg	248	35	14	83	SA15	No	No	100000	0	0.00083	Pass
	Chloride	mg/kg	247	231	94	6700	RSAJ2	No	No	100000	0	0.067	Pass
	Cyanide (total)	mg/kg	174	3	2	1.3	RSAJ2	No	No	27.9	0	0.047	Pass
	Fluoride	mg/kg	14	4	29	8.2	TSB-CJ-09	No	No	55000	0	0.00015	Pass
	Nitrate	mg/kg	14	14	100	52	TSB-GR-02	No	No	100000	0	0.00052	Pass
	Nitrate (as N)	mg/kg	237	211	89	520	SA15	No	No	100000	0	0.0052	Pass
	Nitrite	mg/kg	238	44	18	77	SA64	No	No	100000	0	0.00077	Pass
	ortho-Phosphate	mg/kg	41	7	17	2900	SA11	No	No	--	--	--	--
	Sulfate	mg/kg	251	248	99	15000	SA65	No	No	--	--	--	--
Radionuclides	Radium-226	pCi/g	249	241	97	2.8	SA189	No	No	0.023	241	120	Fail
	Radium-228	pCi/g	249	237	95	3.3	SA70	No	No	0.041	237	81	Fail
	Thorium-228	pCi/g	252	252	100	4.9	TSB-CJ-09	No	No	0.025	252	200	Fail
	Thorium-230	pCi/g	252	252	100	15	RSAO2	No	No	8.4	1	1.8	Fail
	Thorium-232	pCi/g	252	252	100	2.5	SA189	No	No	7.4	0	0.34	Fail
	Uranium-234	pCi/g	252	252	100	4.3	SA189	No	No	11	0	0.39	Fail
	Uranium-235	pCi/g	252	176	70	0.25	RSAK6	No	No	0.35	0	0.72	Fail
	Uranium-238	pCi/g	252	237	94	4.0	SA189	No	No	1.4	26	2.9	Fail
VOCs	Acetone	mg/kg	279	128	46	0.15	SA106	No	No	100000	0	0.0000015	Pass
	Bromodichloromethane	mg/kg	279	2	1	0.00069	SSAO8-10	No	No	3.37	0	0.00020	Pass
	Bromoform	mg/kg	279	1	0	0.0017	SA102	No	No	325	0	0.0000052	Pass
	2-Butanone	mg/kg	279	95	34	0.027	SSAO7-06	No	No	34100	0	0.00000079	Pass
	Carbon tetrachloride	mg/kg	279	2	1	0.00093	RSAO2	No	No	3.86	0	0.00024	Pass
	Chlorobenzene	mg/kg	279	6	2	0.0019	SA15	No	No	695	0	0.0000027	Pass
	Chloroform	mg/kg	279	106	38	0.15	SA11	No	No	1.56	0	0.096	Pass
	p-Cymene	mg/kg	279	1	0	0.00055	SSAN8-04	No	No	647	0	0.00000085	Pass
	1,2-Dichlorobenzene	mg/kg	279	6	2	0.00039	RSAM4	No	No	373	0	0.0000010	Pass
	1,4-Dichlorobenzene	mg/kg	279	6	2	0.016	SA08	No	No	13.7	0	0.0012	Pass
	1,1-Dichloroethane	mg/kg	279	3	1	0.0030	SA21	No	No	21.5	0	0.00014	Pass
	1,1-Dichloroethene	mg/kg	279	4	1	0.0012	SSAN8-04	No	No	1280	0	0.00000094	Pass
	Ethyl tert-butyl ether	mg/kg	265	2	1	0.00040	RSAO2	No	No	209	0	0.0000019	Pass
	Formaldehyde	mg/kg	4	1	25	1.0	SA85	No	No	67000	0	0.000015	Pass
	Methylene chloride	mg/kg	279	73	26	0.040	SA21	No	No	59.1	0	0.00068	Pass

TABLE 9. Outside ECA Soils (0-10 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker BCLs

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Detects		PBT	Class A Carcinogen	BCLs			Toxicity Screen
						Maximum	Location of Maximum			BCL or Site Specific Value	Number >BCL	Ratio of Maximum Value to BCL	
VOCs	Styrene	mg/kg	279	1	0	0.00028	SA55	No	No	1730	0	0.00000016	Pass
	Tetrachloroethene	mg/kg	279	3	1	0.0015	SA149	No	No	3.52	0	0.00043	Pass
	Toluene	mg/kg	279	68	24	0.0051	RSAO2	No	No	521	0	0.0000098	Pass
	1,2,3-Trichlorobenzene	mg/kg	279	2	1	0.0013	SA11	No	No	660	0	0.0000020	Pass
	1,2,4-Trichlorobenzene	mg/kg	279	6	2	0.0037	SA11	Yes	No	125	0	0.000030	Pass
	1,1,1-Trichloroethane	mg/kg	279	2	1	0.00095	SA08	No	No	1390	0	0.00000068	Pass
	Trichloroethene	mg/kg	279	2	1	0.00050	RSAI7	No	Yes	6.01	0	0.000083	Pass
	Trichlorofluoromethane	mg/kg	279	5	2	0.0017	RSAN6	No	No	1980	0	0.00000086	Pass
	1,2,4-Trimethylbenzene	mg/kg	279	7	3	0.0014	SSAO8-11	No	No	604	0	0.0000023	Pass
	1,3,5-Trimethylbenzene	mg/kg	279	1	0	0.00050	SSAO8-11	No	No	246	0	0.0000020	Pass
	Vinyl chloride	mg/kg	279	1	0	0.00028	RSAM7	No	Yes	1.97	0	0.00014	Pass
	m,p-Xylene	mg/kg	42	4	10	0.0015	SSAO8-11	No	No	214	0	0.0000070	Pass
	o-Xylene	mg/kg	252	2	1	0.00057	SSAO8-11	No	No	282	0	0.0000020	Pass
	4-Methyl-2-pentanone	mg/kg	279	1	0	0.0035	RSAO2	No	No	17200	0	0.00000020	Pass
	tert Butyl alcohol	mg/kg	265	1	0	0.0076	RSAM4	No	No	21300	0	0.00000036	Pass
SVOCs	Butylbenzylphthalate	mg/kg	529	9	2	0.11	SSAQ6-02	No	No	240	0	0.00046	Pass
	Di-n-butylphthalate	mg/kg	529	38	7	7.5	SSAP4-01	No	No	91600	0	0.000082	Pass
	Di-n-octylphthalate	mg/kg	529	3	1	0.088	SSAO4-01	No	No	11000	0	0.0000080	Pass
	Diethylphthalate	mg/kg	529	6	1	0.35	SA86	No	No	100000	0	0.0000035	Pass
	Dimethylphthalate	mg/kg	529	66	12	0.79	BDT-1-S-10	No	No	100000	0	0.0000079	Pass
	Hexachlorobenzene	mg/kg	983	524	53	55	RSAI3	Yes	No	1.6	8	34	Fail
	Hexachlorobutadiene	mg/kg	279	5	2	0.0045	SA11	Yes	No	32.9	0	0.00014	Pass
	1-Methylnaphthalene	mg/kg	8	4	50	5.6	EE-C25-1	No	No	73	0	0.077	Pass
	2-Methylnaphthalene	mg/kg	545	12	2	7.9	EE-C25-1	No	No	3000	0	0.0026	Pass
	Octachlorostyrene	mg/kg	535	90	17	2.1	SSAK3-05	Yes	No	--	--	--	--
	bis(2-Ethylhexyl)phthalate	mg/kg	529	111	21	61	SSAP4-01	No	No	183	0	0.33	Fail

TABLE 9. Outside ECA Soils (0-10 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker BCLs

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Detects		PBT	Class A Carcinogen	BCLs			Toxicity Screen
						Maximum	Location of Maximum			BCL or Site Specific Value	Number >BCL	Ratio of Maximum Value to BCL	
PAHs	Acenaphthene	mg/kg	545	9	2	0.70	EE-C25-1	Yes	Yes	2360	0	0.00030	Pass
	Acenaphthylene	mg/kg	545	9	2	0.22	EE-C25-1	Yes	No	147	0	0.0015	Pass
	Anthracene	mg/kg	545	18	3	0.30	EE-C25-1	Yes	No	9080	0	0.000033	Pass
	BaPEq*	mg/kg	533	53	10	0.83	SSAQ6-02	Yes	No	0.323	3	2.6	Fail
	Benzo(g,h,i)perylene	mg/kg	544	56	10	0.51	SSAQ6-02	Yes	No	38900	0	0.000013	Pass
	Fluoranthene	mg/kg	545	79	14	1.7	SSAQ6-02	No	No	33700	0	0.000050	Pass
	Fluorene	mg/kg	545	5	1	1.1	EE-C25-1	Yes	No	3460	0	0.00032	Pass
	Naphthalene	mg/kg	810	36	4	3.1	EE-C25-1	Yes	No	15.6	0	0.20	Fail
	Phenanthrene	mg/kg	545	73	13	1.5	EE-C25-1	Yes	No	24.5	0	0.061	Fail
	Pyrene	mg/kg	545	102	19	1.3	EE-C25-1	Yes	No	20800	0	0.000063	Pass
PCBs	Aroclor-1248	mg/kg	56	1	2	0.091	RSAS5	Yes	No	1.15	0	0.079	Fail
	Aroclor-1260	mg/kg	56	1	2	0.034	RSAS5	Yes	No	1.15	0	0.030	Fail
Dioxins/Furans	Dioxin/Furan TEQ*	mg/kg	483	477	99	0.031	RSAI7	Yes	No	0.0027	6	12	Fail
Pesticides - OCPs	Aldrin	mg/kg	308	2	1	0.00052	SSAL2-05	Yes	No	0.151	0	0.0034	Pass
	alpha-BHC	mg/kg	308	16	5	0.012	RSAQ4	No	No	334	0	0.000036	Pass
	beta-BHC	mg/kg	308	173	56	0.87	SA67	No	No	66.7	0	0.013	Pass
	delta-BHC	mg/kg	308	8	3	0.0015	SA86	No	No	334	0	0.0000045	Pass
	gamma-BHC	mg/kg	308	4	1	0.0019	RSAQ4	Yes	No	11.1	0	0.00017	Pass
	Chlordane (total)	mg/kg	299	1	0	0.0030	SA66	Yes	No	8.9	0	0.00034	Pass
	gamma-Chlordane	mg/kg	305	2	1	0.0053	TSB-CJ-09	No	No	8.9	0	0.00060	Pass
	4,4'-DDD	mg/kg	308	10	3	0.032	SSAL3-04	Yes	No	13.5	0	0.0024	Pass
	2,4'-DDE	mg/kg	14	3	21	0.042	TSB-GJ-04	No	No	9.5	0	0.0044	Pass
Pesticides - OCPs	4,4'-DDE	mg/kg	308	155	50	6.0	SSAM3-01	Yes	No	9.5	0	0.63	Fail
	4,4'-DDT	mg/kg	308	121	39	2.3	SSAM2-01	Yes	No	9.5	0	0.24	Fail
	Dieldrin	mg/kg	308	4	1	0.059	SSAM2-01	Yes	No	0.16	0	0.37	Fail
	Endosulfan I	mg/kg	308	2	1	0.0015	SSAL3-01	Yes	No	5500	0	0.00000027	Pass
	Endosulfan sulfate	mg/kg	308	2	1	0.016	BDT-4-S-15	Yes	No	5500	0	0.0000029	Pass
	Endrin	mg/kg	308	2	1	0.0054	SA180	No	No	275	0	0.000020	Pass
	Endrin ketone	mg/kg	308	11	4	0.020	SA86	No	No	275	0	0.000073	Pass
	Heptachlor epoxide	mg/kg	308	1	0	0.037	CS-E08B-1	Yes	No	0.282	0	0.13	Fail
	Methoxychlor	mg/kg	308	16	5	0.38	SSAM2-01	Yes	No	4580	0	0.000083	Pass
	Toxaphene	mg/kg	308	1	0	0.62	SSAL3-04	Yes	No	2.33	0	0.27	Fail

TABLE 9. Outside ECA Soils (0-10 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker BCLs

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Detects		PBT	Class A Carcinogen	BCLs			Toxicity Screen
						Maximum	Location of Maximum			BCL or Site Specific Value	Number >BCL	Ratio of Maximum Value to BCL	
Pesticides - OPPs	Dimethoate	mg/kg	44	3	7	0.013	SA05	No	No	160	0	0.000081	Pass
	Stirophos	mg/kg	44	1	2	0.041	SA166	No	No	107	0	0.00038	Pass
Other Organics	Phthalic acid	mg/kg	43	1	2	0.40	TSB-CJ-09	No	No	100000	0	0.0000040	Pass

Notes:

Blue highlighting indicates a COPC that does not pass the toxicity screen or does not have a BCL.

-- = No value

bgs = below ground surface

ft = feet

mg/kg = milligram per kilogram

pCi/g = picocuries per gram

ECA = Excavation control area

BCL = Basic comparison level

PBT = Persistent bioaccumulative toxic

VOC = Volatile organic compound

SVOC = Semivolatile organic compound

PAH = Polycyclic aromatic hydrocarbons

PCB = Polychlorinated biphenyl

OCP = Organochlorine pesticides

OPP = Organophosphorus pesticides

TEQ = Toxicity equivalents

BaPEq = Benzo(a)pyrene equivalent

* Methodology for equivalent calculations explained in text

The BCL used for each analyte is the lower of the indoor and outdoor worker BCLs

TABLE 10. Inside ECA Soils (0-2 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker BCLs

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Detects		PBT	Class A Carcinogen	BCLs			Toxicity Screen
						Maximum	Location of Maximum			BCL or Site Specific Value	Number >BCL	Ratio of Maximum Value to BCL	
Chlorine Oxyanions	Chlorate	mg/kg	65	43	66	600	SA124	No	No	38900	0	0.015	Pass
	Perchlorate	mg/kg	93	90	97	9500	SSAM6-05	No	No	908	6	10	Fail
Metals	Antimony	mg/kg	67	29	43	30	SA130	No	No	519	0	0.058	Pass
	Arsenic	mg/kg	129	129	100	590	EE-C23-1	No	Yes	7.2	17	81	Fail
	Barium	mg/kg	67	67	100	6800	SA56	No	No	100000	0	0.068	Pass
	Beryllium	mg/kg	67	67	100	2.2	SA130	No	Yes	2540	0	0.00085	Pass
	Boron	mg/kg	67	26	39	110	RSAJ5	No	No	100000	0	0.0011	Pass
	Cadmium	mg/kg	67	52	78	2.7	SA130	Yes	No	1270	0	0.0022	Pass
	Chromium (total)	mg/kg	67	67	100	37	RSAJ7	No	No	100000	0	0.00037	Pass
	Chromium VI	mg/kg	124	29	23	5.2	SA124	No	Yes	1230	0	0.0042	Pass
	Cobalt	mg/kg	69	69	100	190	RSAQ8	No	No	385	0	0.49	Fail
	Copper	mg/kg	67	67	100	170	SA130	No	No	48200	0	0.0035	Pass
	Lead	mg/kg	73	73	100	3600	EE-C23-1	Yes	No	800	1	4.5	Fail
	Magnesium	mg/kg	75	74	99	190000	DS-DB-1	No	No	100000	5	1.9	Fail
	Manganese	mg/kg	90	90	100	77000	EE-C23-1	No	No	28100	5	2.8	Fail
	Mercury	mg/kg	67	60	90	0.80	SA33	Yes	No	208	0	0.0039	Pass
	Molybdenum	mg/kg	67	66	99	82	SA56	No	No	6490	0	0.013	Pass
	Nickel	mg/kg	67	67	100	98	RSAQ8	No	Yes	24700	0	0.0040	Pass
	Phosphorus (total)	mg/kg	59	59	100	2500	SA61	No	No	100000	0	0.025	Pass
	Platinum	mg/kg	67	38	57	0.057	SA130	No	No	649	0	0.000088	Pass
	Potassium	mg/kg	67	66	99	4200	RSAR3	No	No	--	--	--	--
	Silver	mg/kg	67	15	22	9.6	SA130	No	No	6490	0	0.0015	Pass
	Sodium	mg/kg	67	66	99	5700	SA124	No	No	--	--	--	--
	Thallium	mg/kg	67	65	97	62	SA56	No	No	85.7	0	0.72	Fail
	Tungsten	mg/kg	67	60	90	70	SA130	No	No	9730	0	0.0072	Pass
	Vanadium	mg/kg	67	67	100	110	SA130	No	No	6490	0	0.017	Pass
	Zinc	mg/kg	67	67	100	510	SA130	No	No	100000	0	0.0051	Pass
Other Inorganics	Ammonia	mg/kg	64	6	9	130	SA72	No	No	100000	0	0.0013	Pass
	Bromide	mg/kg	65	4	6	1.2	SA107	No	No	100000	0	0.000012	Pass
	Chloride	mg/kg	65	65	100	1900	SA130	No	No	100000	0	0.019	Pass
	Cyanide (total)	mg/kg	43	1	2	0.86	SA190	No	No	27.9	0	0.031	Pass
	Nitrate (as N)	mg/kg	65	59	91	81	SA72	No	No	100000	0	0.00081	Pass
	Nitrite	mg/kg	65	15	23	5.7	SA13	No	No	100000	0	0.000057	Pass
	ortho-Phosphate	mg/kg	6	1	17	3.2	SA13	No	No	--	--	--	--
	Sulfate	mg/kg	65	64	98	32000	SA130	No	No	--	--	--	--

TABLE 10. Inside ECA Soils (0-2 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker BCLs

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Detects		PBT	Class A Carcinogen	BCLs			Toxicity Screen
						Maximum	Location of Maximum			BCL or Site Specific Value	Number >BCL	Ratio of Maximum Value to BCL	
Radionuclides	Uranium-235	pCi/g	65	40	62	0.16	SA130	No	No	0.35	0	0.46	Fail
VOCs	Acetone	mg/kg	66	27	41	0.054	SA160	No	No	100000	0	0.00000054	Pass
	Benzene	mg/kg	66	1	2	0.00082	SA10	No	Yes	4.23	0	0.00019	Pass
	2-Butanone	mg/kg	66	23	35	0.0055	SA33	No	No	34100	0	0.00000016	Pass
	Chlorobenzene	mg/kg	66	1	2	0.0055	SA10	No	No	695	0	0.0000079	Pass
	Chloroform	mg/kg	66	9	14	0.022	SA56	No	No	1.56	0	0.014	Pass
	1,2-Dichlorobenzene	mg/kg	66	1	2	0.00056	SA10	No	No	373	0	0.0000015	Pass
	1,4-Dichlorobenzene	mg/kg	66	5	8	0.017	SA19	No	No	13.7	0	0.0012	Pass
	2-Hexanone	mg/kg	66	2	3	0.00066	SA33	No	No	1930	0	0.00000034	Pass
	Methylene chloride	mg/kg	66	10	15	0.0017	SA61	No	No	59.1	0	0.000029	Pass
	Toluene	mg/kg	66	14	21	0.0032	RSAJ7	No	No	521	0	0.0000061	Pass
	1,2,4-Trichlorobenzene	mg/kg	66	2	3	0.0015	EE-E14A-1	Yes	No	125	0	0.000012	Pass
	Trichlorofluoromethane	mg/kg	66	1	2	0.00040	RSAR6	No	No	1980	0	0.00000020	Pass
	1,2,4-Trimethylbenzene	mg/kg	66	1	2	0.00059	SA179	No	No	604	0	0.00000098	Pass
	4-Methyl-2-pentanone	mg/kg	66	1	2	0.0016	RSAJ7	No	No	17200	0	0.000000093	Pass
SVOCs	Butylbenzylphthalate	mg/kg	107	5	5	15	DS-C24-1	No	No	240	0	0.062	Pass
	Di-n-butylphthalate	mg/kg	107	8	7	0.12	SA46	No	No	91600	0	0.0000013	Pass
	Di-n-octylphthalate	mg/kg	107	1	1	0.082	SSAP4-03	No	No	11000	0	0.0000075	Pass
	Dimethylphthalate	mg/kg	107	7	7	0.14	SSAR4-04	No	No	100000	0	0.0000014	Pass
	Hexachlorobenzene	mg/kg	173	98	57	300	SA127	Yes	No	1.6	28	190	Fail
	Hexachlorobutadiene	mg/kg	66	2	3	0.0022	EE-E14A-1	Yes	No	32.9	0	0.000067	Pass
	1-Methylnaphthalene	mg/kg	7	5	71	0.027	EE-C24-2	No	No	73	0	0.00037	Pass
	2-Methylnaphthalene	mg/kg	117	9	8	0.056	EE-C24-2	No	No	3000	0	0.000019	Pass
	Octachlorostyrene	mg/kg	108	29	27	9.3	RSAJ7	Yes	No	--	--	--	--
	bis(2-Ethylhexyl)phthalate	mg/kg	107	18	17	0.65	SSAR3-01	No	No	183	0	0.0036	Pass
PAHs	Acenaphthene	mg/kg	117	2	2	0.012	SSAP5-03	Yes	Yes	2360	0	0.0000051	Pass
	Acenaphthylene	mg/kg	117	9	8	0.052	SA190	Yes	No	147	0	0.00035	Pass
	Anthracene	mg/kg	117	9	8	0.080	SA190	Yes	No	9080	0	0.0000088	Pass
	BaPEq*	mg/kg	112	23	21	1.4	DS-C24-2	Yes	No	0.323	3	4.4	Fail
	Benzo(g,h,i)perylene	mg/kg	117	35	30	1.1	SSAP5-03	Yes	No	38900	0	0.000028	Pass
	Fluoranthene	mg/kg	117	47	40	1.6	DS-C24-2	No	No	33700	0	0.000047	Pass
	Naphthalene	mg/kg	183	10	5	0.049	EE-C24-2	Yes	No	15.6	0	0.0031	Pass
	Phenanthrene	mg/kg	117	33	28	0.59	DS-C24-2	Yes	No	24.5	0	0.024	Fail
	Pyrene	mg/kg	117	55	47	1.7	DS-C24-2	Yes	No	20800	0	0.000082	Pass

TABLE 10. Inside ECA Soils (0-2 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker BCLs

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Detects		PBT	Class A Carcinogen	BCLs			Toxicity Screen
						Maximum	Location of Maximum			BCL or Site Specific Value	Number >BCL	Ratio of Maximum Value to BCL	
PCBs	Aroclor-1260	mg/kg	21	5	24	0.51	SA33	Yes	No	1.15	0	0.44	Fail
Dioxins/Furans	Dioxin/Furan TEQ*	mg/kg	136	131	96	0.073	SA127	Yes	No	0.0027	17	27	Fail
Pesticides - OCPs	beta-BHC	mg/kg	35	12	34	1.3	EE-E08A-1	No	No	66.7	0	0.019	Pass
	gamma-Chlordane	mg/kg	33	2	6	0.031	SA107	Yes	No	8.9	0	0.0035	Pass
	4,4'-DDE	mg/kg	35	4	11	0.14	SA107	Yes	No	9.5	0	0.015	Fail
	4,4'-DDT	mg/kg	35	5	14	0.12	SA107	Yes	No	9.5	0	0.013	Fail
	Heptachlor	mg/kg	35	1	3	0.93	EE-E08A-1	Yes	No	0.57	1	1.6	Fail
	Methoxychlor	mg/kg	35	1	3	0.0076	SA13	Yes	No	4580	0	0.0000017	Pass

Notes:

Blue highlighting indicates a COPC that does not pass the toxicity screen or does not have a BCL.

-- = No value

bgs = below ground surface

ft = feet

mg/kg = milligram per kilogram

pCi/g = picocuries per gram

ECA = Excavation control area

BCL = Basic comparison level

PBT = Persistent bioaccumulative toxic

VOC = Volatile organic compound

SVOC = Semivolatile organic compound

PAH = Polycyclic aromatic hydrocarbons

PCB = Polychlorinated biphenyl

OCP = Organochlorine pesticides

OPP = Organophosphorus pesticides

TEQ = Toxicity equivalents

BaPEq = Benzo(a)pyrene equivalent

* Methodology for equivalent calculations explained in text

The BCL used for each analyte is the lower of the indoor and outdoor worker BCLs

TABLE 11. Inside ECA Soils (0-2 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker Inhalation BCLs

Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Unit	No. of Samples	No. of Detects	% Detects	Detects		PBT	Class A Carcinogen	Inhalation BCLs			Toxicity Screen
						Maximum	Location of Maximum			BCL or Site Specific Value	Number >BCL	Ratio of Maximum Value to BCL	
Chlorine Oxyanions	Perchlorate	mg/kg	93	90	97	9500	SSAM6-05	No	No	--	--	--	--
Metals	Arsenic	mg/kg	258	258	100	590	EE-C23-1	No	Yes	3400	0	0.17	Fail
	Cobalt	mg/kg	69	69	100	190	RSAQ8	No	No	1600	0	0.12	Fail
	Lead	mg/kg	73	73	100	3600	EE-C23-1	Yes	No	--	--	--	--
	Magnesium	mg/kg	75	74	99	190000	DS-DB-1	No	No	--	--	--	--
	Manganese	mg/kg	90	90	100	77000	EE-C23-1	No	No	260000	0	0.30	Fail
	Potassium	mg/kg	67	66	99	4200	RSAR3	No	No	--	--	--	--
	Sodium	mg/kg	67	66	99	5700	SA124	No	No	--	--	--	--
	Thallium	mg/kg	67	65	97	62	SA56	No	No	--	--	--	--
Other Inorganics	ortho-Phosphate	mg/kg	6	1	17	3.2	SA13	No	No	--	--	--	--
	Sulfate	mg/kg	65	64	98	32000	SA130	No	No	--	--	--	--
Radionuclides	Uranium-235	pCi/g	65	40	62	0.16	SA130	No	No	0.35	0	0.46	Fail
SVOCs	Hexachlorobenzene	mg/kg	173	98	57	300	SA127	Yes	No	32000	0	0.0094	Pass
	Octachlorostyrene	mg/kg	108	29	27	9.3	RSAJ7	Yes	No	--	--	--	--
PAHs	BaPEq*	mg/kg	112	23	21	1.4	DS-C24-2	Yes	No	13000	0	0.00011	Pass
	Phenanthrene	mg/kg	117	33	28	0.59	DS-C24-2	Yes	No	5400	0	0.00011	Pass
PCBs	Aroclor-1260	mg/kg	21	5	24	0.51	SA33	Yes	No	26000	0	0.000020	Pass
Dioxins/Furans	Dioxin/Furan TEQ*	mg/kg	136	131	96	0.073	SA127	Yes	No	--	--	--	--
Pesticides - OCPs	4,4'-DDE	mg/kg	35	4	11	0.14	SA107	Yes	No	150000	0	0.00000093	Pass
	4,4'-DDT	mg/kg	35	5	14	0.12	SA107	Yes	No	150000	0	0.00000080	Pass
	Heptachlor	mg/kg	35	1	3	0.93	EE-E08A-1	Yes	No	11000	0	0.000085	Pass

TABLE 11. Inside ECA Soils (0-2 ft bgs): Concentration/Toxicity Screen based on Indoor/Outdoor Worker Inhalation BCLs
Nevada Environmental Response Trust Site, Henderson, Nevada

Notes:

Blue highlighting indicates a COPC that does not pass the toxicity screen or does not have a BCL.

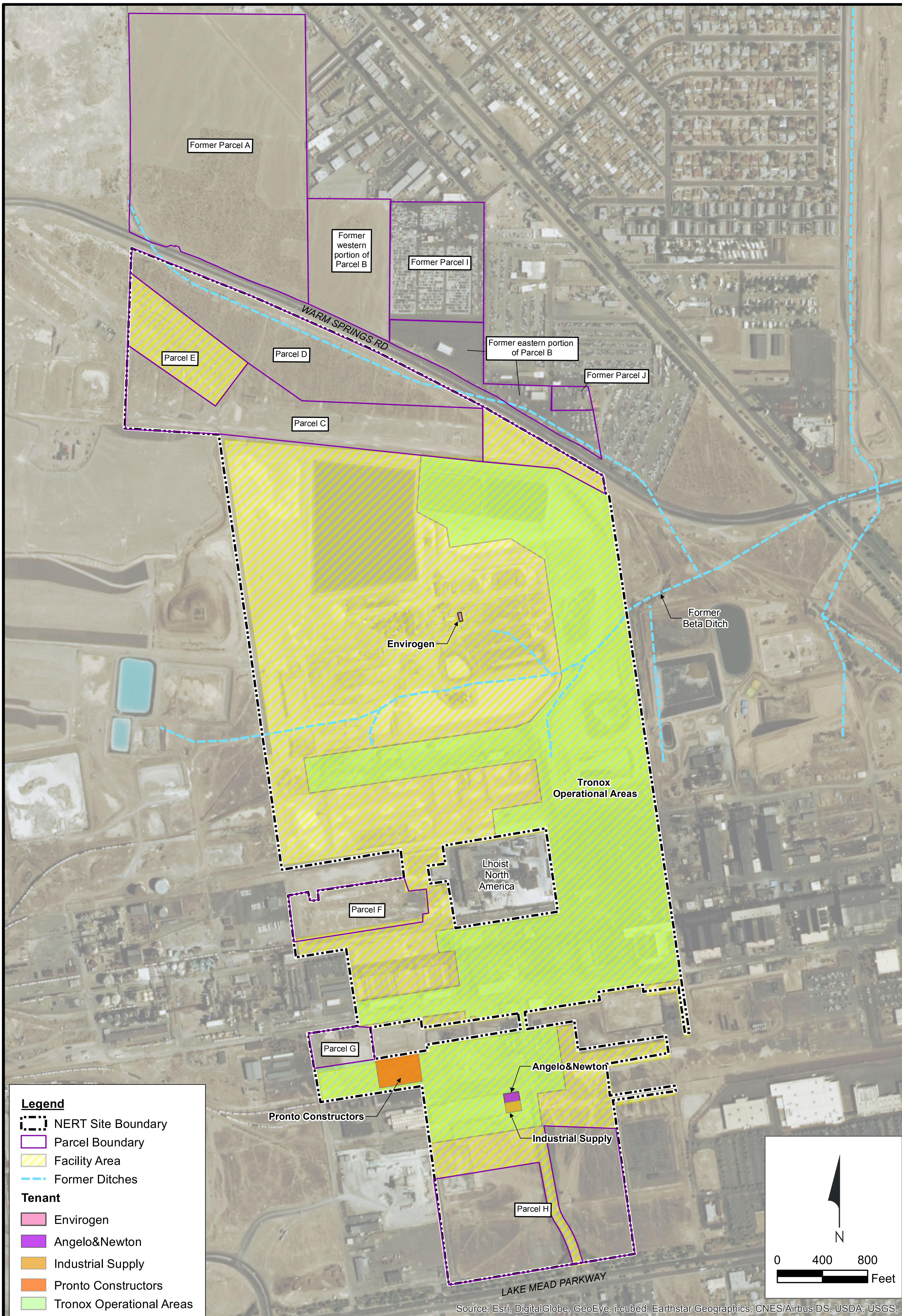
-- = No value	SVOC = Semivolatile organic compound
bgs = below ground surface	PAH = Polycyclic aromatic hydrocarbons
ft = feet	PCB = Polychlorinated biphenyl
mg/kg = milligram per kilogram	OCP = Organochlorine pesticides
pCi/g = picocuries per gram	OPP = Organophosphorus pesticides
ECA = Excavation control area	TEQ = Toxicity equivalents
BCL = Basic comparison level	BaPEq = Benzo(a)pyrene equivalent
PBT = Persistent bioaccumulative toxic	* Methodology for equivalent calculations explained in text
VOC = Volatile organic compound	The BCL used for each analyte is the lower of the indoor and outdoor worker BCLs

TABLE 12. COPCs Identified for Outside ECA Soils (0-10 ft bgs) and Inside ECA Soils (0-2 ft bgs)
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Group	Analyte	Outside ECA Soils	Inside ECA Soils
Chlorine Oxyanions	Chlorate	x	
	Perchlorate	x	(x)
Metals	Arsenic	x	x
	Chromium VI	x	
	Cobalt	x	x
	Lead	x	x
	Manganese	x	x
	Palladium	(x)	
	Thallium		(x)
	Zirconium	x	
Radionuclides	Radium-226	x	
	Radium-228	x	
	Thorium-228	x	
	Thorium-230	x	
	Thorium-232	x	
	Uranium-234	x	
	Uranium-235	x	x
	Uranium-238	x	
SVOCs	Hexachlorobenzene	x	
	Octachlorostyrene	(x)	(x)
	bis(2-Ethylhexyl)phthalate	x	
PAHs	BaPEq	x	
	Naphthalene	x	
	Phenanthrene	x	
PCBs	Aroclor-1248	x	
	Aroclor-1260	x	
Dioxins/Furans	Dioxin/Furan TEQ	x	(x)
Pesticides - OCPs	4,4'-DDE	x	
	4,4'-DDT	x	
	Dieldrin	x	
	Heptachlor epoxide	x	
	Toxaphene	x	
Asbestos	Long amphibole fibers	x	x
	Short amphibole fibers	x	x

Notes:
-- = Not applicable
bgs = below ground surface
ft = feet
ECA = Excavation control area
BCL = Basic comparison level
x = Evaluated quantitatively
(x) = For outside ECA soils, indicates that an inhalation and/or oral toxicity value is not available; for inside ECA soils, indicates that an inhalation toxicity value in not available. All chemicals denoted (x) will be identified as a COPC, and the chemical will be evaluated qualitatively in the uncertainties section of the BHRA.

FIGURES



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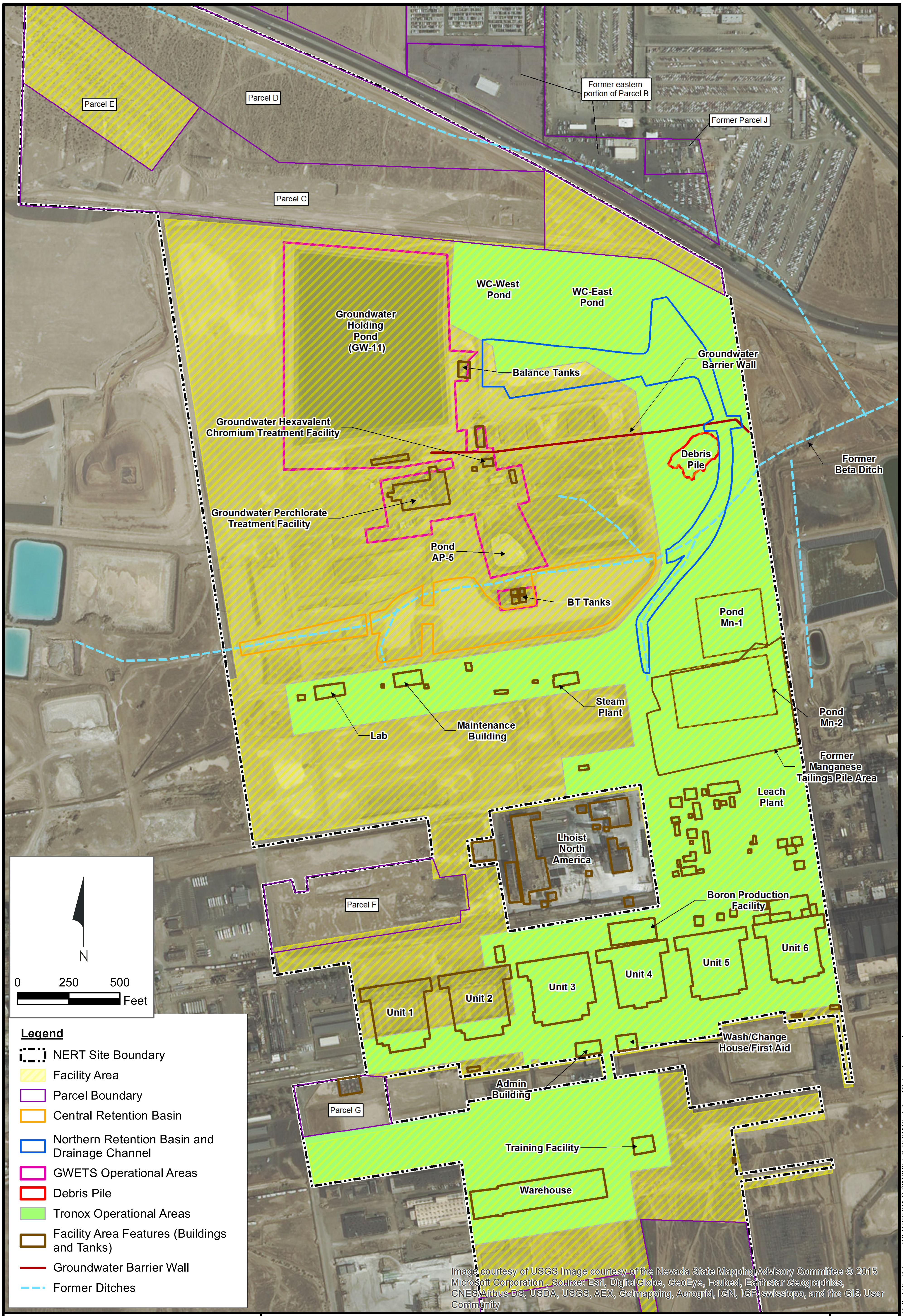
Facility Area Boundary and Tronox Operational Areas
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **1**

Drafter: RS | Date: 5/4/2015 | Contract Number: 21-34800I | Approved by: | Revised:



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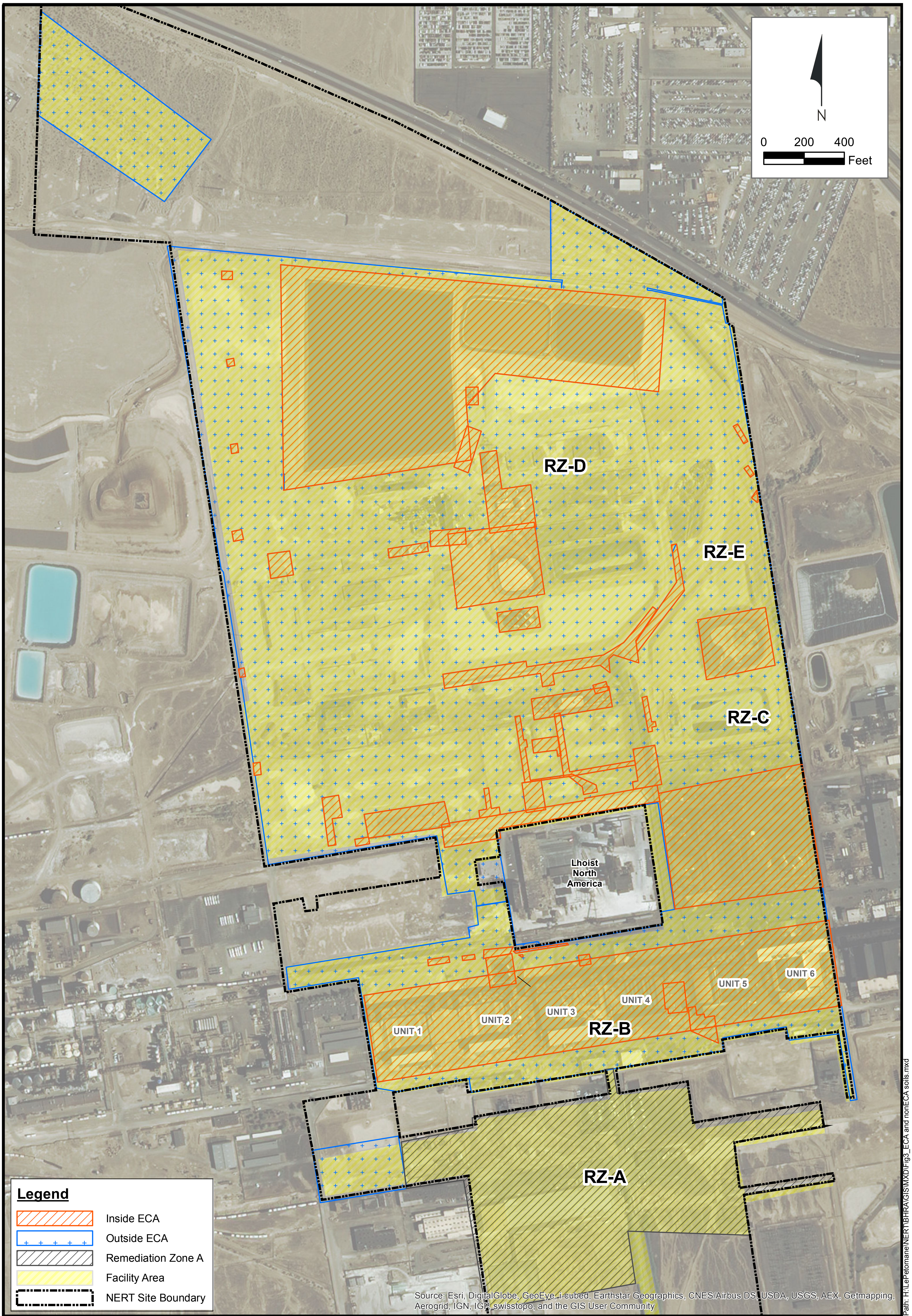
Facility Area Features

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **2**

Drafter: RS | Date: 5/4/2015 | Contract Number: 21-34800I | Approved by: | Revised:



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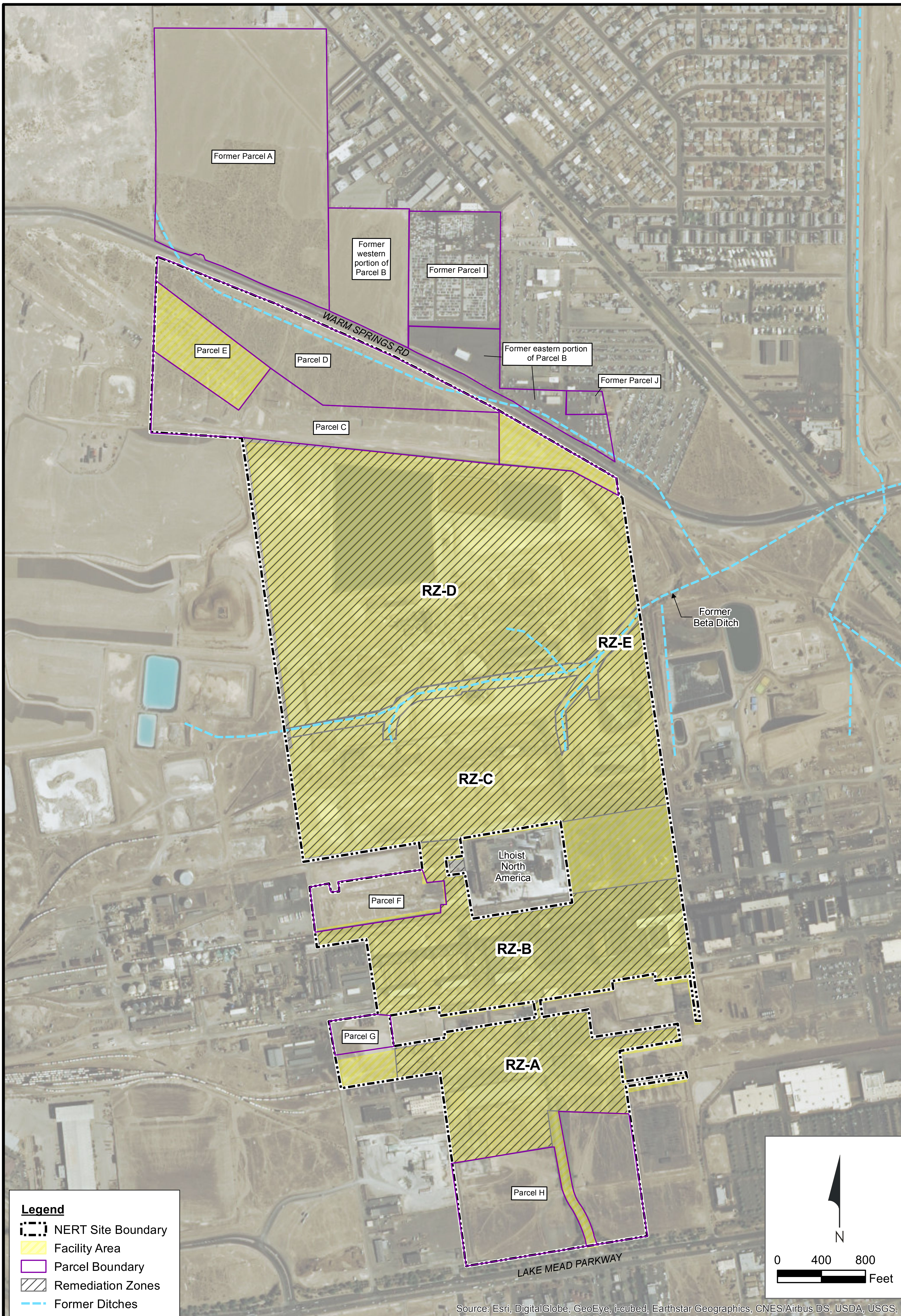
Outside ECA Soils and Inside ECA Soils
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
3

Drafter: RS/YZ | Date: 5/4/2015 | Contract Number: 21-37300C | Approved by: | Revised:



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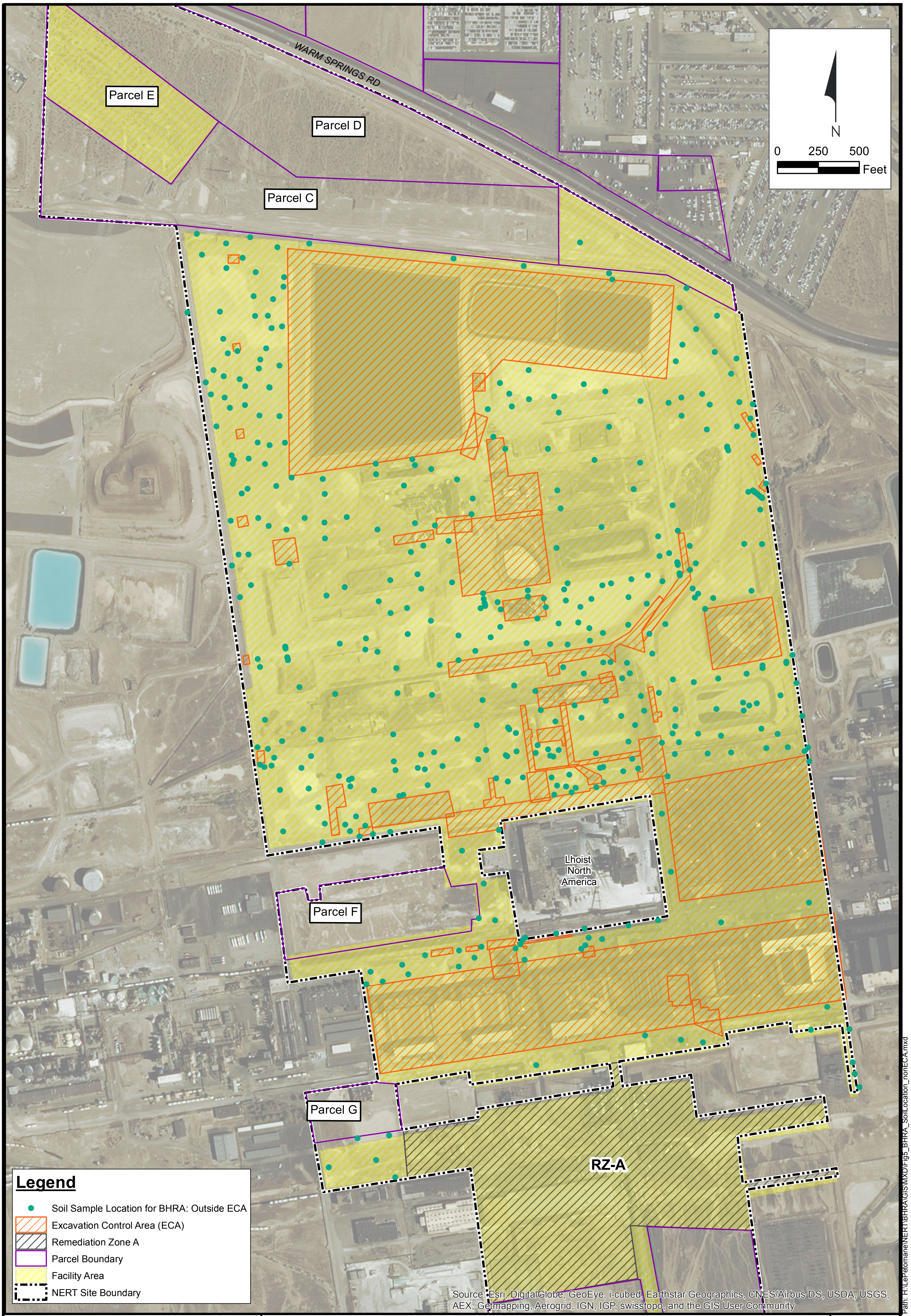
Facility Area and Remediation Zones

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **4**

Drafter: RS | Date: 5/4/2015 | Contract Number: 21-34800I | Approved by: | Revised:



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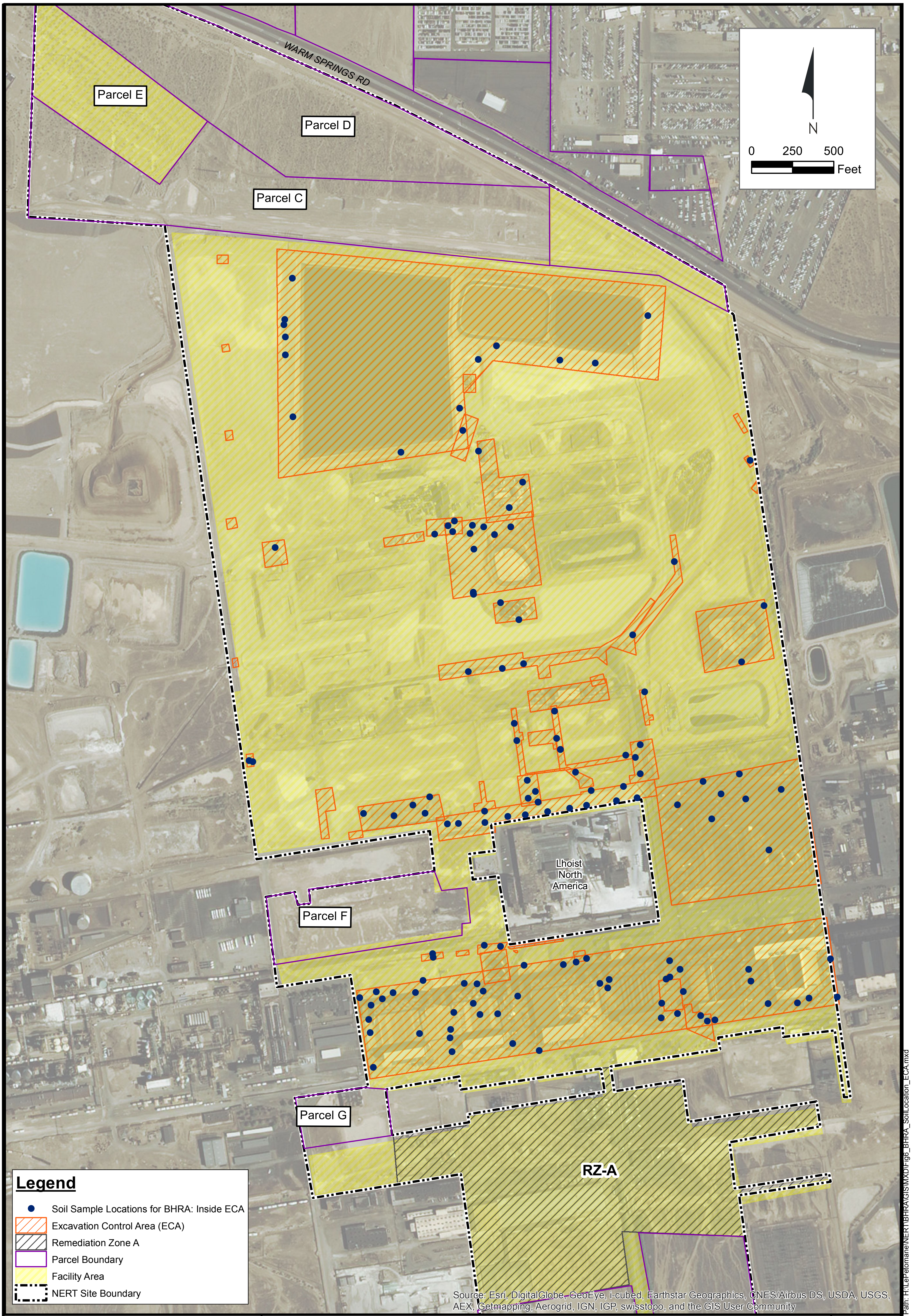
Outside ECA Areas: Soil Sampling Locations included in the BHRA
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure
5

Drafter: RS, YZ | Date: 5/4/2015 | Contract Number: 21-37300C | Approved by: | Revised:



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Inside ECA Areas: Soil Sampling Locations included in the BHRA

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure 6

Drafter: RS, YZ Date: 5/4/2015 Contract Number: 21-37300C Approved by: Revised:

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Outside ECA Soils (0-10ft bgs): Arsenic

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **7**

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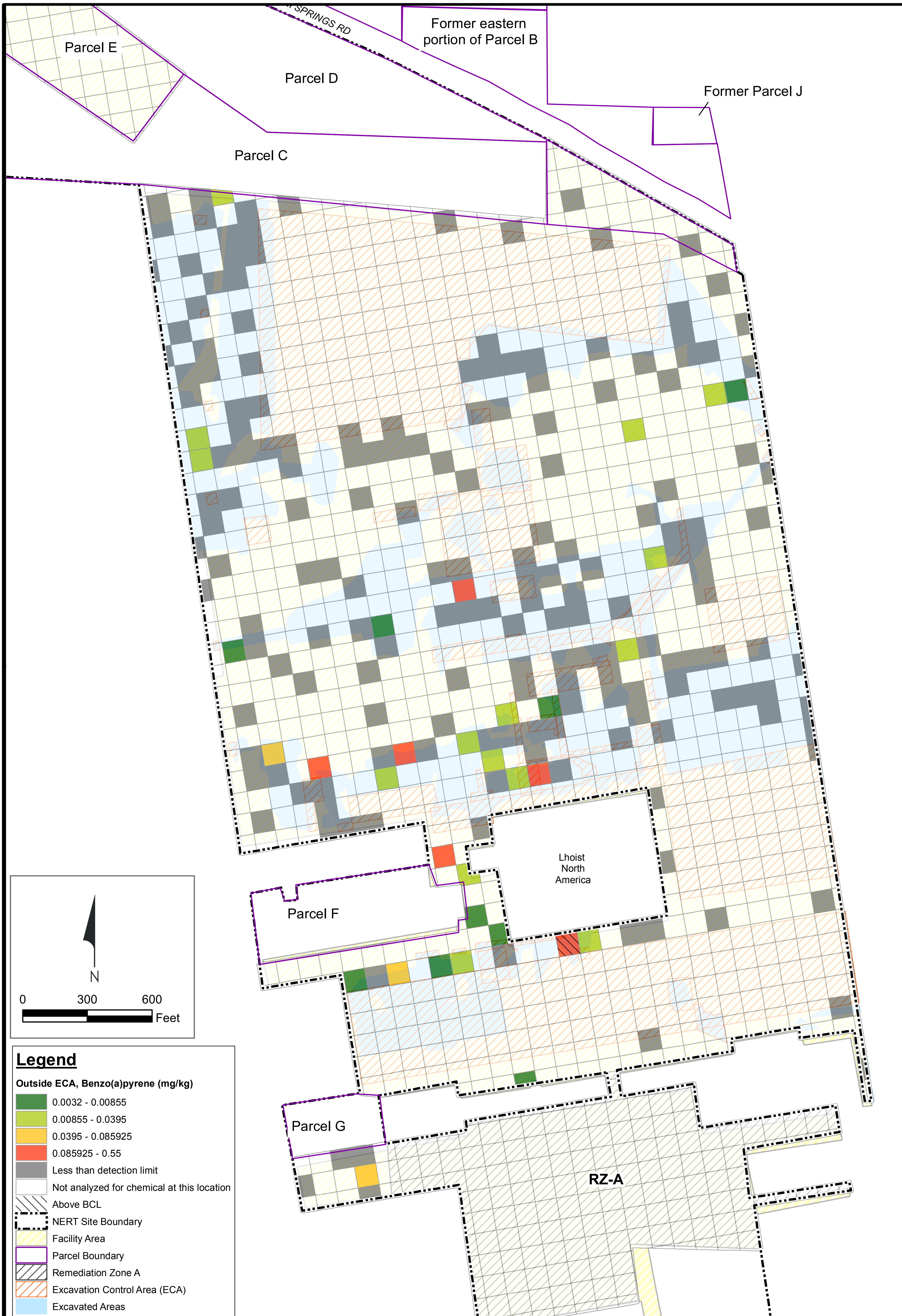

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Outside ECA Soils (0-10ft bgs): Benzo(a)pyrene

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **8**

Drafter: YZ	Date: 5/5/2015	Contract Number: 21-37300C	Approved by:	Revised:

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Outside ECA Soils (0-10ft bgs): Hexachlorobenzene

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **9**

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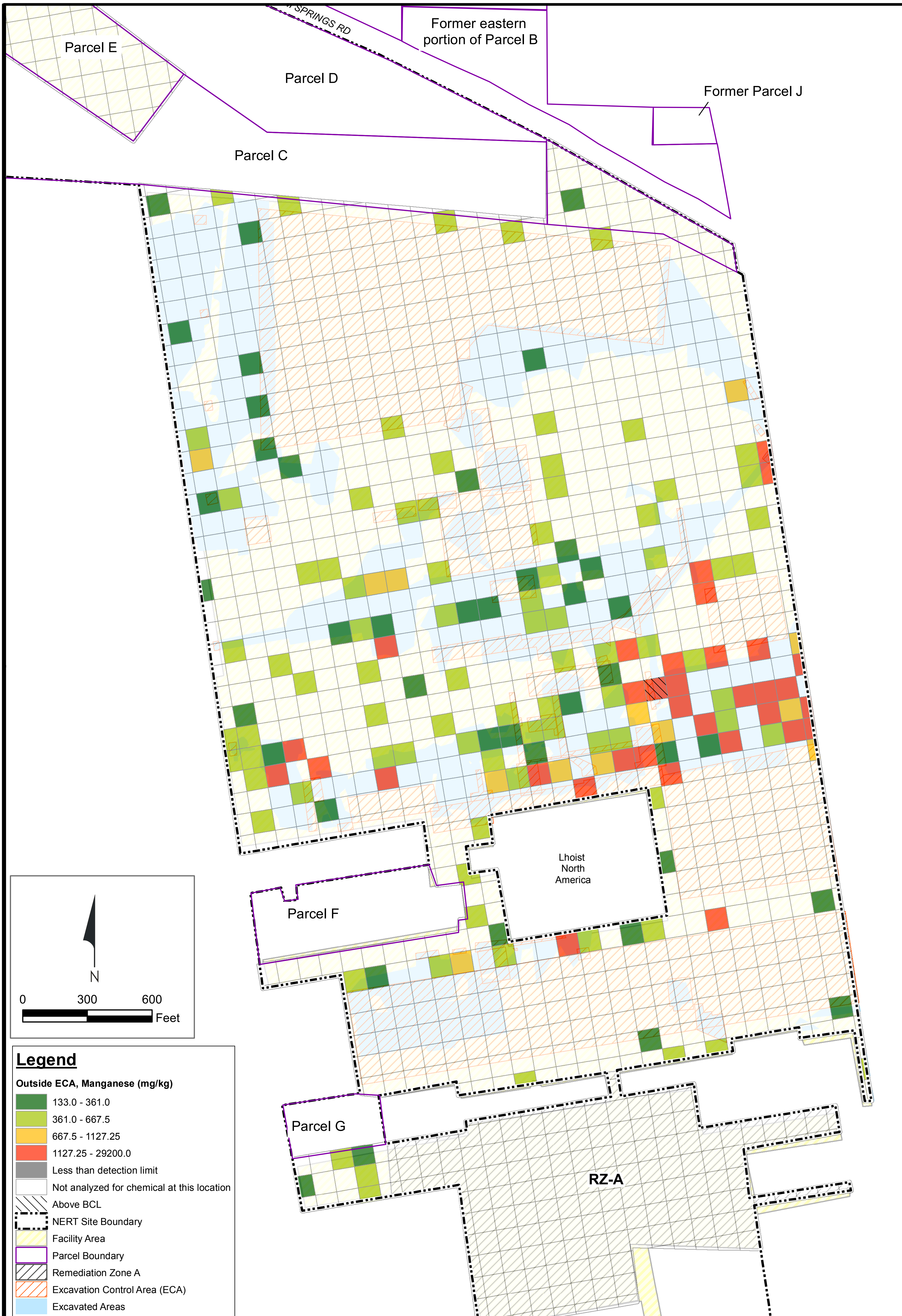

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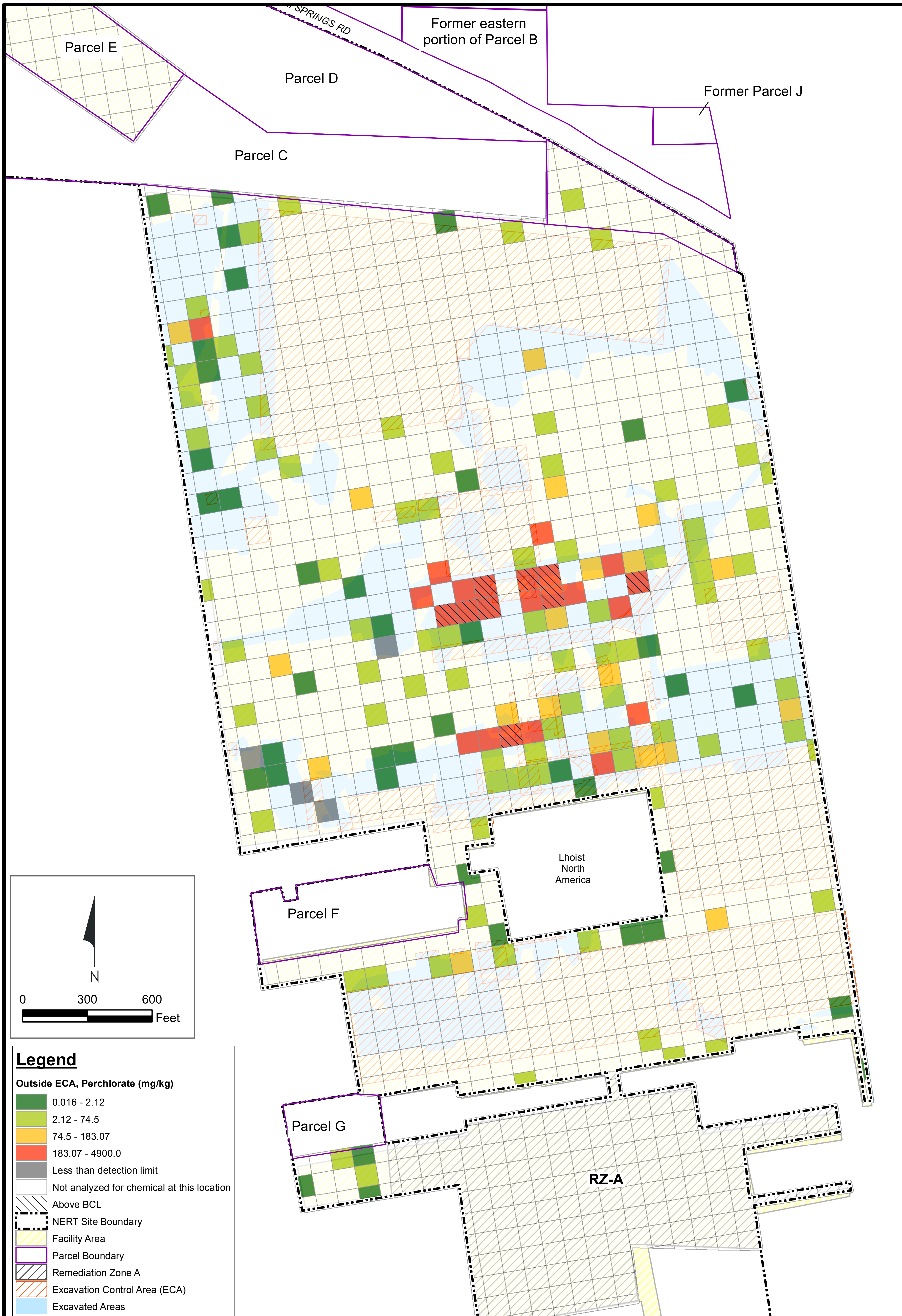
Outside ECA Soils (0-10ft bgs): Manganese

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **10**

Drafter: YZ | Date: 5/5/2015 | Contract Number: 21-37300C | Approved by: | Revised:



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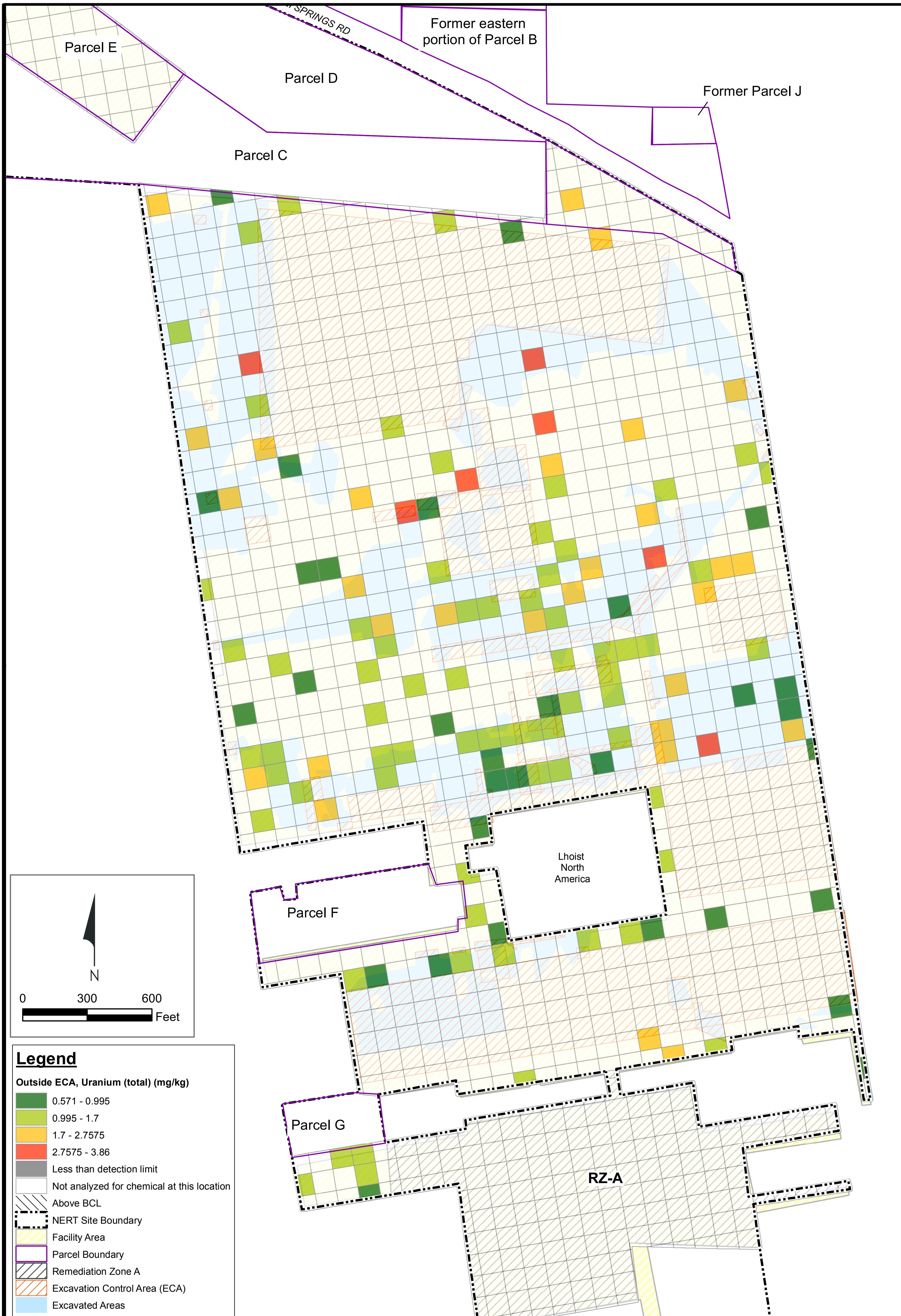
Outside ECA Soils (0-10ft bgs): Perchlorate

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **11**

Drafter: YZ | Date: 5/5/2015 | Contract Number: 21-37300C | Approved by: | Revised:



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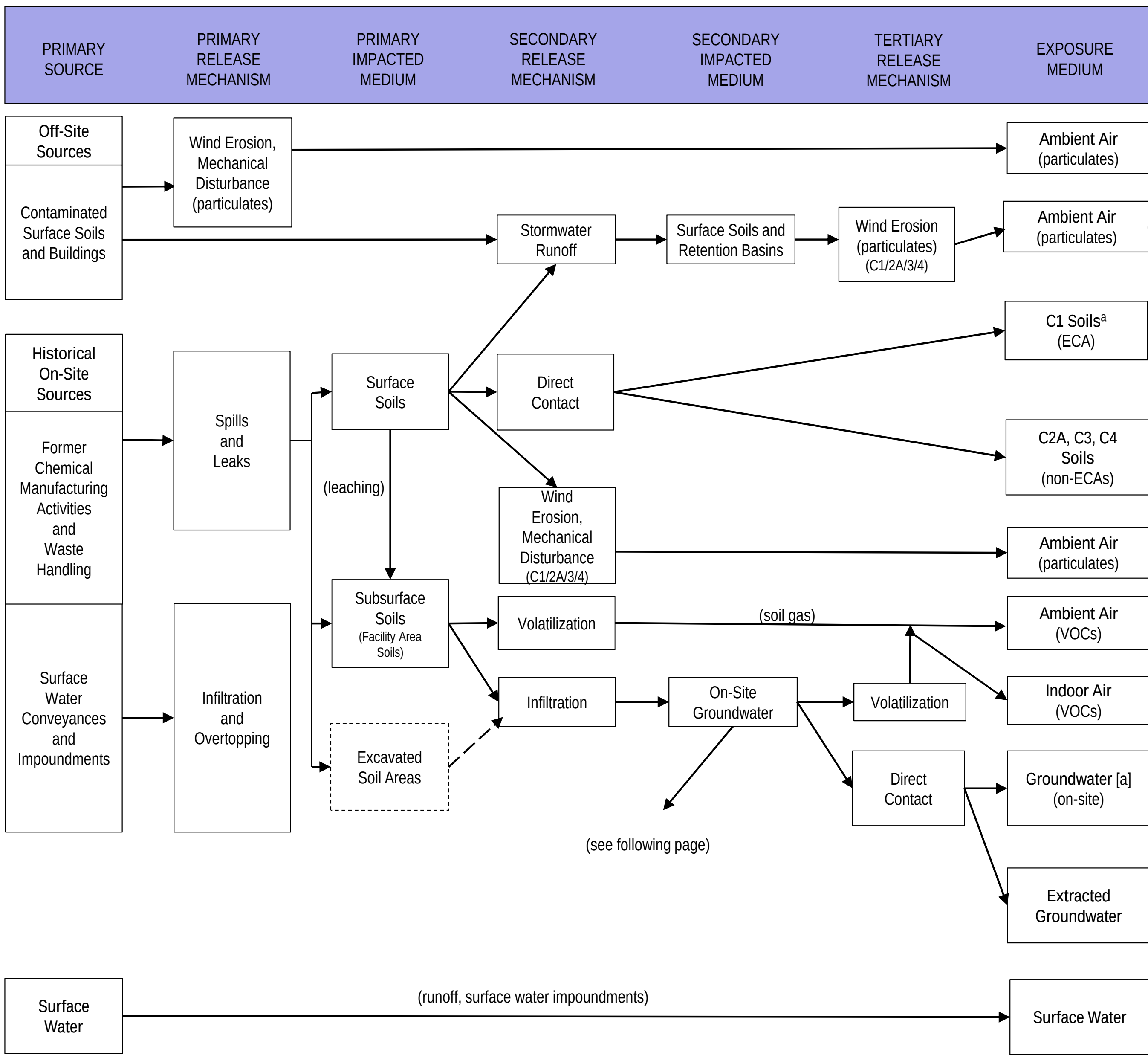
Outside ECA Soils (0-10ft bgs): Uranium (total)

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **12**

Drafter: YZ | Date: 5/5/2015 | Contract Number: 21-37300C | Approved by: | Revised:

APPENDIX A
CONCEPTUAL SITE MODEL DIAGRAM



EXPOSURE ROUTE	ON-SITE RECEPTOR: Short-term Construction Worker	Outdoor Worker	Indoor Worker	Visitor/ Trespasser
Inhalation	(✓)	(✓)	(✓)	⊙
Inhalation	✓	✓	✓	⊙
Ingestion	SMP	SMP	✓	⊙
Dermal	SMP	SMP	o	⊙
External Gamma	SMP	SMP	✓	⊙
Ingestion	✓	✓	✓	⊙
Dermal	✓	✓	o	⊙
External Gamma	✓	✓	✓	⊙
Inhalation	✓	✓	✓	⊙
Inhalation	◎	◎	inc	⊙
Inhalation	inc	inc	✓	⊙
Ingestion	inc	inc	inc	inc
Dermal	inc	inc	inc	inc
Inhalation	inc	OSHA	inc	inc
Ingestion	inc	OSHA	inc	inc
Dermal	inc	OSHA	inc	inc
Ingestion	●	●	inc	⊙
Dermal	●	●	inc	⊙

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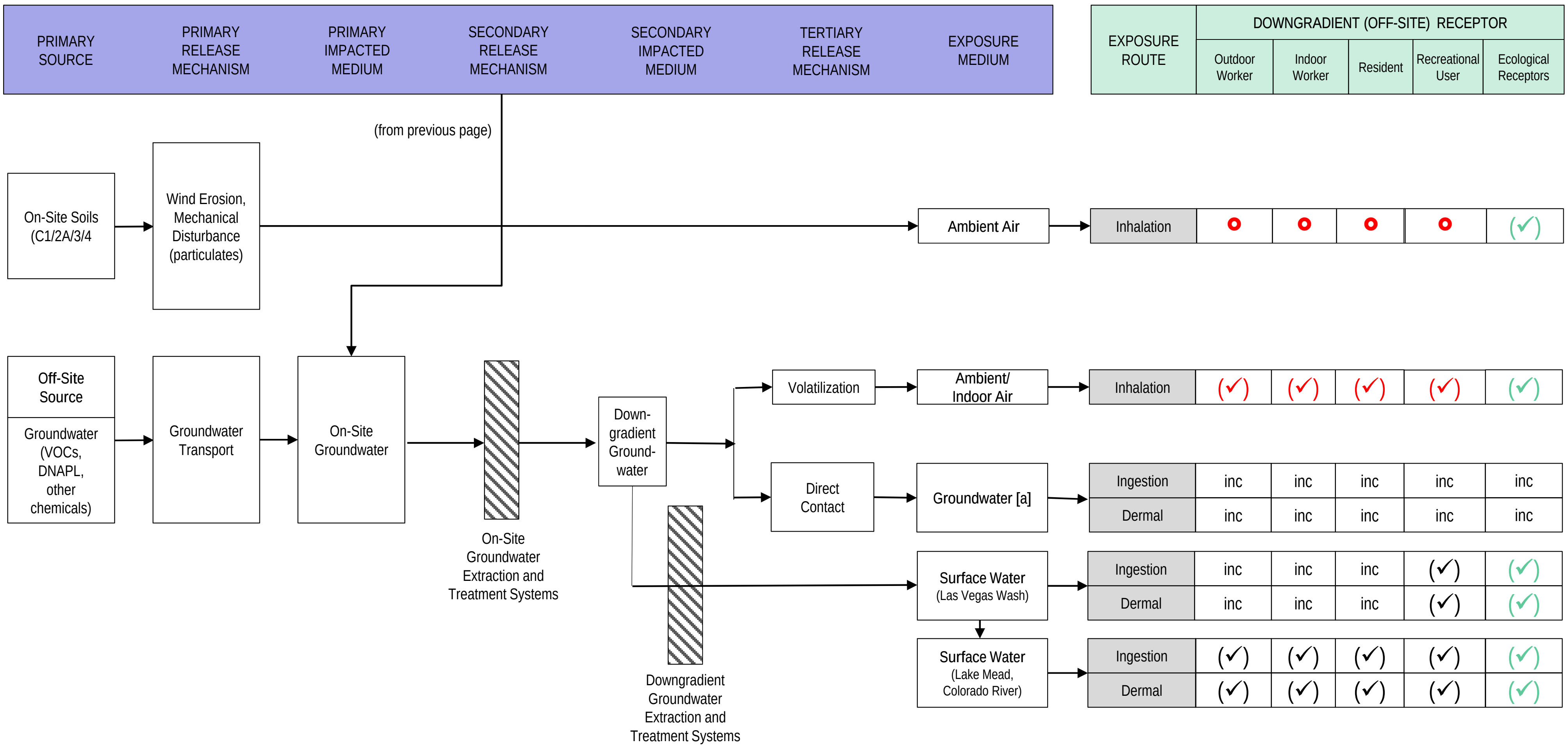
Conceptual Site Model Diagram: Facility Area and Downgradient Plume
Nevada Environmental Response Trust Site, Henderson, Nevada

Drafter: JR | Date: 5/4/2015 | Contract Number: 21-37300C | Approved by: | Revised:



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Conceptual Site Model Diagram: Facility Area and Downgradient Plume
Nevada Environmental Response Trust Site, Henderson, Nevada

Drafter: JR	Date: 5/4/2015	Contract Number: 21-37300C	Approved by:	Revised:

Note:

This preliminary CSM, including the identification of sources, release mechanisms, exposure media, exposure routes, and receptors is based on current understanding of on-site and off-site environmental conditions. The CSM will be revised, as appropriate, based on evaluation of additional environmental data collected during the RI.

[a]	Groundwater is not and will not be used as a source of drinking water. Incidental ingestion and dermal contact with groundwater by on-site construction workers are considered to be incomplete exposure pathways because depth to groundwater is >20 ft bgs. For off-site workers, depth to groundwater in some areas is <20 feet; however, the intermittent exposures of a construction worker to groundwater would be negligible.

Key:

C1, C2A, C3, C4	Category 1, 2A, 3, and 4 soils, where C1 = soils 0 – 10 feet bgs in ECAs; C2A = soils 0 – 10 feet bgs (excluding remediation zone A) with concentrations <BCLs; C3 = soils 0 – 10 feet bgs with concentrations >BCLs; C4 = soils 0 – 10 feet bgs not previously sampled or available information considered inadequate. C2B soils (not shown on this CSM) are soils 0 – 10 feet bgs with concentrations <BCLs in remediation zone A.
inc	Incomplete exposure pathway
OSHA	Workers at the groundwater extraction and treatment facility could potentially be exposed to contaminants in extracted groundwater. However, potential exposures will not be evaluated quantitatively because the workers are regulated by the Occupational Safety and Health Administration (OSHA) and a comprehensive worker health and safety plan (HASP) is in place to mitigate potential exposures.
SMP	Site Management Plan -- potential exposures for direct-contact pathways will be managed through the SMP.
✓	Complete exposure pathway; evaluated quantitatively in the BHRA.
(✓)	Potentially complete exposure pathway for off-site receptors. For indoor and outdoor air; pathway will be evaluated quantitatively using analytical results for soil gas and/or groundwater depending on receptor location and data availability. The specific receptors and pathways (i.e., indoor and outdoor exposures) that will be evaluated quantitatively will depend on various factors, including the results from additional sampling for VOCs in the downgradient groundwater plume and/or results from off-site soil gas investigations.
(✓)	Complete exposure pathway. ENVIRON understands that exposures of on-site receptors to airborne releases from neighboring properties would be evaluated in the risk assessments being prepared for those properties, under the oversight of NDEP. Pathway will be discussed quantitatively in the BHRA using results of risk assessments prepared by the neighboring properties, or qualitatively, if risk assessments are not available.
(✓)	Complete exposure pathway for perchlorate and possibly other site-related chemicals; for perchlorate, pathway will be evaluated by comparing surface water concentrations to the Nevada Provisional Action Level for perchlorate (NDEP 2011b).
(✓)	Complete exposure pathway; as discussed in Section 1.2.3, the ecological risk assessment will be conducted following aquifer restoration.
○	Complete, but insignificant exposure pathway. Consistent with USEPA guidance (USEPA 2002b) and the NDEP-approved 2010 HRA work plan (Northgate and Exponent 2010a), potential exposures of indoor workers to soil from dermal exposure are not evaluated quantitatively, but will be discussed qualitatively.
◎	Exposures of outdoor workers via inhalation of soil or groundwater vapors would be less than exposures of indoor workers; inhalation of vapors in outdoor air will be evaluated only if estimated risks for the vapor intrusion (indoor) pathway are >1E-06 or the hazard index is >1.
○	Exposures of all off-site receptors via inhalation of airborne soil particulates would be significantly less than exposures of on-site workers; inhalation of particulates will be evaluated for off-site receptors only if estimated risks for on-site receptors are >1E-06 or the hazard index is >1.
○	For on-site receptors, potentially complete, but insignificant exposure pathway; not evaluated quantitatively because potential exposures would be intermittent and of short duration or regulated under OSHA; surface water pathways will be discussed qualitatively.
⊙	Potentially complete exposure pathway; not evaluated quantitatively because potential exposures of a visitor/trespasser would be less than exposures of an on-site worker; the visitor/trespasser will be discussed qualitatively.

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Conceptual Site Model Diagram: Facility Area and Downgradient Plume

Nevada Environmental Response Trust Site, Henderson, Nevada

Drafter: JR Date: 5/4/2015 Contract Number: 21-37300C Approved by: Revised:

APPENDIX B
SOIL DATA SUMMARY STATISTICS
(NOT INCLUDED IN THIS DELIVERABLE)

APPENDIX C
BACKGROUND EVALUATION FOR METALS AND RADIONUCLIDES

Appendix C tables present summary statistics, background comparisons, secular equilibrium test results, and correlation matrices, as listed below:

- Table C1: Summary statistics for metals in background (RZ-A) soils, inside ECA soils (upper 2 ft) and outside ECA soils (upper 10 ft);
- Table C2: Background comparisons for metals in soils: inside ECA soils (upper 2 ft) and outside ECA soils (upper 10 ft);
- Table C3: Summary statistics for radionuclides in background (RZ-A) soils, inside ECA soils (upper 2 ft) and outside ECA soils (upper 10 ft);
- Table C4: Background comparisons for radionuclides in soils: inside ECA soils (upper 2 ft) and outside ECA soils (upper 10 ft);
- Table C5a: Equivalence test for secular equilibrium of the uranium decay series (U-238 chain);
- Table C5b: Equivalence test for secular equilibrium of the thorium decay series (Th-232 chain); and
- Table C6: Correlation matrices for the uranium decay series and the thorium decay series

Appendix C figures present box plots and Q-Q plots for both untransformed and log-transformed data for metals and radionuclides, as listed below:

- Figures C1-1 through C1-40: Boxplots for metals and radionuclides in background soils, inside ECA soils (upper 2 ft) and outside ECA soils (upper 10 ft); and

Figures C2-1A through C2-40B: Normal and lognormal Q-Q plots for metals and radionuclides in background soils, inside ECA soils (upper 2 ft), and outside ECA soils (upper 10 ft).

Table C1. Summary Statistics for Metals in Background (RZ-A) Soils, Inside ECA Soils (0-2 ft bgs), and Outside ECA Soils (0-10 ft bgs)
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Name	Location	No. of Samples	No. of Detects	% Detects	Non-detects (mg/kg)		Detects (mg/kg)					Shapiro-Wilk Test	
					Minimun	Maximum	Minimum	Median	Mean	Maximum	Standard Deviation	Normal (*p*-value)	Lognormal (*p*-value)
Aluminum	Background	31	31	100%	NA	NA	7340	8970	9020	11400	890	0.6	0.9
	inside ECA	67	67	100%	NA	NA	3950	8500	8520	11700	1470	0.6	*0.001*
	outside ECA	254	254	100%	NA	NA	5130	8880	8740	12200	1370	0.2	*<0.001*
Antimony	Background	31	3	10%	2.0	2.2	0.60	0.90	1.6	3.4	1.5	*<0.001*	*<0.001*
	inside ECA	67	29	43%	1.7	2.2	0.12	0.80	2.8	30.3	7.0	*<0.001*	*<0.001*
	outside ECA	248	82	33%	0.063	2.4	0.11	0.18	0.50	2.4	0.61	*<0.001*	*<0.001*
Arsenic	Background	31	31	100%	NA	NA	1.6	2.4	2.4	4.3	0.54	0.02	0.5
	inside ECA	129	129	100%	NA	NA	1.3	3.0	16.8	586	69	*<0.001*	*<0.001*
	outside ECA	594	594	100%	NA	NA	0.57	3.3	3.9	39.2	2.8	*<0.001*	*<0.001*
Barium	Background	31	31	100%	NA	NA	111	162	166	213	22.5	0.6	0.4
	inside ECA	67	67	100%	NA	NA	115	176	350	6760	877	*<0.001*	*<0.001*
	outside ECA	254	254	100%	NA	NA	79.8	175	188	1780	115	*<0.001*	*<0.001*
Beryllium	Background	31	31	100%	NA	NA	0.36	0.46	0.46	0.59	0.048	0.6	0.7
	inside ECA	67	67	100%	NA	NA	0.30	0.46	0.52	2.2	0.28	*<0.001*	*<0.001*
	outside ECA	254	254	100%	NA	NA	0.073	0.47	0.47	0.71	0.077	*<0.001*	*<0.001*
Boron	Background	31	7	23%	10.2	11	3.6	6.2	6.7	11.7	2.7	*<0.001*	*<0.001*
	inside ECA	67	26	39%	4.2	11.1	2.8	11.4	16.2	108	21.4	*<0.001*	*<0.001*
	outside ECA	254	78	31%	1.4	12.9	1.5	12.6	65.3	1510	236	*<0.001*	*<0.001*
Cadmium	Background	31	25	81%	0.10	0.11	0.11	0.19	0.20	0.48	0.085	*0.003*	0.02
	inside ECA	67	52	78%	0.10	0.11	0.06	0.17	0.32	2.7	0.45	*<0.001*	*<0.001*
	outside ECA	254	168	66%	0.005	0.11	0.04	0.13	0.23	8.9	0.70	*<0.001*	*<0.001*
Calcium	Background	31	31	100%	NA	NA	19200	28200	29000	43300	6580	0.2	0.6
	inside ECA	67	66	99%	55.6	55.6	11900	24600	25600	51200	8490	0.02	*<0.001*
	outside ECA	254	254	100%	NA	NA	9930	27700	28100	62500	9050	*<0.001*	0.1
Chromium	Background	31	31	100%	NA	NA	5.6	7.5	7.7	10.7	1.2	0.4	0.7
	inside ECA	67	67	100%	NA	NA	4.4	8.2	9.7	36.9	5.5	*<0.001*	*<0.001*
	outside ECA	256	256	100%	NA	NA	1.3	8.3	10.8	102	11.8	*<0.001*	*<0.001*
Chromium VI	Background	31	1	3%	0.41	0.43	0.29	0.29	0.29	0.29	NA	*<0.001*	*<0.001*
	inside ECA	124	29	23%	0.11	0.44	0.12	0.59	1.2	5.2	1.3	*<0.001*	*<0.001*
	outside ECA	472	89	19%	0.11	0.51	0.11	0.79	6.0	106	17.8	*<0.001*	*<0.001*
Cobalt	Background	31	31	100%	NA	NA	5.4	7.3	7.3	9.1	0.76	0.5	0.4
	inside ECA	69	69	100%	NA	NA	1.7	7.7	12.3	190	23.1	*<0.001*	*<0.001*
	outside ECA	302	302	100%	NA	NA	3.2	7.4	11.5	284	26.7	*<0.001*	*<0.001*
Copper	Background	31	31	100%	NA	NA	15.8	19.1	23.1	140	21.8	*<0.001*	*<0.001*
	inside ECA	67	67	100%	NA	NA	12	19.8	31.5	171	31.4	*<0.001*	*<0.001*
	outside ECA	254	254	100%	NA	NA	8.0	17.3	18.1	77.1	6.3	*<0.001*	*<0.001*
Iron	Background	31	31	100%	NA	NA	11300	15700	15500	20600	2140	0.5	0.3
	inside ECA	67	67	100%	NA	NA	6910	15600	15200	20700	2760	0.5	*0.002*
	outside ECA	254	254	100%	NA	NA	7050	14600	14400	21000	2460	0.6	*<0.001*
Lead	Background	31	31	100%	NA	NA	7.1	8.9	11.3	72.8	11.6	*<0.001*	*<0.001*
	inside ECA	73	73	100%	NA	NA	6.0	12	79	3620	425	*<0.001*	*<0.001*
	outside ECA	327	327	100%	NA	NA	3.6	8.7	11.9	267	17.7	*<0.001*	*<0.001*

Table C1. Summary Statistics for Metals in Background (RZ-A) Soils, Inside ECA Soils (0-2 ft bgs), and Outside ECA Soils (0-10 ft bgs)
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Name	Location	No. of Samples	No. of Detects	% Detects	Non-detects (mg/kg)		Detects (mg/kg)					Shapiro-Wilk Test	
					Minimun	Maximum	Minimum	Median	Mean	Maximum	Standard Deviation	Normal (*p*-value)	Lognormal (*p*-value)
Magnesium	Background	31	31	100%	NA	NA	7700	9810	9990	13000	1320	0.8	1
	inside ECA	75	74	99%	55.6	55.6	6330	9350	21500	189000	41400	*<0.001*	*<0.001*
	outside ECA	306	306	100%	NA	NA	5300	9830	10800	71000	5060	*<0.001*	*<0.001*
Manganese	Background	31	31	100%	NA	NA	262	360	366	537	61.3	0.03	0.4
	inside ECA	90	90	100%	NA	NA	77.1	427	5080	77300	15000	*<0.001*	*<0.001*
	outside ECA	410	410	100%	NA	NA	133	374	891	29200	2170	*<0.001*	*<0.001*
Mercury	Background	31	27	87%	0.017	0.019	0.006	0.016	0.036	0.36	0.069	*<0.001*	*<0.001*
	inside ECA	67	60	90%	0.016	0.041	0.007	0.02	0.063	0.80	0.14	*<0.001*	*<0.001*
	outside ECA	256	214	84%	0.0067	0.04	0.003	0.012	0.019	0.31	0.029	*<0.001*	*<0.001*
Molybdenum	Background	31	30	97%	0.31	0.31	0.31	0.49	1.7	32.7	5.9	*<0.001*	*<0.001*
	inside ECA	67	66	99%	0.56	0.56	0.19	0.49	2.3	82.2	10.3	*<0.001*	*<0.001*
	outside ECA	254	229	NA	0.052	0.34	0.17	0.48	0.56	3.2	0.37	*<0.001*	*<0.001*
Nickel	Background	31	31	100%	NA	NA	12.7	15.6	15.9	21.4	1.8	0.08	0.5
	inside ECA	67	67	100%	NA	NA	10	15.3	17	98.1	10.8	*<0.001*	*<0.001*
	outside ECA	254	254	100%	NA	NA	6.6	14.9	15.6	164	9.8	*<0.001*	*<0.001*
Platinum	Background	31	19	61%	0.10	0.11	0.006	0.01	0.012	0.046	0.0085	*<0.001*	*<0.001*
	inside ECA	67	38	57%	0.095	0.24	0.005	0.011	0.016	0.057	0.013	*<0.001*	*<0.001*
	outside ECA	254	148	58%	0.01	0.24	0.005	0.01	0.014	0.16	0.015	*<0.001*	*<0.001*
Potassium	Background	31	31	100%	NA	NA	1450	2080	2180	4210	658	*<0.001*	0.02
	inside ECA	67	66	99%	11.1	11.1	1520	2420	2520	4240	592	*<0.001*	*<0.001*
	outside ECA	254	254	100%	NA	NA	1230	2140	2230	4190	527	*<0.001*	0.7
Selenium	Background	31	3	10%	4.1	4.4	0.80	0.80	0.83	0.90	0.058	*<0.001*	*<0.001*
	inside ECA	67	4	6%	0.55	50	0.90	0.95	0.98	1.1	0.096	*<0.001*	*<0.001*
	outside ECA	254	9	4%	0.16	4.7	0.80	1.0	0.96	1.2	0.12	*<0.001*	*<0.001*
Silver	Background	31	0	0%	0.50	0.50	NA	NA	NA	NA	NA	NA	NA
	inside ECA	67	15	22%	0.40	0.60	0.028	0.15	0.95	9.6	2.4	*<0.001*	*<0.001*
	outside ECA	254	66	26%	0.021	0.60	0.02	0.12	0.25	7.6	0.93	*<0.001*	*<0.001*
Sodium	Background	31	31	100%	NA	NA	307	630	621	1050	194	0.3	0.3
	inside ECA	67	66	99%	22.2	22.2	197	622	931	5660	925	*<0.001*	*<0.001*
	outside ECA	254	254	100%	NA	NA	198	763	1150	11700	1200	*<0.001*	*<0.001*
Strontium	Background	31	31	100%	NA	NA	129	214	222	339	57	0.4	0.3
	inside ECA	67	65	97%	0.56	213	84.3	162	191	1200	144	*<0.001*	*<0.001*
	outside ECA	254	254	100%	NA	NA	72.5	205	217	805	90.6	*<0.001*	0.2
Thallium	Background	31	31	100%	NA	NA	0.071	0.092	0.11	0.19	0.033	*<0.001*	*0.003*
	inside ECA	67	65	97%	0.22	0.23	0.063	0.10	1.3	61.8	7.7	*<0.001*	*<0.001*
	outside ECA	254	219	86%	0.10	0.26	0.016	0.099	0.16	8.4	0.57	*<0.001*	*<0.001*
Tin	Background	31	0	0%	10.2	11	NA	NA	NA	NA	NA	0.4	0.4
	inside ECA	67	8	12%	8.6	11.9	0.49	0.68	2.1	6.6	2.7	*<0.001*	*<0.001*
	outside ECA	254	47	19%	8.7	12.2	0.40	0.52	1.3	11.9	2.2	*<0.001*	*<0.001*
Titanium	Background	31	31	100%	NA	NA	480	829	793	1080	162	0.2	0.04
	inside ECA	67	67	100%	NA	NA	310	763	762	1190	185	1	0.04
	outside ECA	254	254	100%	NA	NA	336	741	729	1270	176	0.1	*<0.001*

Table C1. Summary Statistics for Metals in Background (RZ-A) Soils, Inside ECA Soils (0-2 ft bgs), and Outside ECA Soils (0-10 ft bgs)
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Name	Location	No. of Samples	No. of Detects	% Detects	Non-detects (mg/kg)		Detects (mg/kg)					Shapiro-Wilk Test	
					Minimun	Maximum	Minimum	Median	Mean	Maximum	Standard Deviation	Normal (*p*-value)	Lognormal (*p*-value)
Tungsten	Background	31	30	97%	0.11	0.11	0.12	0.17	0.21	0.62	0.11	*<0.001*	0.04
	inside ECA	67	60	90%	0.10	0.58	0.11	0.24	2.7	69.9	11.1	*<0.001*	*<0.001*
	outside ECA	254	218	86%	0.10	0.65	0.033	0.23	0.39	8.5	0.72	*<0.001*	*<0.001*
Uranium	Background	31	31	100%	NA	NA	0.66	0.98	1.1	1.9	0.36	*0.002*	0.05
	inside ECA	67	66	99%	0.11	0.11	0.59	0.89	1.1	7.6	0.89	*<0.001*	*<0.001*
	outside ECA	254	254	100%	NA	NA	0.19	1.0	1.2	3.9	0.59	*<0.001*	*<0.001*
Vanadium	Background	31	31	100%	NA	NA	28	46	43.8	54.9	7.6	0.08	0.02
	inside ECA	67	67	100%	NA	NA	17.7	44.8	45.2	111	14	*<0.001*	0.01
	outside ECA	254	254	100%	NA	NA	21.8	41.8	41.9	78	8.7	0.04	*<0.001*
Zinc	Background	31	31	100%	NA	NA	25.8	33.3	40.4	254	39.9	*<0.001*	*<0.001*
	inside ECA	67	67	100%	NA	NA	24.9	36.3	50	511	63.1	*<0.001*	*<0.001*
	outside ECA	254	254	100%	NA	NA	17.5	31.8	33.8	269	18.3	*<0.001*	*<0.001*

Notes:
p- values < 0.01 are shown in italic
NA - value not available
Background dataset is from RZ-A, excluding the 6 borings in LOU 62.
Shapiro Wilk tests use 1/2 the detection limit (DL) for non-detects.

Table C2. Background Comparisons for Metals in Soils: Inside ECA Soils (0-2 ft bgs) and Outside ECA Soils (0-10 ft bgs)
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Name	Location	Distribution	*t*-test (*p*-value)	*t*-test (logged data) (*p*-value)	Gehan Test (*p*-value)	Quantile Test (0.8) (*p*-value)	Slippage Test (*p*-value)	Site Samples Greater than Background Samples?	Notes
Aluminum	inside ECA	N	1	1	0.9	0.7	0.7	No	a
	outside ECA	N	0.9	1	0.8	0.2	0.4	No	
Antimony	inside ECA	NP	0.1	0.9	1	0.03	0.3	LDF	a b
	outside ECA	NP	1	1	1	0.2	1	LDF	a b
Arsenic	inside ECA	NP	*0.01*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	Yes	
	outside ECA	NP	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	Yes	
Barium	inside ECA	NP	0.05	*0.004*	*0.01*	*0.02*	*0.003*	Yes	
	outside ECA	NP	*0.003*	*0.004*	*0.01*	0.04	*0.02*	Yes	
Beryllium	inside ECA	NP	0.06	0.1	0.3	0.5	0.1	Yes	c
	outside ECA	NP	0.4	0.6	0.4	0.1	0.2	No	
Boron	inside ECA	NP	*0.02*	*0.02*	0.1	*0.02*	*0.01*	LDF	b c
	outside ECA	NP	*0.02*	*0.007*	*0.003*	*0.006*	*0.003*	LDF	b c
Cadmium	inside ECA	NP	0.05	0.3	0.7	0.06	0.09	Yes	c
	outside ECA	NP	0.5	1	1	1	0.4	No	a
Calcium	inside ECA	N	1	1	1	1	0.3	No	a
	outside ECA	LN	0.7	0.9	0.8	0.7	0.3	No	
Chromium (total)	inside ECA	NP	*0.004*	*0.005*	0.05	*0.02*	*0.003*	Yes	
	outside ECA	NP	*<0.001*	*<0.001*	0.03	*0.007*	*0.002*	Yes	
Chromium VI	inside ECA	NP	*<0.001*	*<0.001*	0.05	*0.02*	0.4	LDF	b c
	outside ECA	NP	*0.002*	*<0.001*	*0.02*	*0.01*	0.3	LDF	b c
Cobalt	inside ECA	NP	0.04	*0.02*	0.03	*0.02*	*0.003*	Yes	
	outside ECA	NP	*0.003*	*0.002*	0.4	0.3	*0.02*	Yes	
Copper	inside ECA	NP	0.06	0.03	0.2	*0.02*	0.5	Yes	
	outside ECA	NP	0.9	1	1	0.9	1	No	a
Iron	inside ECA	N	0.7	0.8	0.7	0.4	0.7	No	
	outside ECA	N	1	1	1	0.9	0.9	No	a
Lead	inside ECA	NP	0.09	*<0.001*	*<0.001*	*0.003*	0.08	Yes	
	outside ECA	NP	0.4	0.5	0.7	0.2	0.8	No	
Magnesium	inside ECA	NP	*0.01*	0.2	0.8	0.07	0.04	Yes	c
	outside ECA	NP	*0.02*	0.2	0.5	0.1	*0.02*	Yes	
Manganese	inside ECA	NP	*0.002*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	Yes	
	outside ECA	NP	*<0.001*	*<0.001*	0.09	*<0.001*	*<0.001*	Yes	
Mercury	inside ECA	NP	0.1	*0.03*	*0.01*	0.3	0.5	Yes	
	outside ECA	NP	0.9	1	1	0.7	1	No	a
Molybdenum	inside ECA	NP	0.4	0.4	0.4	0.2	0.7	No	
	outside ECA	NP	0.9	1	0.9	0.9	1	No	a
Nickel	inside ECA	NP	0.2	0.5	0.9	0.3	0.2	No	
	outside ECA	NP	0.7	1	1	0.7	0.5	No	a
Platinum	inside ECA	NP	0.06	0.1	0.2	0.1	0.4	No	
	outside ECA	NP	0.2	0.5	0.4	0.2	0.6	No	
Potassium	inside ECA	NP	*0.02*	0.3	*<0.001*	0.2	0.7	Yes	
	outside ECA	LN	0.3	0.3	0.2	0.2	1	No	a
Selenium	inside ECA	NP	0.2	0.9	0.9	0.9	0.6	LDF	b
	outside ECA	NP	1	1	0.9	1	0.7	LDF	b

Table C2. Background Comparisons for Metals in Soils: Inside ECA Soils (0-2 ft bgs) and Outside ECA Soils (0-10 ft bgs)
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Name	Location	Distribution	*t*-test (*p*-value)	*t*-test (logged data) (*p*-value)	Gehan Test (*p*-value)	Quantile Test (0.8) (*p*-value)	Slippage Test (*p*-value)	Site Samples Greater than Background Samples?	Notes
Silver	inside ECA	NP	0.1	0.7	0.9	*0.03*	NA	LDF	b c
	outside ECA	NP	0.5	1	1	*0.01*	NA	LDF	b c
Sodium	inside ECA	NP	*0.007*	0.2	0.3	*0.002*	*0.002*	Yes	
	outside ECA	NP	*<0.001*	*<0.001*	*<0.001*	*<0.001*	*<0.001*	Yes	
Strontium	inside ECA	NP	1	1	1	1	0.3	No	a
	outside ECA	LN	0.7	0.9	0.8	0.2	0.04	Yes	c
Thallium	inside ECA	NP	0.1	*<0.001*	*0.002*	*0.02*	*<0.001*	Yes	
	outside ECA	NP	0.09	0.3	0.06	0.6	0.1	Yes	c
Tin	inside ECA	NP	1	1	1	0.2	NA	LDF	b
	outside ECA	NP	1	1	0.9	0.06	NA	LDF	b
Titanium	inside ECA	N, LN	0.8	0.8	0.8	0.9	0.5	No	
	outside ECA	N	1	1	1	1	0.6	No	a
Tungsten	inside ECA	NP	0.04	*<0.001*	*0.003*	*0.002*	*0.002*	Yes	
	outside ECA	NP	*0.001*	*0.02*	*0.007*	0.3	0.06	Yes	
Uranium	inside ECA	NP	0.5	0.9	0.9	0.9	0.3	No	
	outside ECA	NP	*0.02*	0.07	0.1	0.6	0.04	Yes	c
Vanadium	inside ECA	LN	0.3	0.5	0.6	0.2	*0.01*	Yes	
	outside ECA	N	0.9	0.9	0.9	0.9	0.2	No	
Zinc	inside ECA	NP	0.2	0.06	*0.005*	0.06	0.7	Yes	
	outside ECA	NP	0.8	0.9	1	0.9	0.9	No	

Notes:
p- values in italics indicate $p < 0.03$
LDF = Low detection frequency (<25%) in either site or background datasets. Background comparison results may not be applicable.
NA - value not available
Background comparison tests use 1/2 the detection limit (DL) for non-detects in the parametric test (t-test) and the DL for non-parametric tests (Gehan test, quantile test, and slippage test).
Background dataset is from RZ-A, excluding the 6 borings in LOU 62.

Distibution:
N = Site data and background data consistent with normal distribution
LN = Site data and background data consistent with log-normal distribution
NP = Site data or background data is not consistent with both normal distribution and log-normal distribution.

Notes:
a = Site data lower than background data
b = Less than 25% frequency of detection in either site or background data sets.
c = Site data greater than background data based on visual inspection of box and Q-Q plots

Table C3. Summary Statistics for Radionuclides in Background (RZ-A) Soils, Inside ECA Soils (0-2 ft bgs), and Outside ECA Soils (0-10 ft bgs)
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Name	Location	No. of Samples	No. of Detects	% Detects	Non-detects (mg/kg)		Detects (mg/kg)					Shapiro-Wilk Test	
					Minimun	Maximum	Minimum	Median	Mean	Maximum	Standard Deviation	Normal (*p*-value)	Lognormal (*p*-value)
Ra-226	Background	31	30	97%	0.50	0.50	0.48	0.89	0.98	1.7	0.32	0.4	0.06
	inside ECA	65	61	94%	0.50	0.50	0.34	0.79	0.83	1.6	0.29	0.3	0.01
	outside ECA	249	241	97%	0.23	0.50	0.20	0.94	0.99	2.8	0.40	*<0.001*	*<0.001*
Ra-228	Background	31	31	100%	NA	NA	0.46	1.2	1.3	2.5	0.54	0.3	0.8
	inside ECA	65	62	95%	0.50	0.50	0.45	1.1	1.2	4.8	0.61	*<0.001*	*0.001*
	outside ECA	249	237	95%	0.45	2.3	0.38	1.3	1.3	3.3	0.50	*<0.001*	*<0.001*
Th-228	Background	31	31	100%	NA	NA	1.2	1.7	1.7	2.9	0.36	0.03	0.5
	inside ECA	65	65	100%	NA	NA	0.85	1.6	1.6	3.1	0.37	0.01	0.2
	outside ECA	252	252	100%	NA	NA	0.48	1.7	1.7	4.9	0.40	*<0.001*	*<0.001*
Th-230	Background	31	31	100%	NA	NA	0.51	1.1	1.1	1.7	0.28	0.7	0.7
	inside ECA	65	65	100%	NA	NA	0.65	0.96	1.0	3.3	0.39	*<0.001*	*<0.001*
	outside ECA	252	252	100%	NA	NA	0.43	1.1	1.3	14.8	1.0	*<0.001*	*<0.001*
Th-232	Background	31	31	100%	NA	NA	1.0	1.5	1.5	2.1	0.24	1	1
	inside ECA	65	65	100%	NA	NA	0.74	1.4	1.4	2.1	0.33	0.04	0.1
	outside ECA	252	252	100%	NA	NA	0.54	1.6	1.6	2.5	0.33	0.5	*<0.001*
U-234	Background	31	31	100%	NA	NA	0.39	1.0	1.1	1.7	0.30	0.09	0.04
	inside ECA	65	65	100%	NA	NA	0.71	0.97	1.1	2.9	0.36	*<0.001*	*<0.001*
	outside ECA	252	252	100%	NA	NA	0.27	1.1	1.2	4.3	0.51	*<0.001*	*<0.001*
U-235	Background	31	20	65%	0.04	0.04	0.018	0.058	0.063	0.20	0.04	*<0.001*	*0.003*
	inside ECA	65	40	62%	0.04	0.29	0.032	0.057	0.063	0.16	0.028	*<0.001*	*<0.001*
	outside ECA	252	176	70%	0.0093	0.90	0.011	0.063	0.076	0.25	0.04	*<0.001*	*<0.001*
U-238	Background	31	31	100%	NA	NA	0.36	1.0	1.0	1.6	0.21	*0.004*	*<0.001*
	inside ECA	65	61	94%	1.0	1.6	0.71	0.91	1.0	2.8	0.34	*<0.001*	*<0.001*
	outside ECA	252	237	94%	1.0	2.9	0.24	0.98	1.1	4.0	0.49	*<0.001*	*<0.001*

Notes:
p- values < 0.01 are shown in italic
NA - value not available
Background dataset is from RZ-A, excluding the 6 borings in LOU 62.
Shapiro Wilk tests use 1/2 the detection limit (DL) for non-detects.

Table C4. Background Comparisons for Radionuclides in Soils: Inside ECA Soils (0-2 ft bgs) and Outside ECA Soils (0-10 ft bgs)
Nevada Environmental Response Trust Site, Henderson, Nevada

Chemical Name	Location	Distri-bution	*t*-test (*p*-value)	*t*-test (logged data) (*p*-value)	Gehan Test (*p*-value)	Quantile Test (0.8) (*p*-value)	Slippage Test (*p*-value)	Site Samples Greater than Background Samples?	Notes
Ra-226	inside ECA	N, LN	1	1	1	1	1	No	a
	outside ECA	NP	0.4	0.6	0.6	0.8	0.1	Yes	b
Ra-228	inside ECA	NP	0.8	0.9	0.8	0.9	0.7	No	
	outside ECA	NP	0.6	0.7	0.5	0.6	0.7	No	
Th-228	inside ECA	N, LN	0.7	0.8	0.7	0.9	0.7	No	
	outside ECA	NP	0.2	0.3	0.2	0.6	0.8	No	
Th-230	inside ECA	NP	0.8	0.8	1	1	0.3	No	
	outside ECA	NP	*0.002*	*0.007*	*0.03*	0.4	0.05	Yes	b
Th-232	inside ECA	N, LN	0.8	0.9	0.9	0.3	0.5	No	
	outside ECA	N	0.05	0.1	0.07	*0.03*	0.1	Yes	b
U-234	inside ECA	NP	0.5	0.5	0.7	0.8	0.3	No	
	outside ECA	NP	*0.03*	0.1	0.1	0.1	0.04	Yes	b
U-235	inside ECA	NP	0.1	0.08	0.05	0.8	1	No	a
	outside ECA	NP	*<0.001*	*0.001*	*<0.001*	0.2	0.7	Yes	
U-238	inside ECA	NP	0.8	0.9	1	0.8	0.5	No	a
	outside ECA	NP	0.1	0.5	0.6	0.4	0.1	Yes	b

Notes:
p- values in italics indicate $p < 0.03$
Background comparison tests use 1/2 the detection limit (DL) for non-detects in the parametric test (t-test) and the DL for non-parametric tests (Gehan test, quantile test, and slippage test).
Background dataset is from RZ-A, excluding the 6 borings in LOU 62.

Distibution:
N = Site data and background data consistent with normal distribution
LN = Site data and background data consistent with log-normal distribution
NP = Site data or background data is not consistent with both normal distribution and log-normal distribution.

Notes:
a = Site data lower than background data
b = Site data greater than background data based on visual inspection of box and Q-Q plots

Table C5a. Equivalence Test for Secular Equilibrium of the Uranium Decay Series (U-238 Chain)[1]

Nevada Environmental Response Trust Site, Henderson, Nevada

Location	p-value	Conclusion[2]	Delta	Sample Size[3]	Number Missing[4]	Analyte	Mean Proportions of Radioactivity	95% Confid. Intervals		Shifts[5]
								Lower	Upper	
All	<0.0001	in Secular Equilibrium	0.1	348	3	Ra-226	0.2168	0.2055	0.2281	0
						Th-230	0.2746	0.2652	0.2841	0
						U-234	0.2587	0.2514	0.2660	0
						U-238	0.2498	0.2419	0.2578	0
Background	<0.0001	in Secular Equilibrium	0.1	31	0	Ra-226	0.2308	0.2024	0.2592	0
						Th-230	0.2615	0.2302	0.2929	0
						U-234	0.2556	0.2290	0.2822	0
						U-238	0.2521	0.2274	0.2768	0
inside ECA	<0.0001	in Secular Equilibrium	0.1	65	0	Ra-226	0.2076	0.1831	0.2321	0
						Th-230	0.2610	0.2457	0.2763	0
						U-234	0.2702	0.2573	0.2831	0
						U-238	0.2612	0.2485	0.2739	0
outside ECA	<0.0001	in Secular Equilibrium	0.1	252	3	Ra-226	0.2175	0.2034	0.2315	0
						Th-230	0.2798	0.2678	0.2918	0
						U-234	0.2561	0.2471	0.2651	0
						U-238	0.2466	0.2366	0.2567	0

Note:

1. Analyzed in top 10 feet bgs in background and outside ECA soil and top 2 feet bgs in inside ECA soil using the EnviroGISdT software tool from Neptune & Company, Inc. Background dataset is from RZ-A, excluding the 6 borings in LOU 62.

2. Tool states "in Secular Equilibrium" if the computed *p*-value is less than a standard significance level of 0.05.

3. Sample dataset includes field duplicates

4. Count of sampling locations for which one or more results are unavailable. These sampling locations are not counted in the sample size and are not included in the secular equilibrium calculation.

5. Data Shift - Lists the values of the data shift utililzed by the tool in case of negative radioactivity measurements. All measurements values for that radioisotope are shifted upwards by the shift value so that all values are non-negative. A zero shift value indicates lack of negative measurements.

Table C5b. Equivalence Test for Secular Equilibrium of the Thorium Decay Series (Th-232 Chain)[1]

Nevada Environmental Response Trust Site, Henderson, Nevada

Location	p-value	Conclusion[2]	Delta	Sample Size[3]	Number Missing[4]	Analyte	Mean Proportions of Radioactivity	95% Confid. Intervals		Shifts[5]
								Lower	Upper	
All	0.0002	in Secular Equilibrium	0.1	348	3	Ra-228	0.2741	0.2610	0.2872	0
						Th-228	0.3819	0.3733	0.3906	0
						Th-232	0.3440	0.3366	0.3513	0
Background	0.164	not in Secular Equilibrium	0.1	31	0	Ra-228	0.2779	0.2341	0.3218	0
						Th-228	0.3808	0.3557	0.4060	0
						Th-232	0.3413	0.3141	0.3684	0
inside ECA	0.2361	note in Secular Equilibrium	0.1	65	0	Ra-228	0.2708	0.2423	0.2993	0
						Th-228	0.3899	0.3679	0.4120	0
						Th-232	0.3393	0.3240	0.3545	0
outside ECA	0.0016	in Secular Equilibrium	0.1	252	3	Ra-228	0.2745	0.2586	0.2904	0
						Th-228	0.3800	0.3698	0.3902	0
						Th-232	0.3455	0.3366	0.3544	0

Note:

1. Analyzed in top 10 feet bgs in background and outside ECA soil and top 2 feet bgs in inside ECA soil using the EnviroGISdT software tool from Neptune & Company, Inc. Background dataset is from RZ-A, excluding the 6 borings in LOU 62.

2. Tool states "in Secular Equilibrium" if the computed *p*-value is less than a standard significance level of 0.05.

3. Sample dataset includes field duplicates

4. Count of sampling locations for which one or more results are unavailable. These sampling locations are not counted in the sample size and are not included in the secular equilibrium calculation.

5. Data Shift - Lists the values of the data shift utililzed by the tool in case of negative radioactivity measurements. All measurements values for that radioisotope are shifted upwards by the shift value so that all values are non-negative. A zero shift value indicates lack of negative measurements.

Table C6. Correlation Matrices for the Uranium Decay Series and the Thorium Decay Series
Nevada Environmental Response Trust Site, Henderson, Nevada

i) Inside ECA Soils (0-2 ft bgs) and Outside ECA Soils (0-10 ft bgs)

Uranium Decay Chain				
Correl.	Ra-226	Th-230	U-234	U-238
Ra-226	1	0.418	0.479	0.429
Th-230	0.418	1	0.507	0.441
U-234	0.479	0.507	1	0.852
U-238	0.429	0.441	0.852	1

Thorium Decay Chain			
Correl.	Ra-228	Th-228	Th-232
Ra-228	1	0.114	0.154
Th-228	0.114	1	0.612
Th-232	0.154	0.612	1

ii) Background (RZ-A) Soils

Uranium Decay Chain				
Correl.	Ra-226	Th-230	U-234	U-238
Ra-226	1	0.706	0.363	0.348
Th-230	0.706	1	0.351	0.271
U-234	0.363	0.351	1	0.886
U-238	0.348	0.271	0.886	1

Thorium Decay Chain			
Correl.	Ra-228	Th-228	Th-232
Ra-228	1	0.297	0.119
Th-228	0.297	1	0.627
Th-232	0.119	0.627	1

Boxplot Schematic

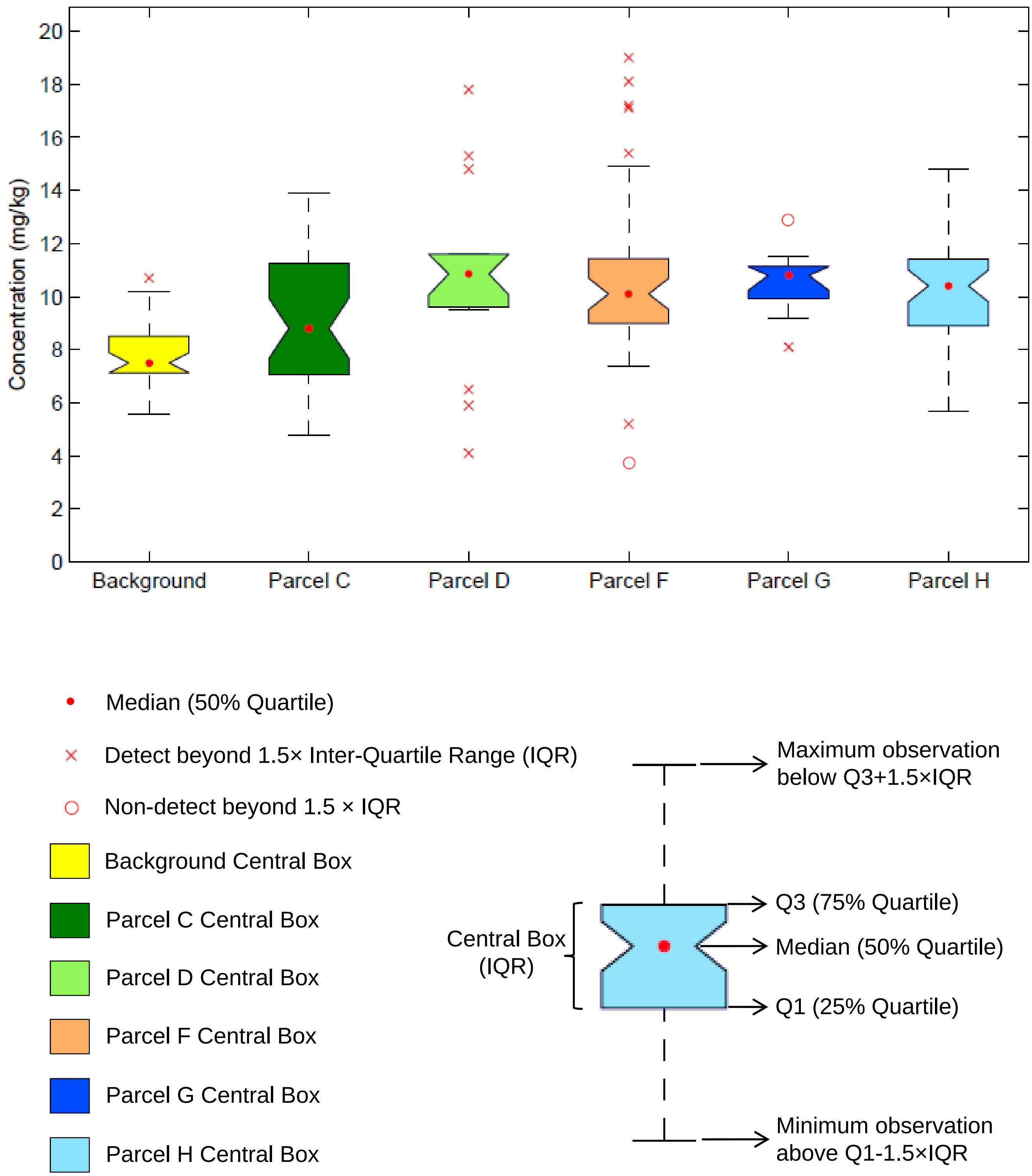
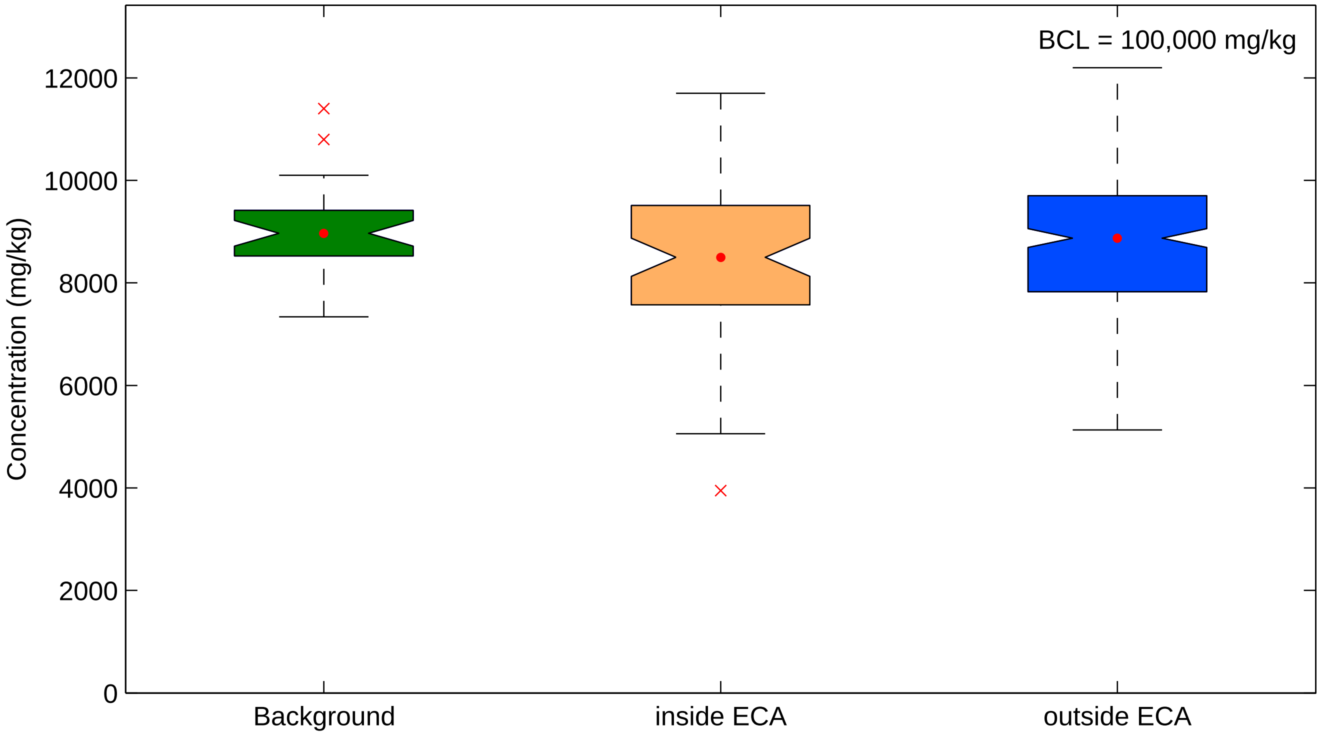


Figure C1−1. Background vs. Site Boxplots
Aluminum



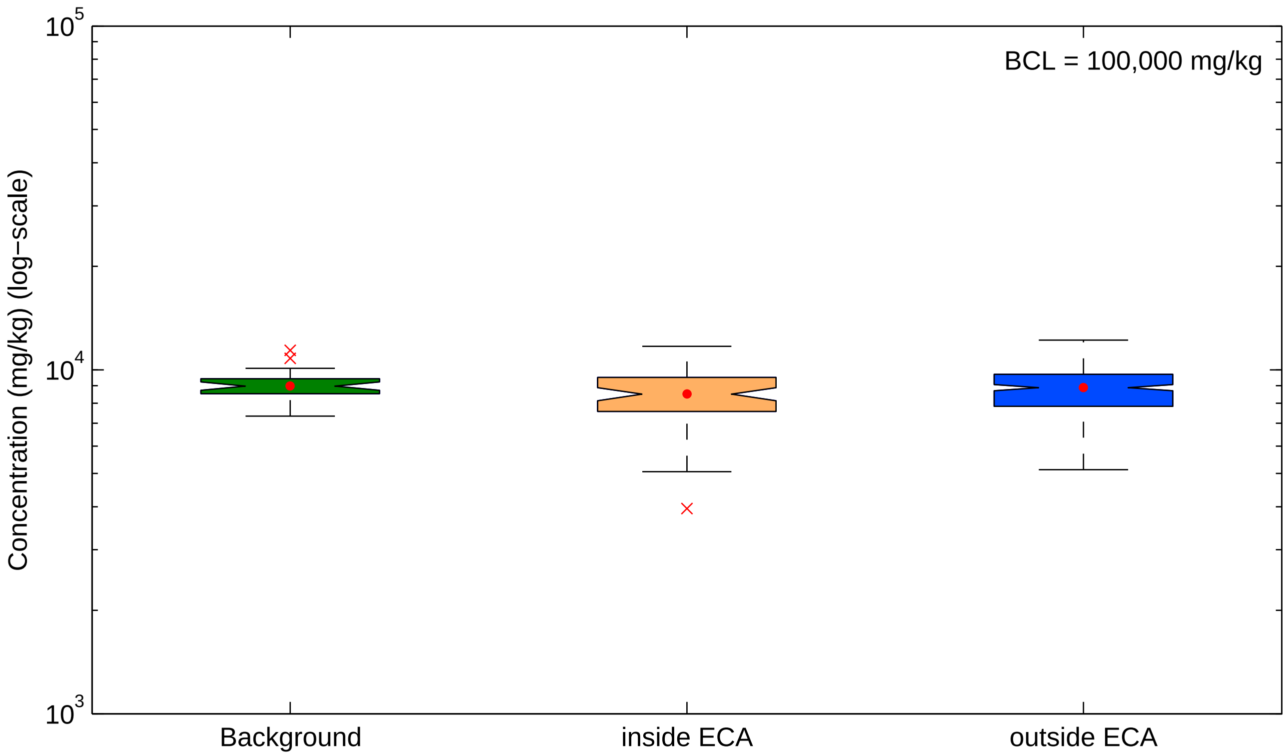


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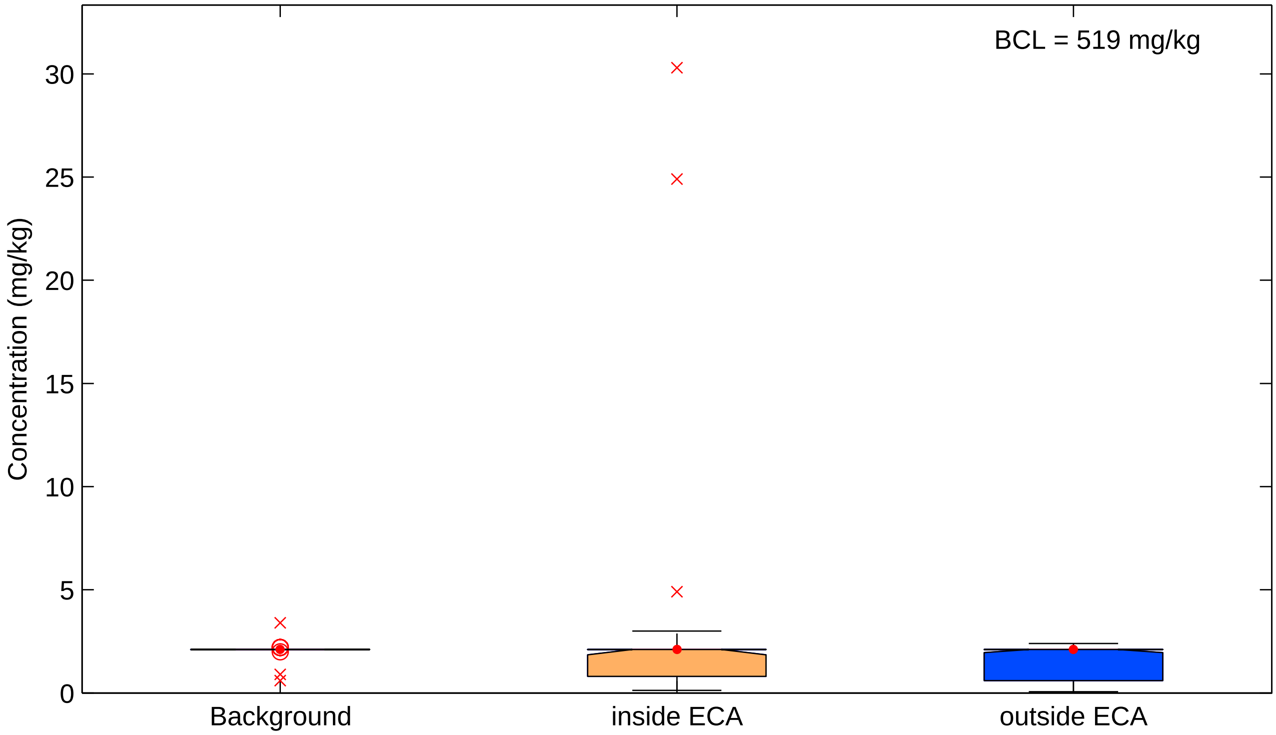
Figure C1−2. Background vs. Site Boxplots
Antimony



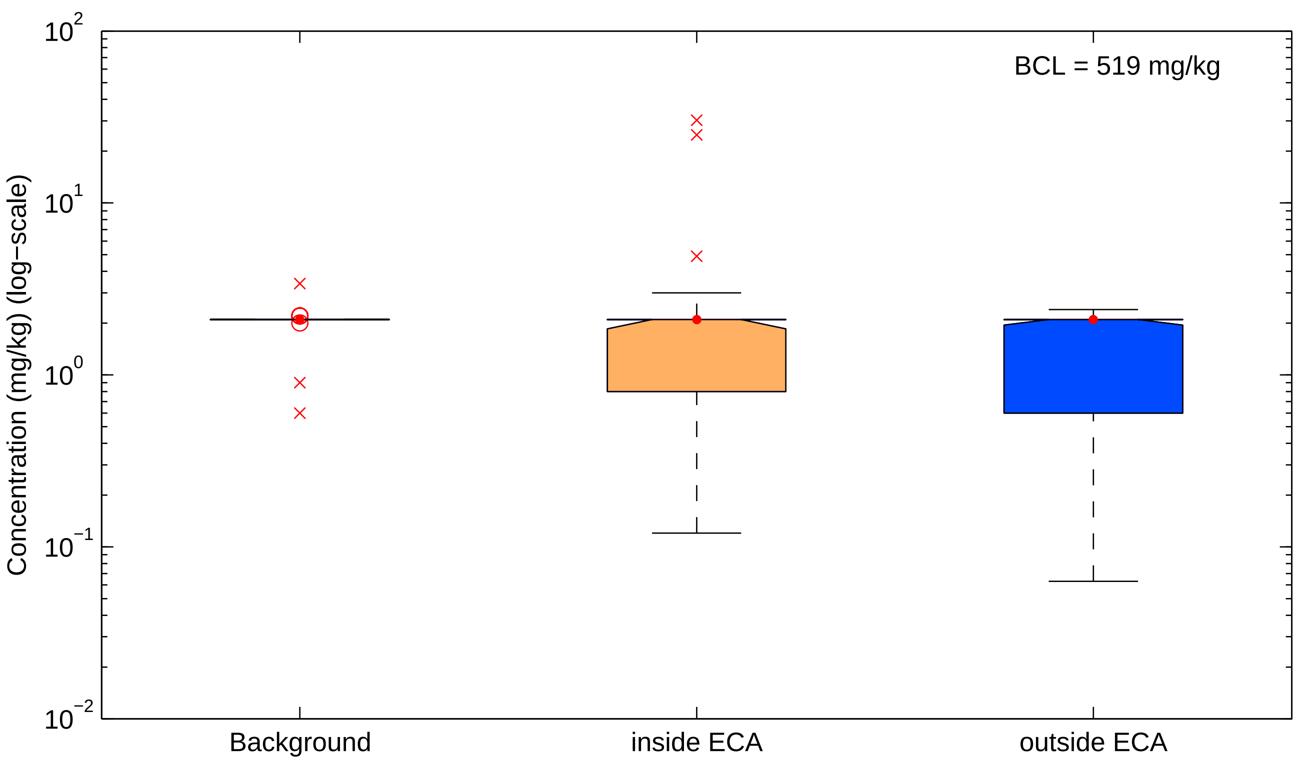


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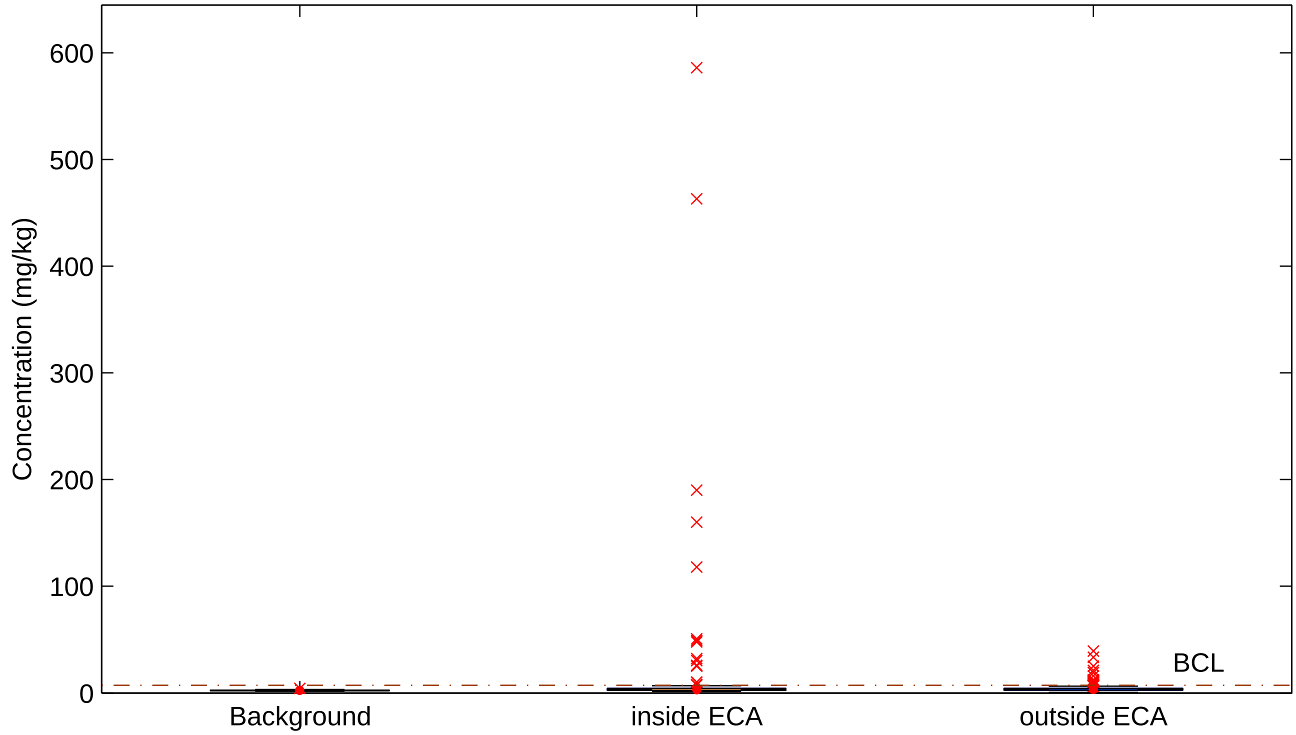
Figure C1−3. Background vs. Site Boxplots
Arsenic



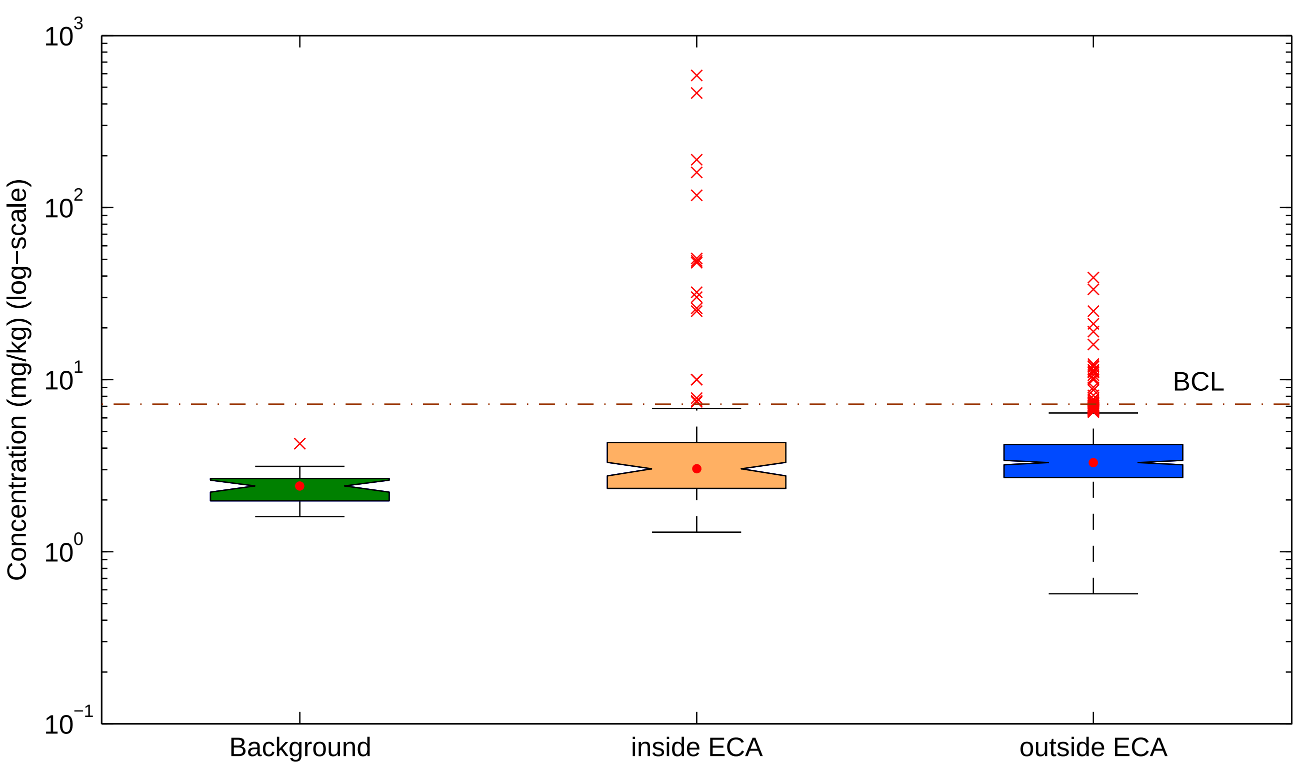


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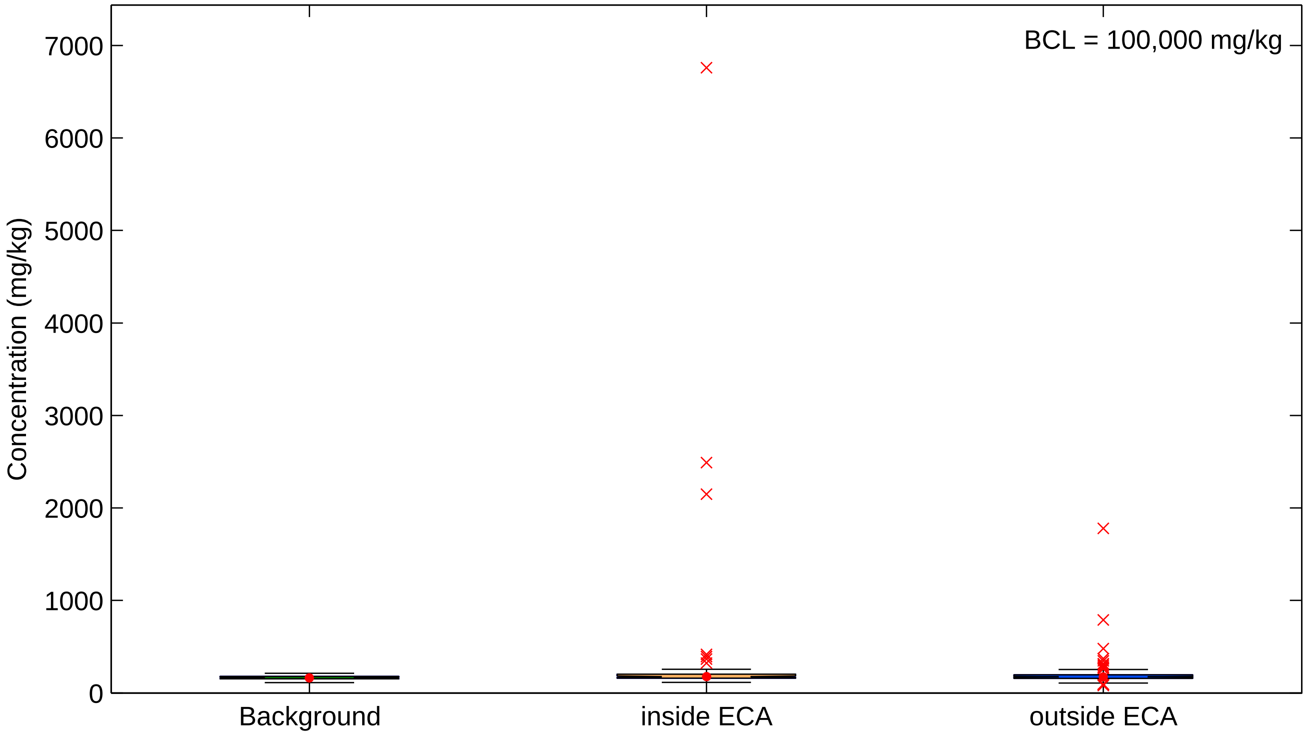
Figure C1−4. Background vs. Site Boxplots
Barium



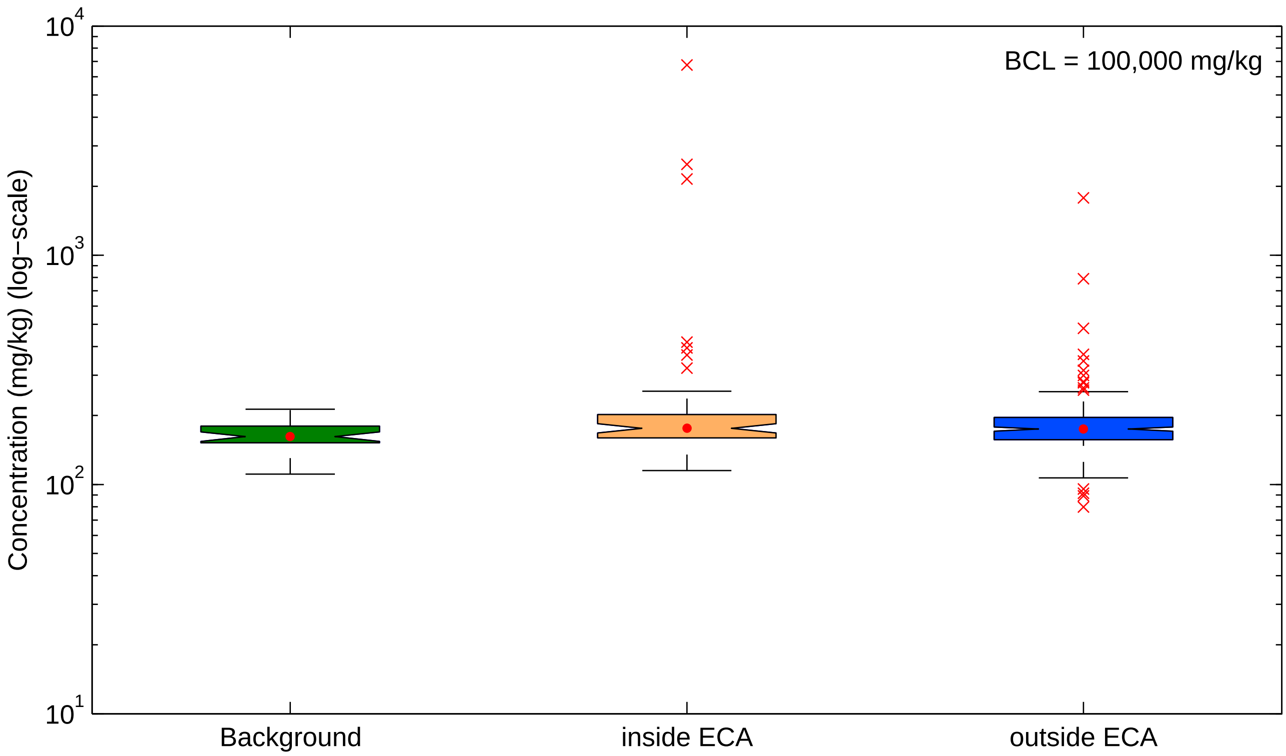
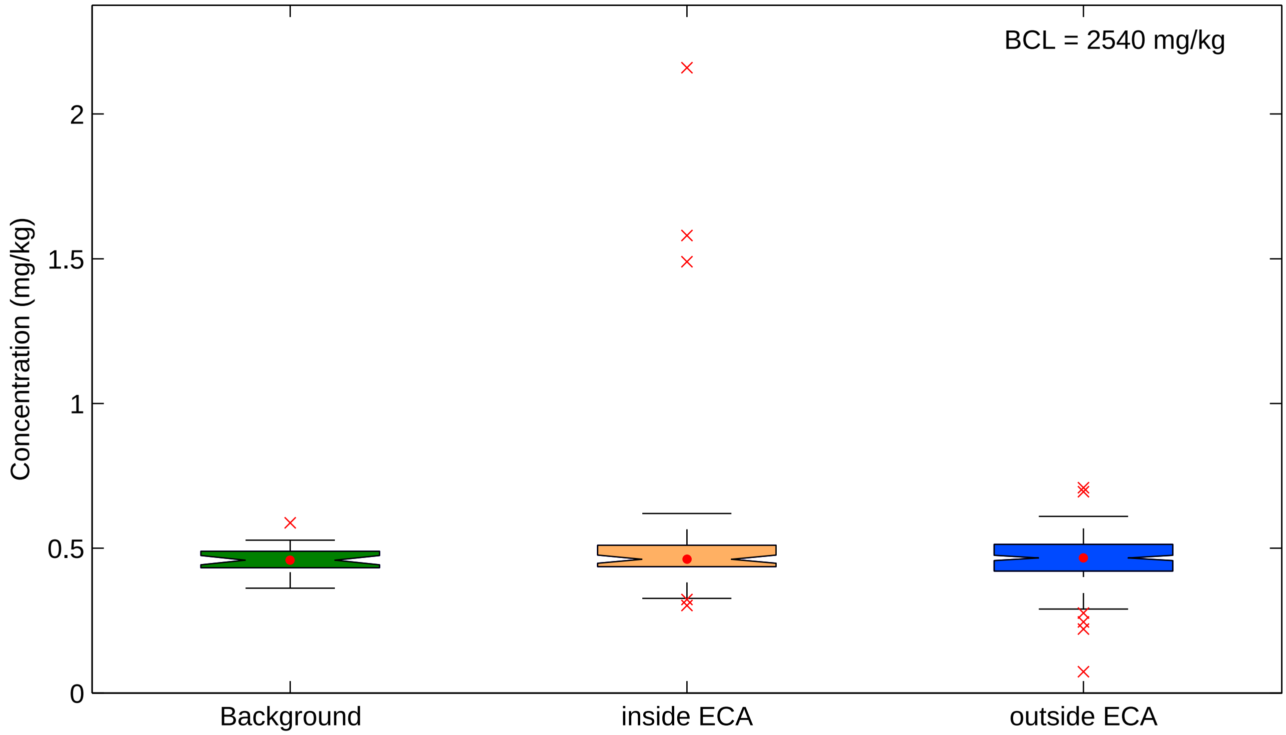


Figure C1−5. Background vs. Site Boxplots
Beryllium



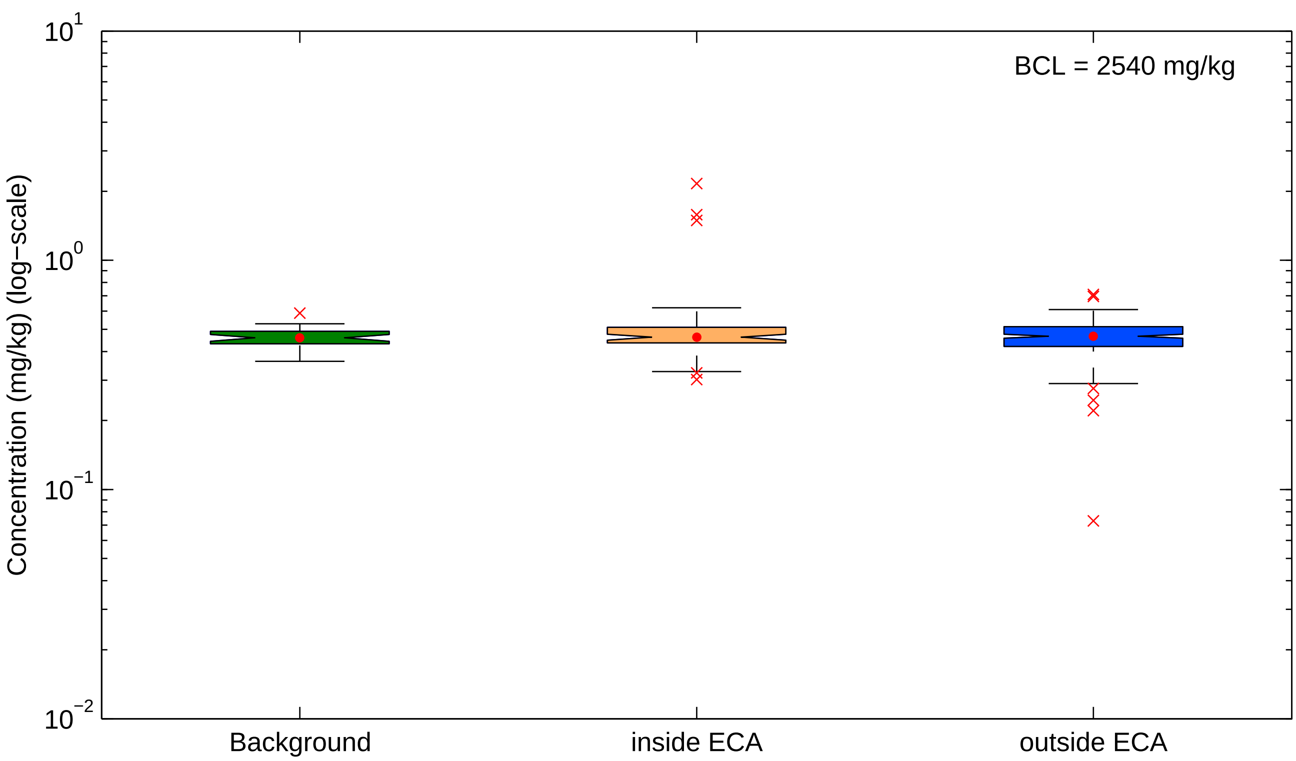
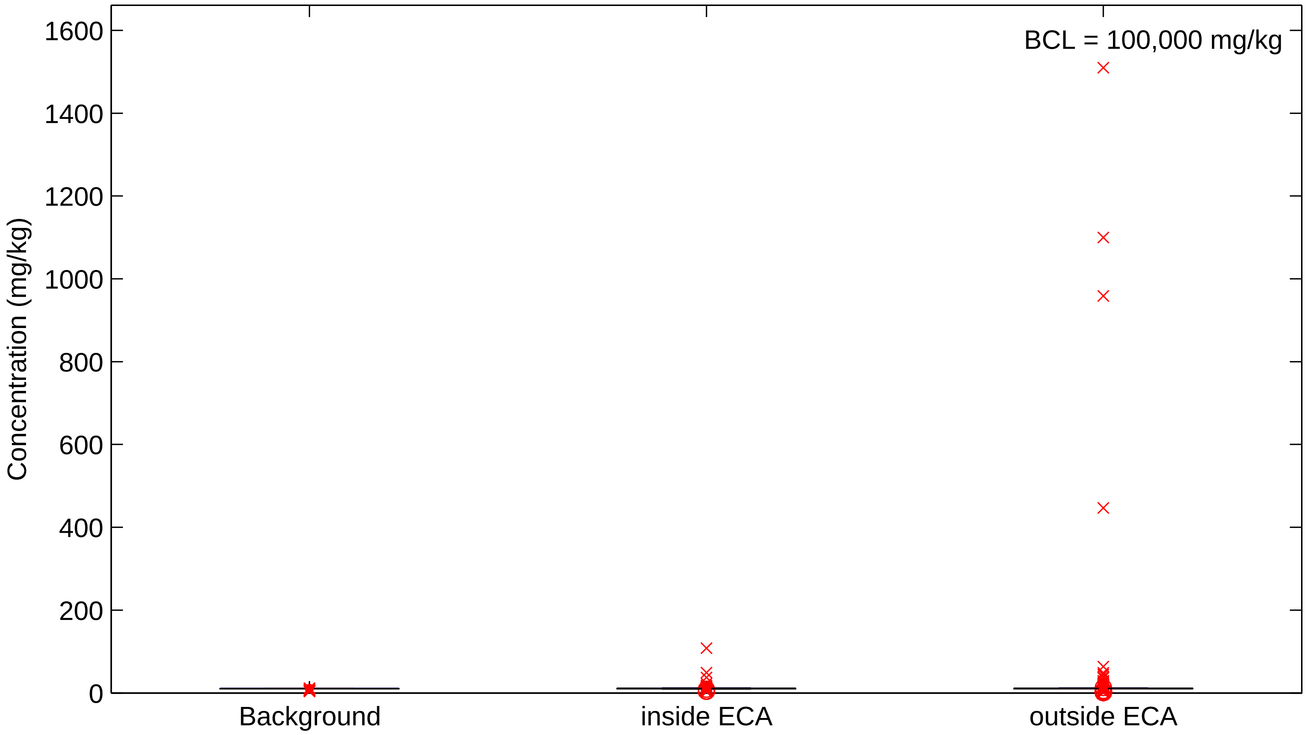


Figure C1−6. Background vs. Site Boxplots
Boron



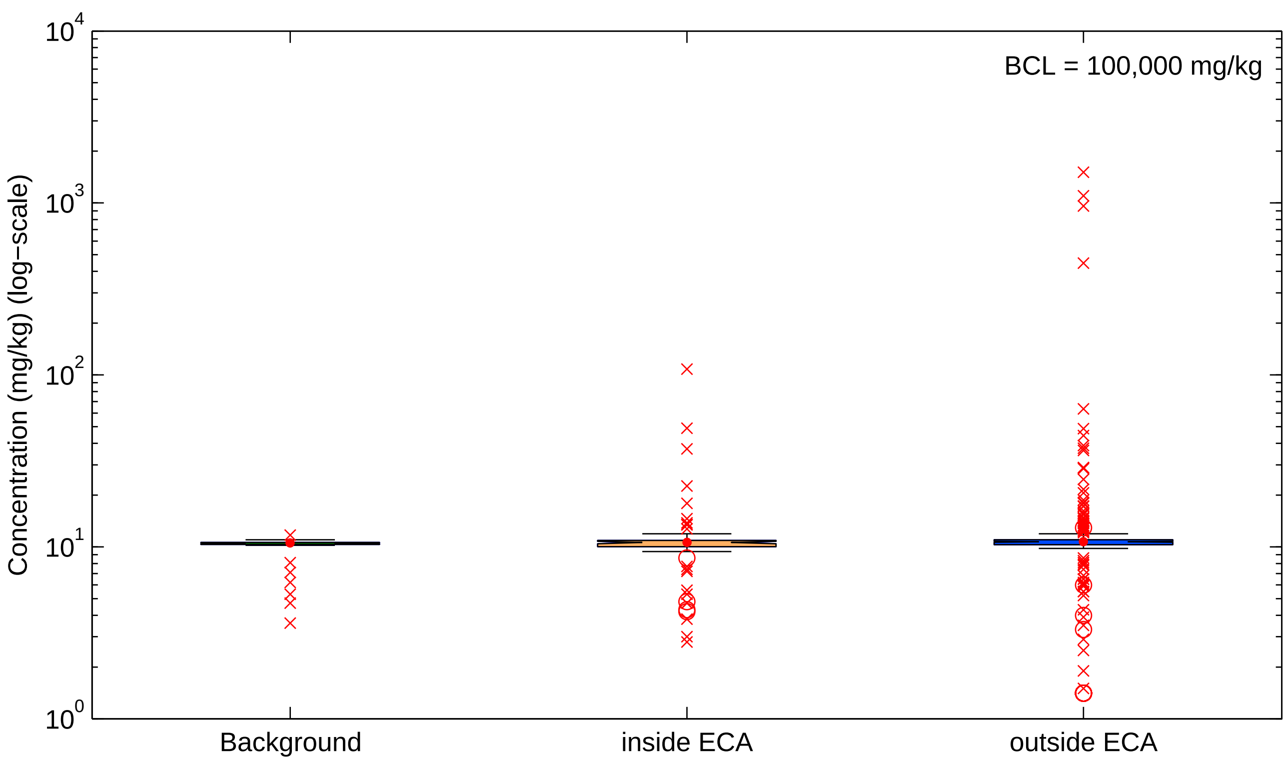


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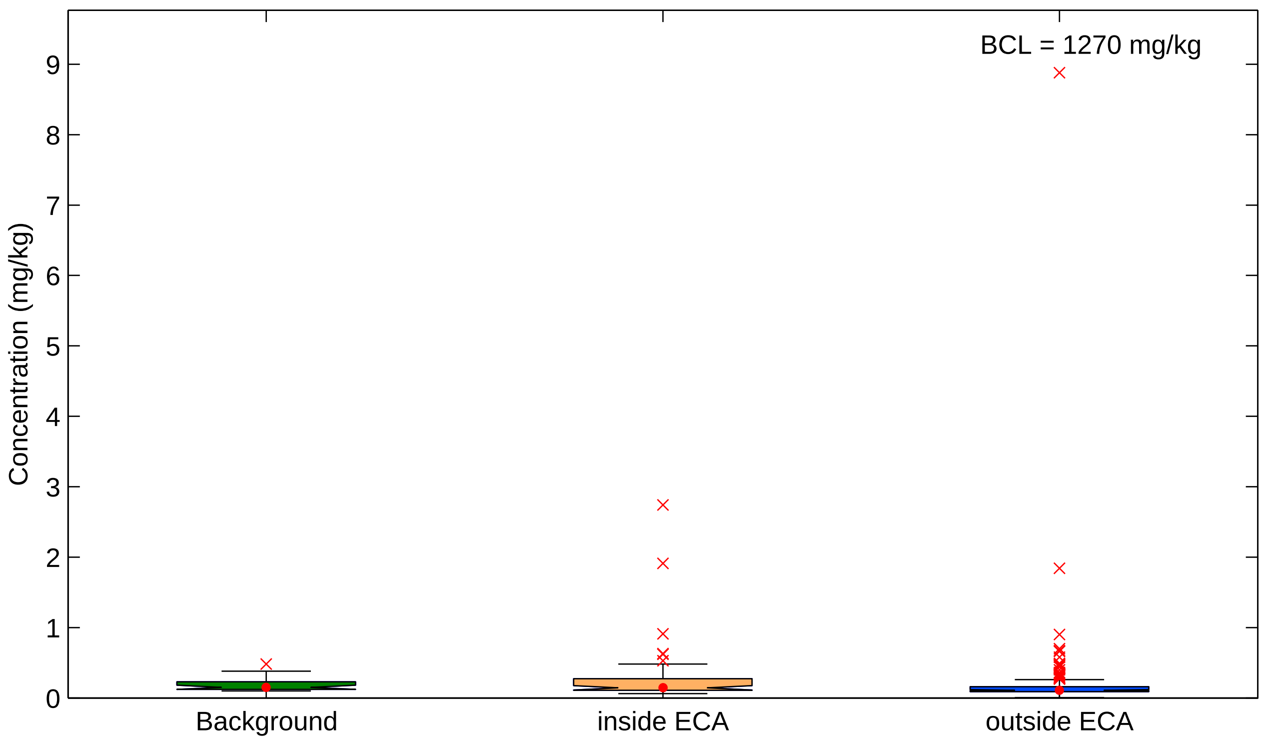
Figure C1−7. Background vs. Site Boxplots
Cadmium



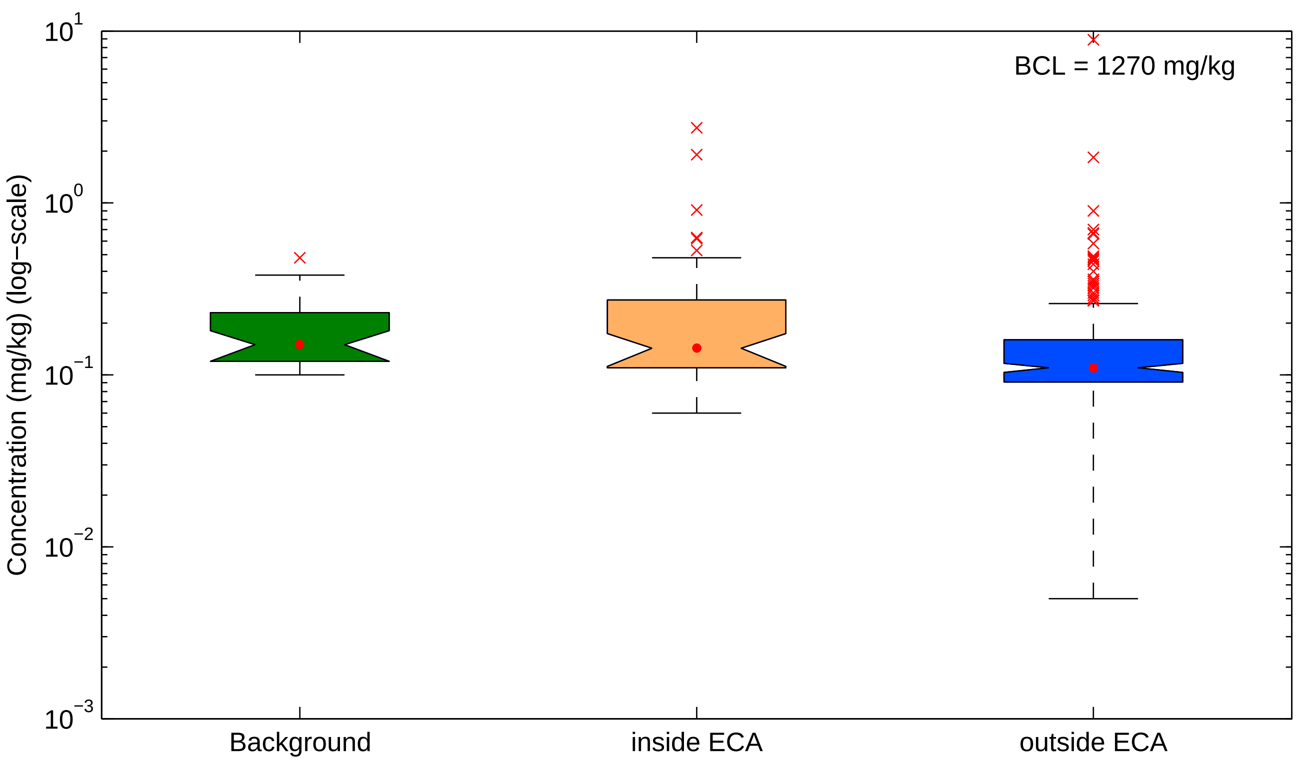


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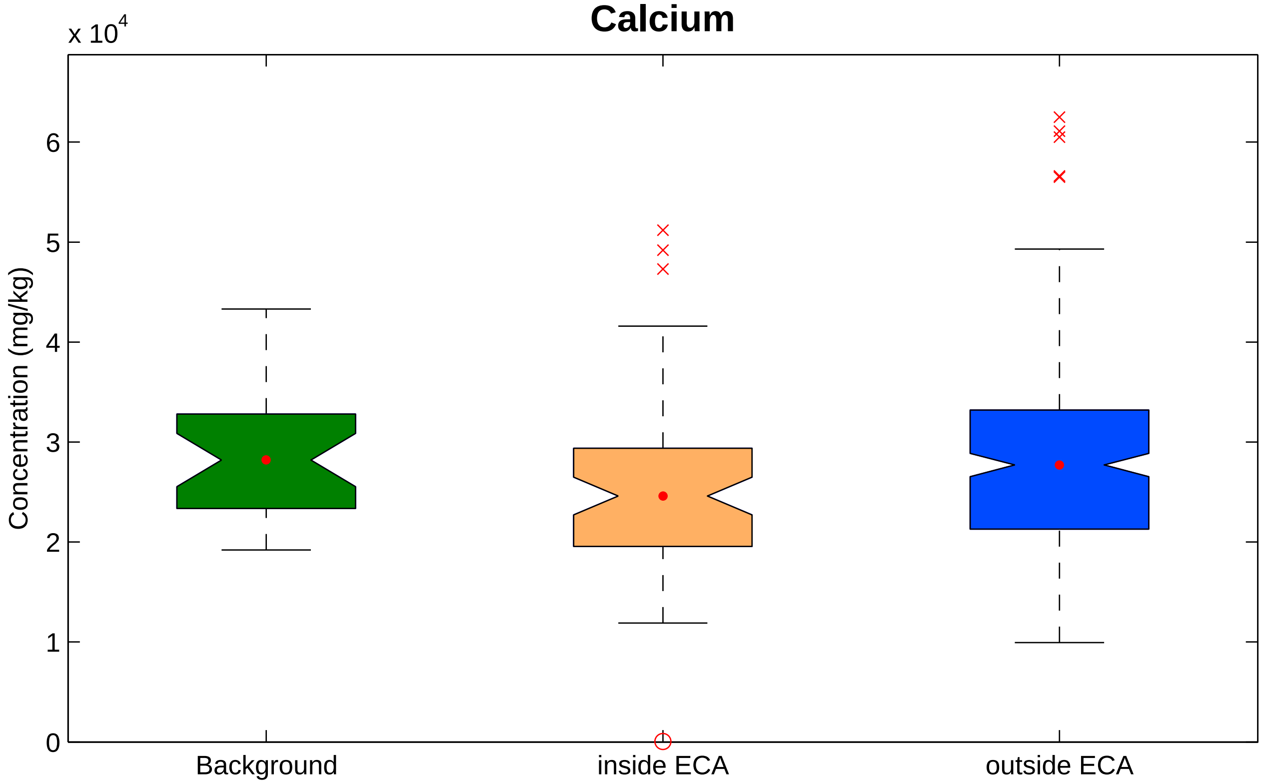
Figure C1−8. Background vs. Site Boxplots
Calcium



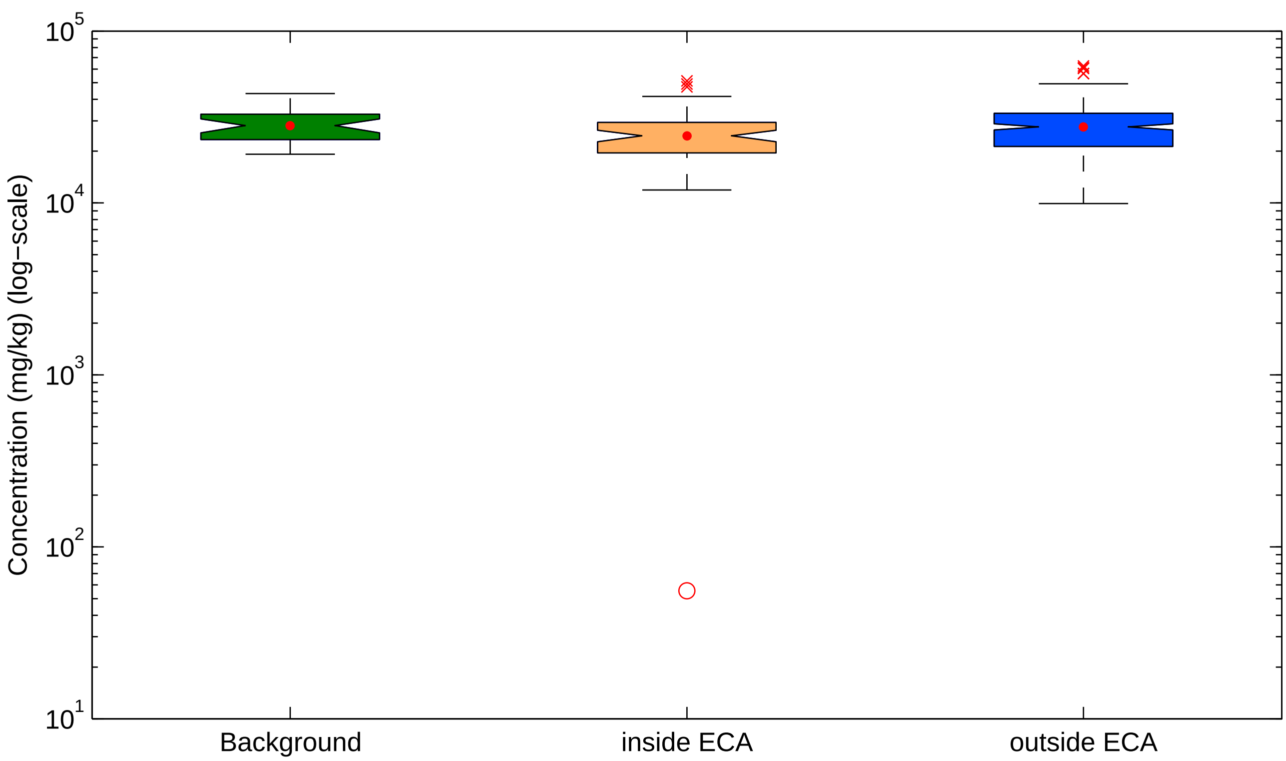


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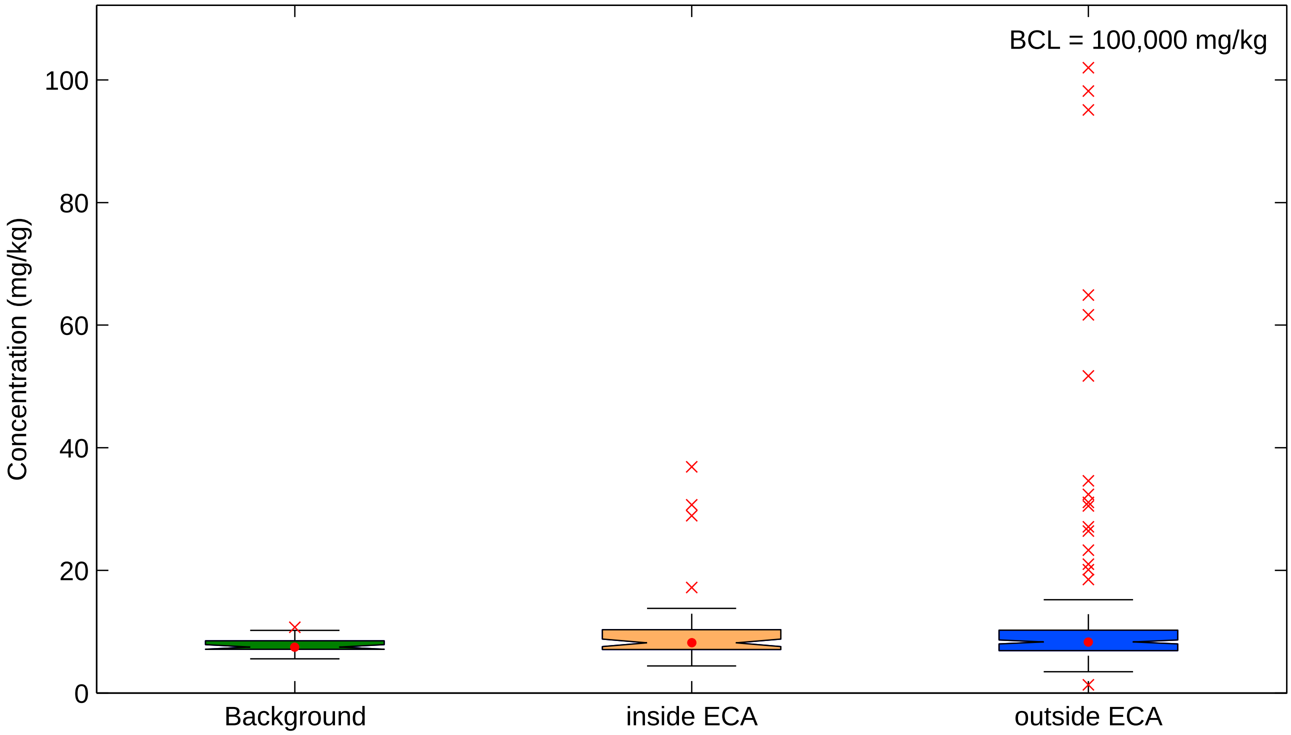
Figure C1−9. Background vs. Site Boxplots
Chromium (Total)



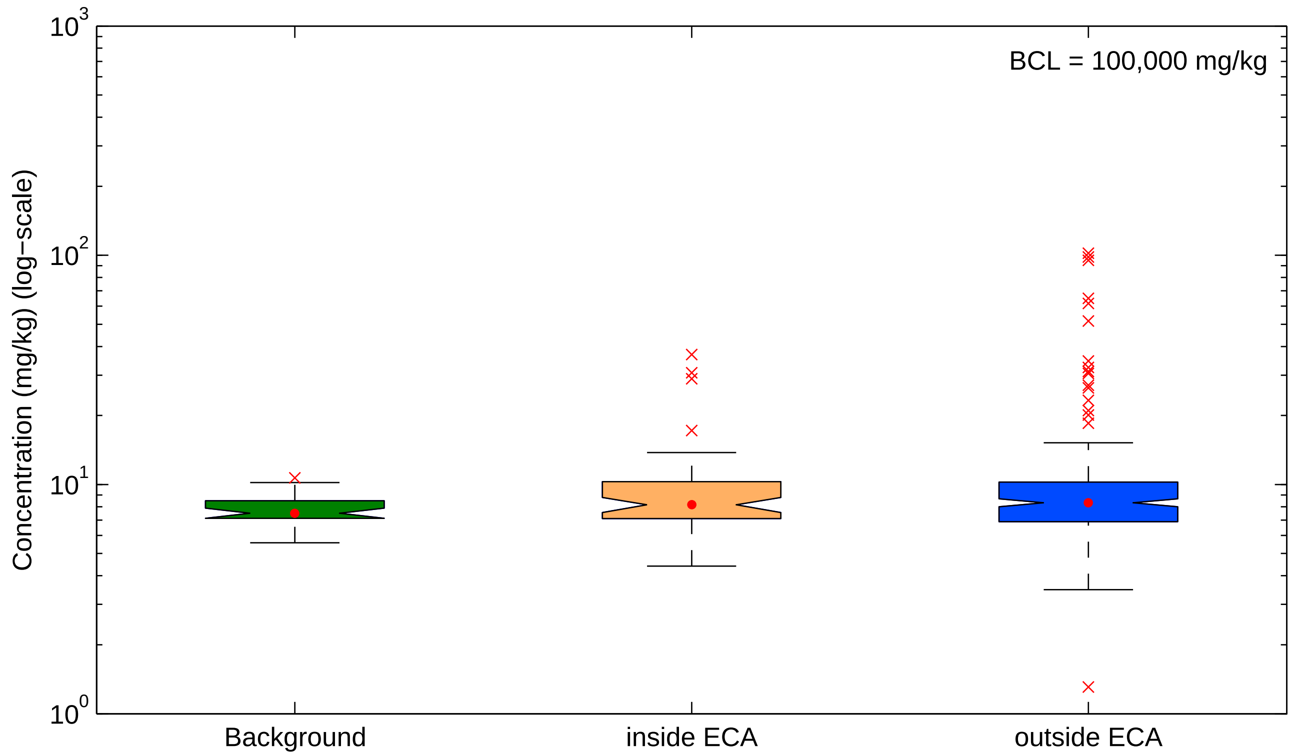


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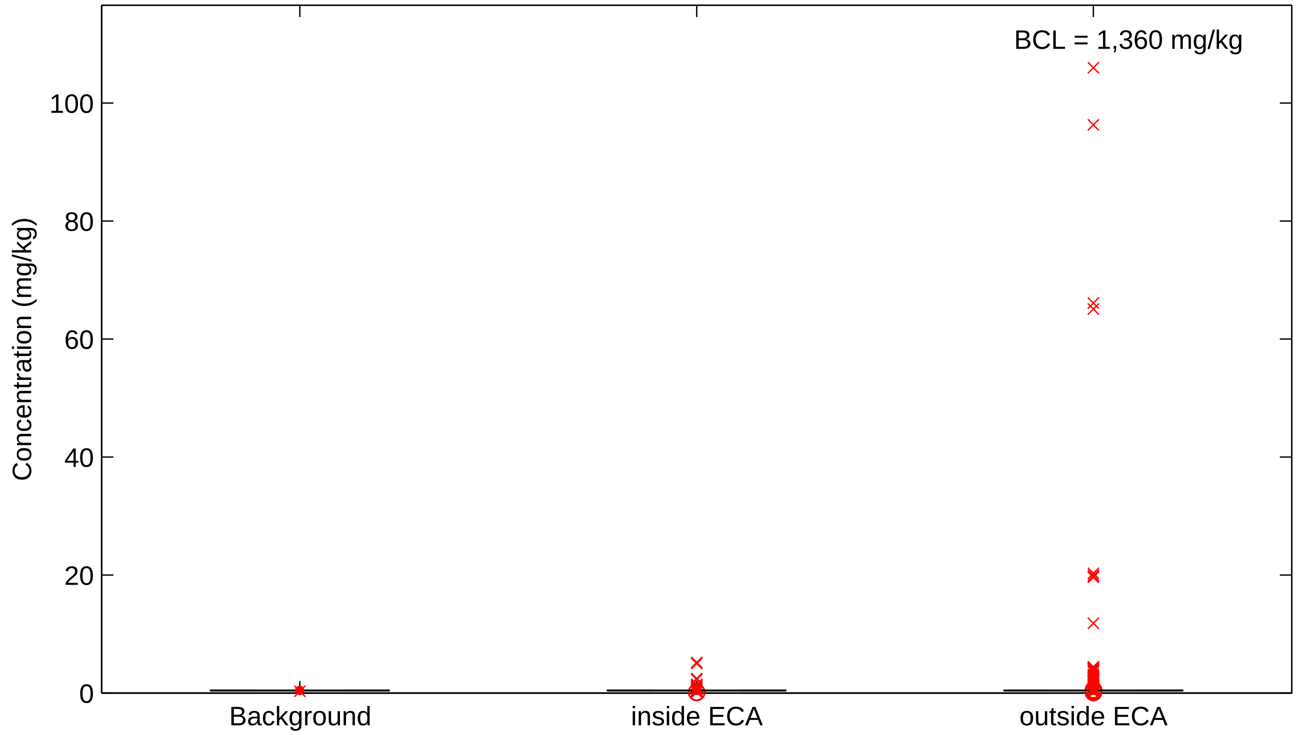
Figure C1−10. Background vs. Site Boxplots
Chromium (VI)



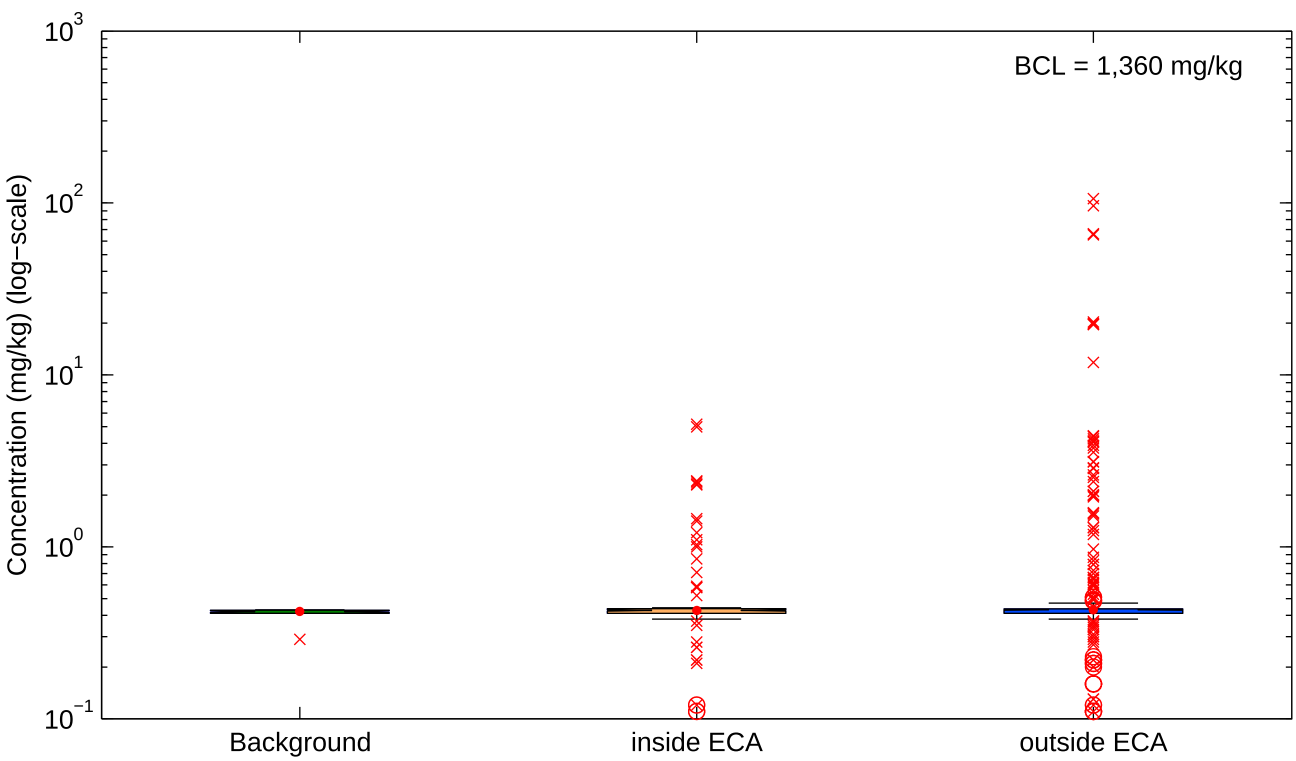


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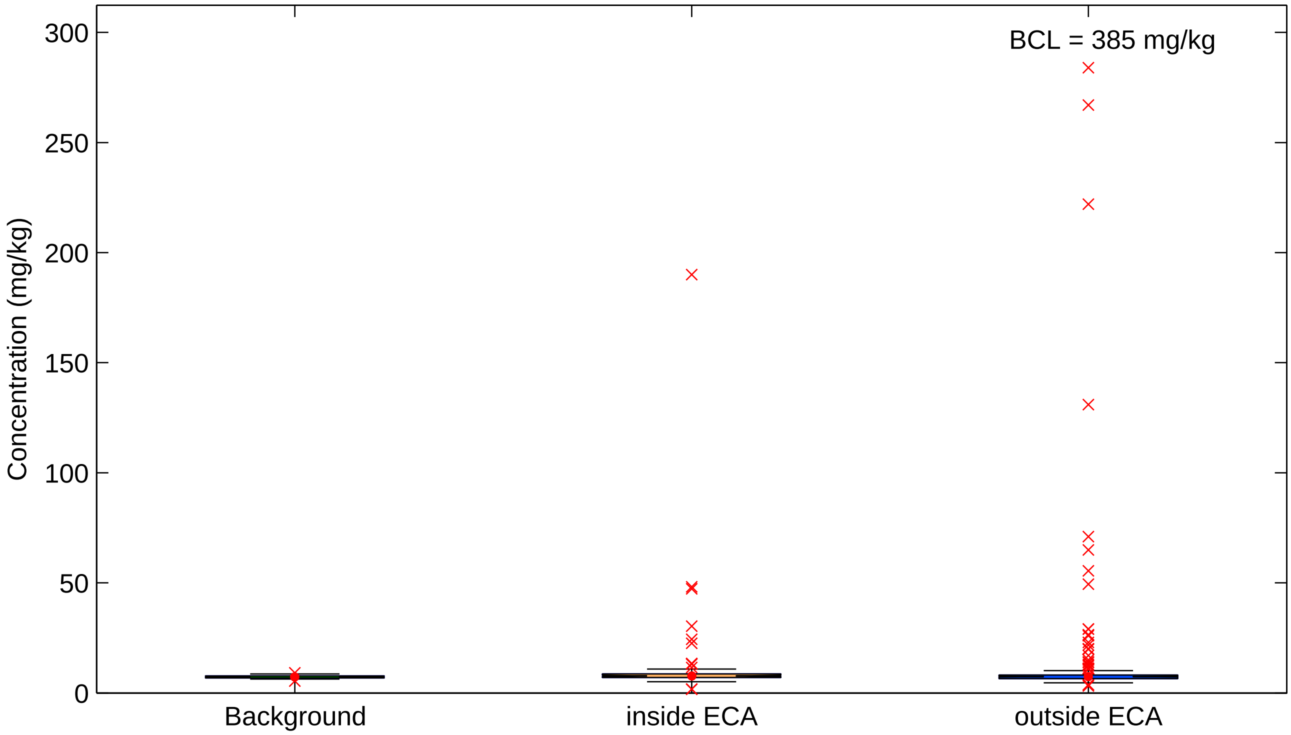
Figure C1−11. Background vs. Site Boxplots
Cobalt



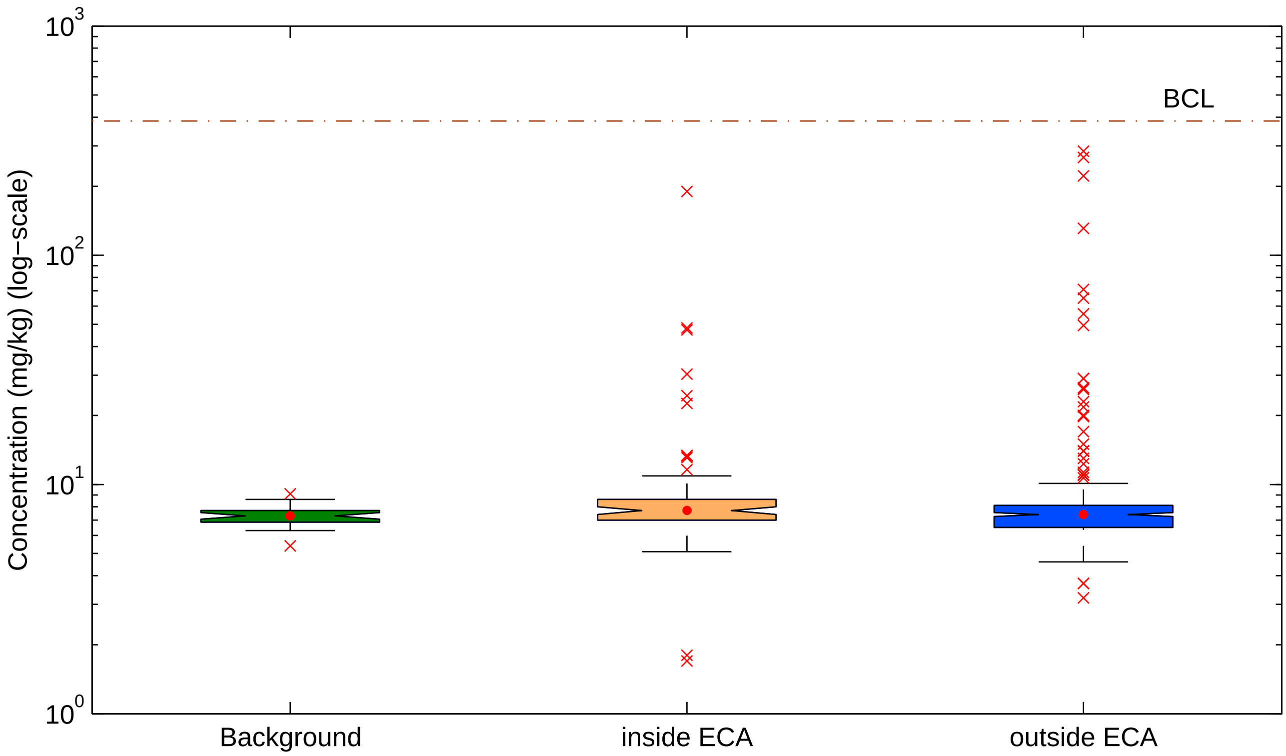


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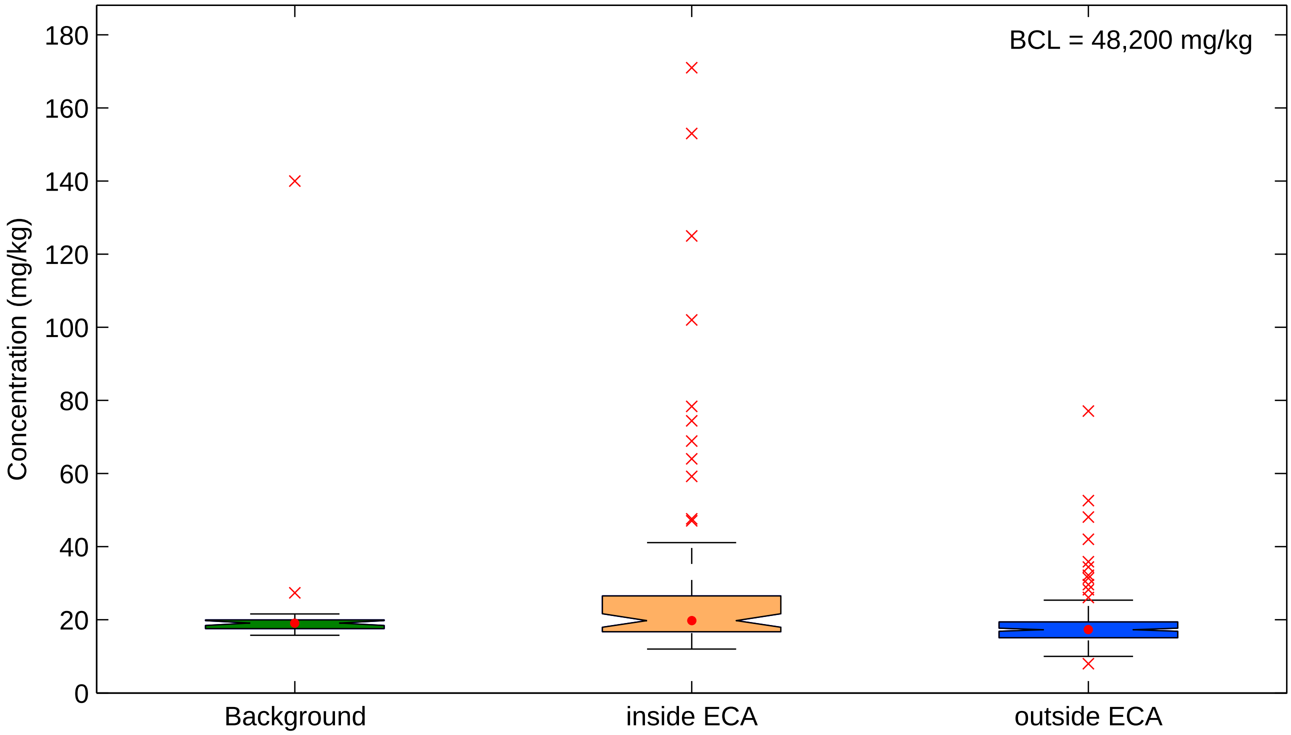
Figure C1−12. Background vs. Site Boxplots
Copper



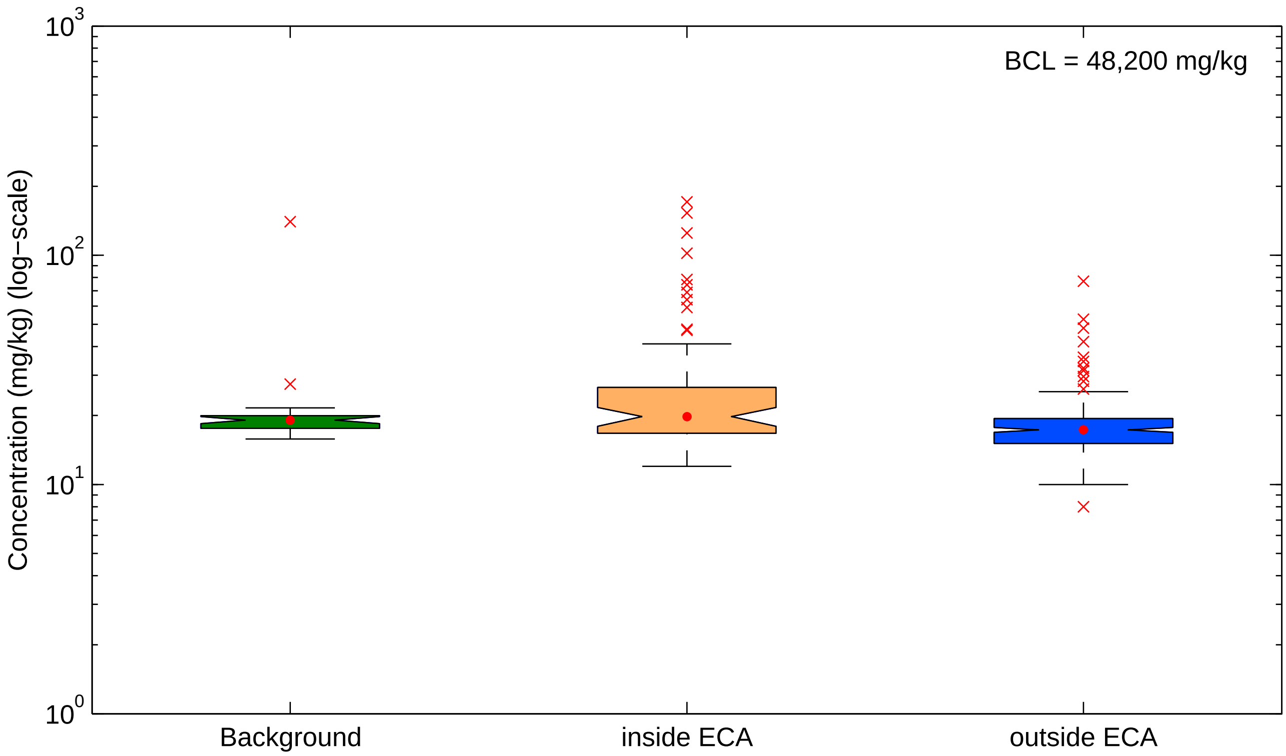


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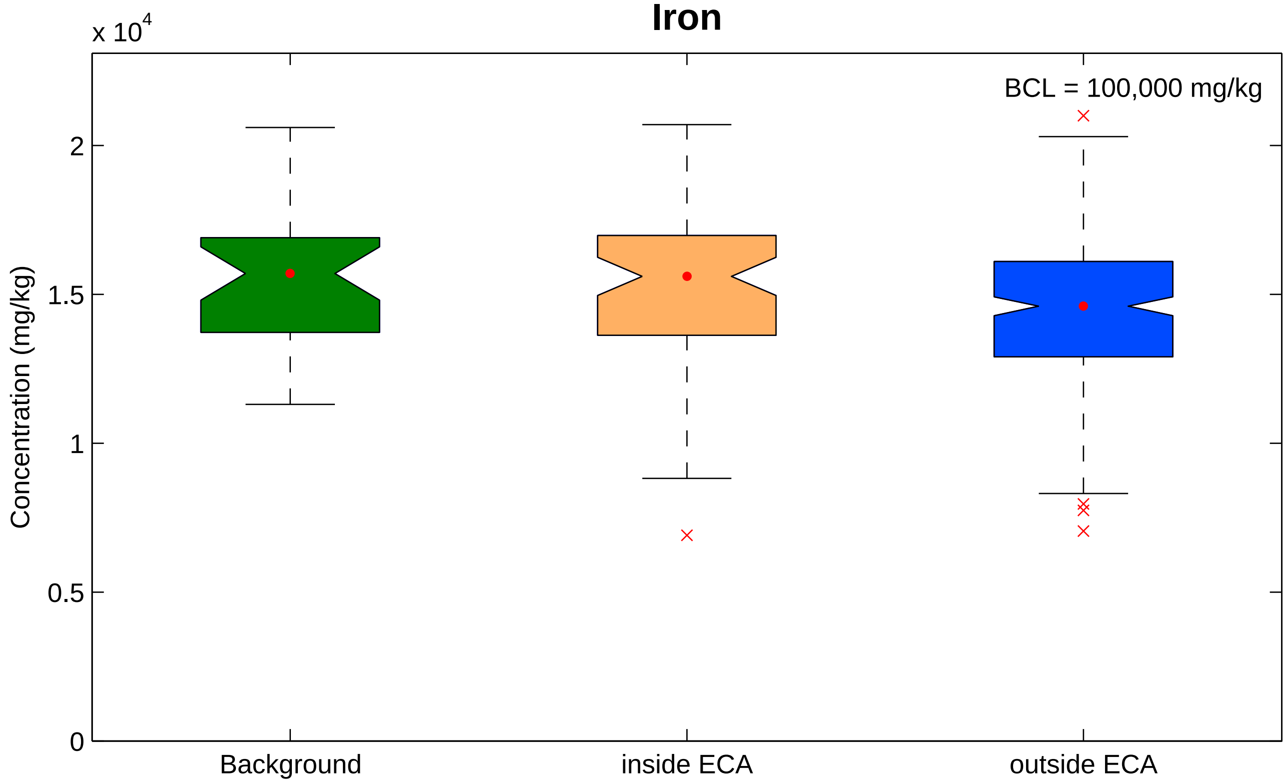
Figure C1−13. Background vs. Site Boxplots
Iron



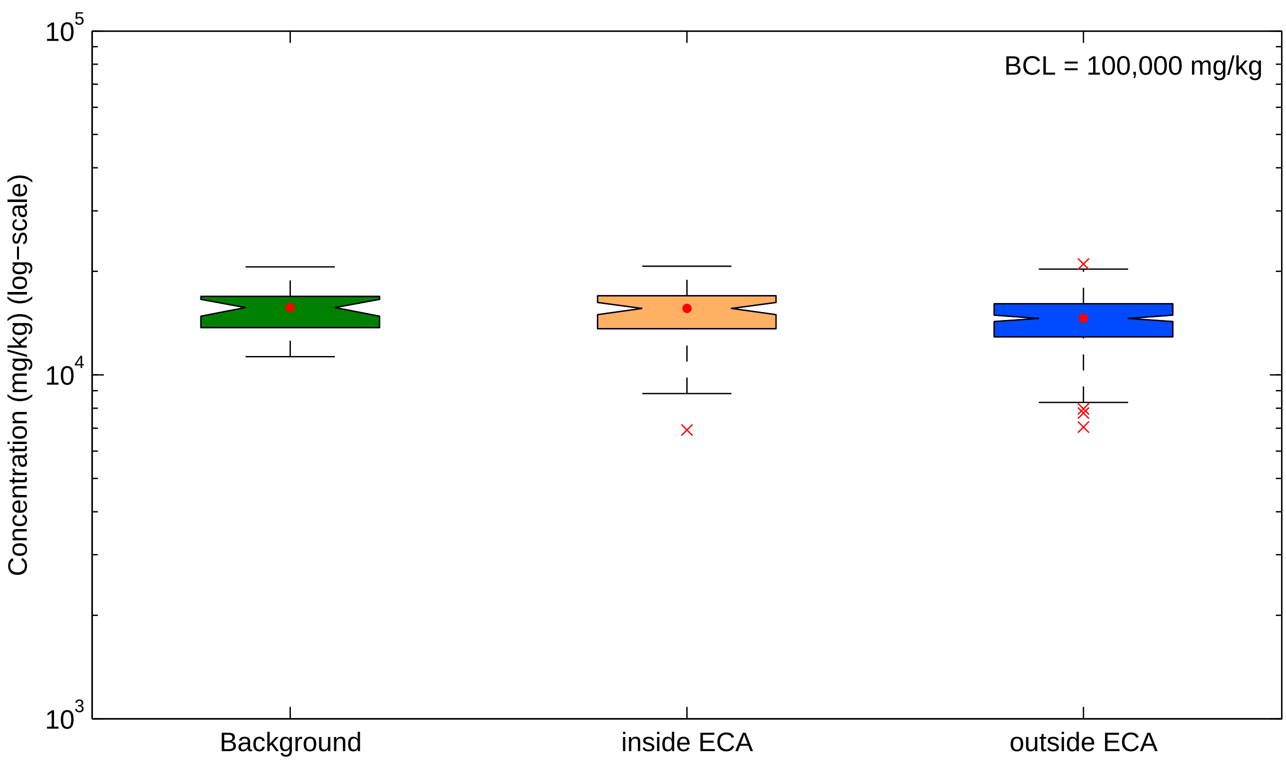
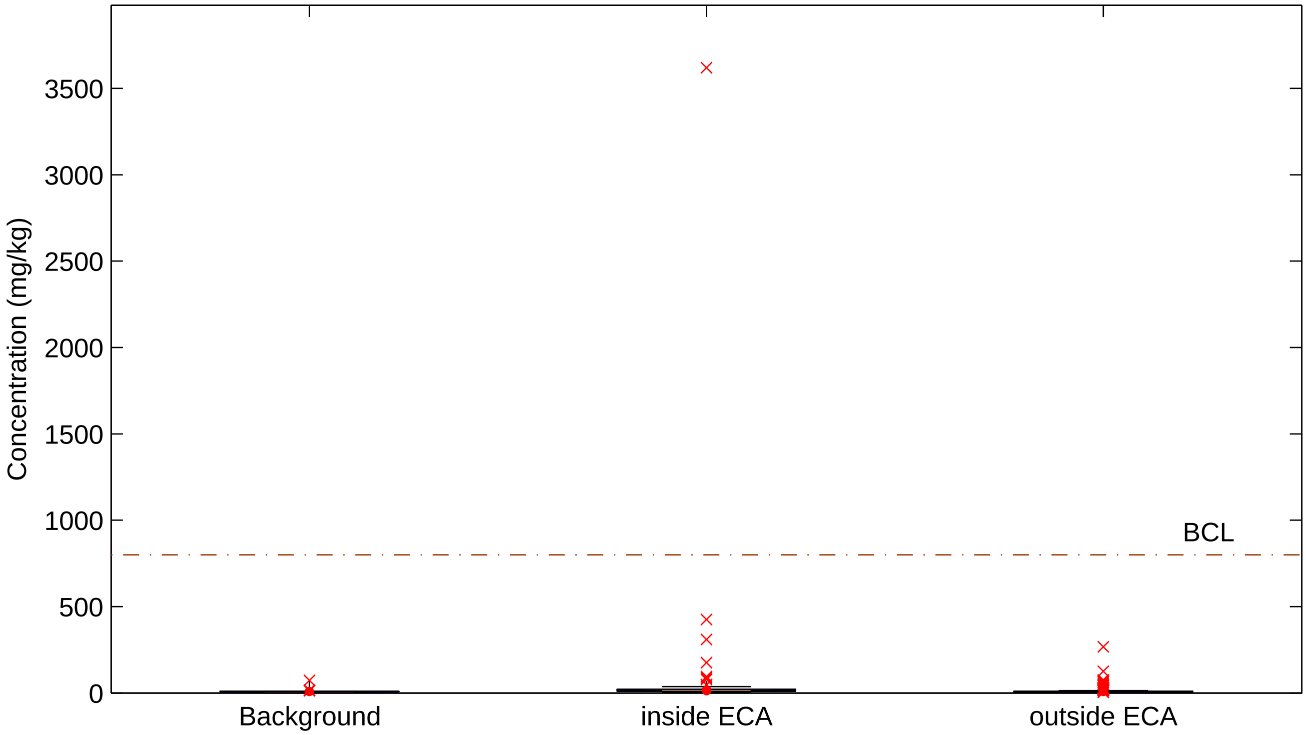


Figure C1−14. Background vs. Site Boxplots
Lead



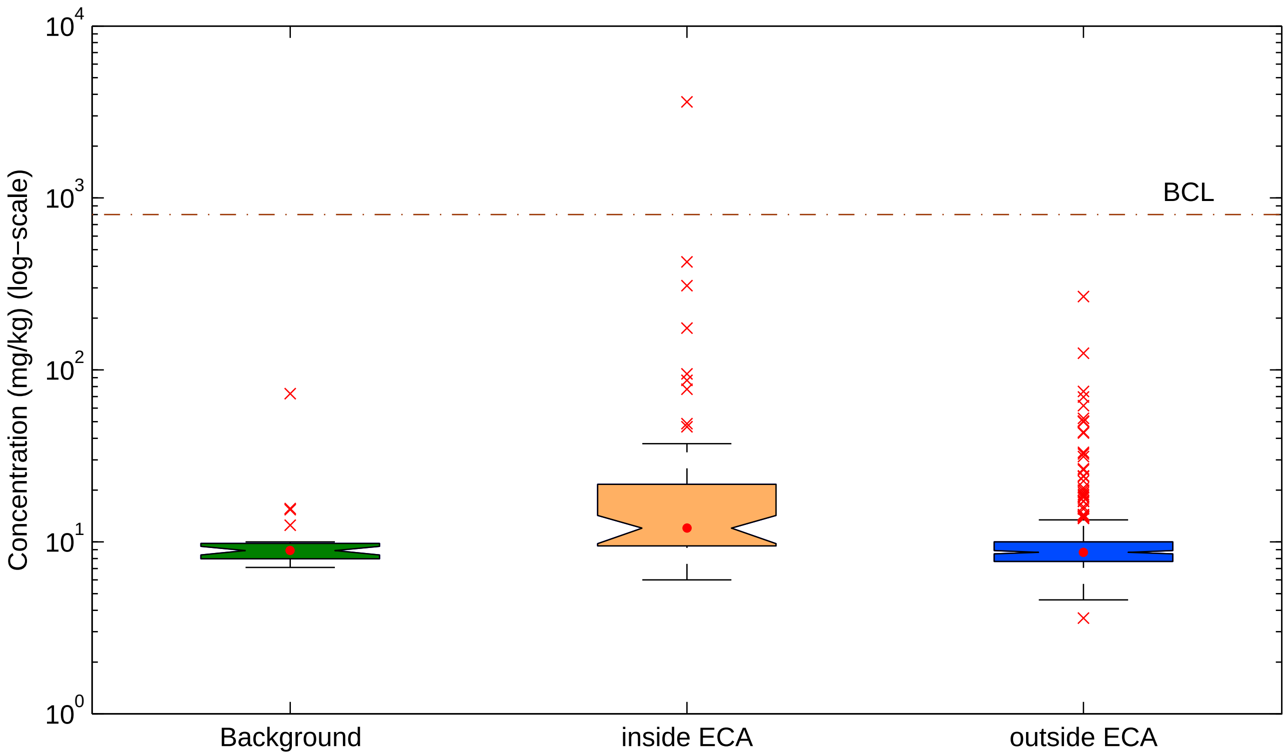


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Figure C1−15. Background vs. Site Boxplots
Magnesium

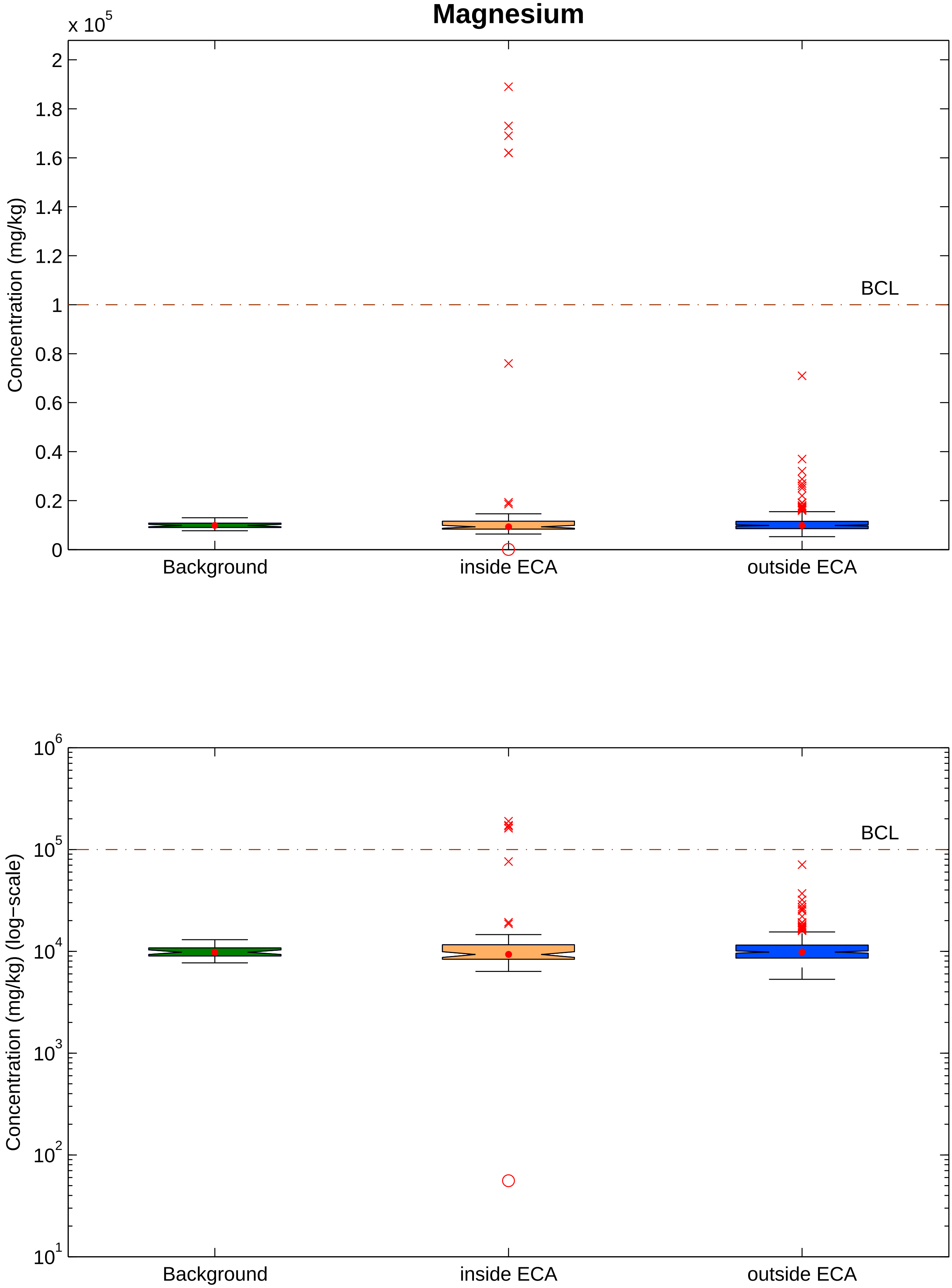

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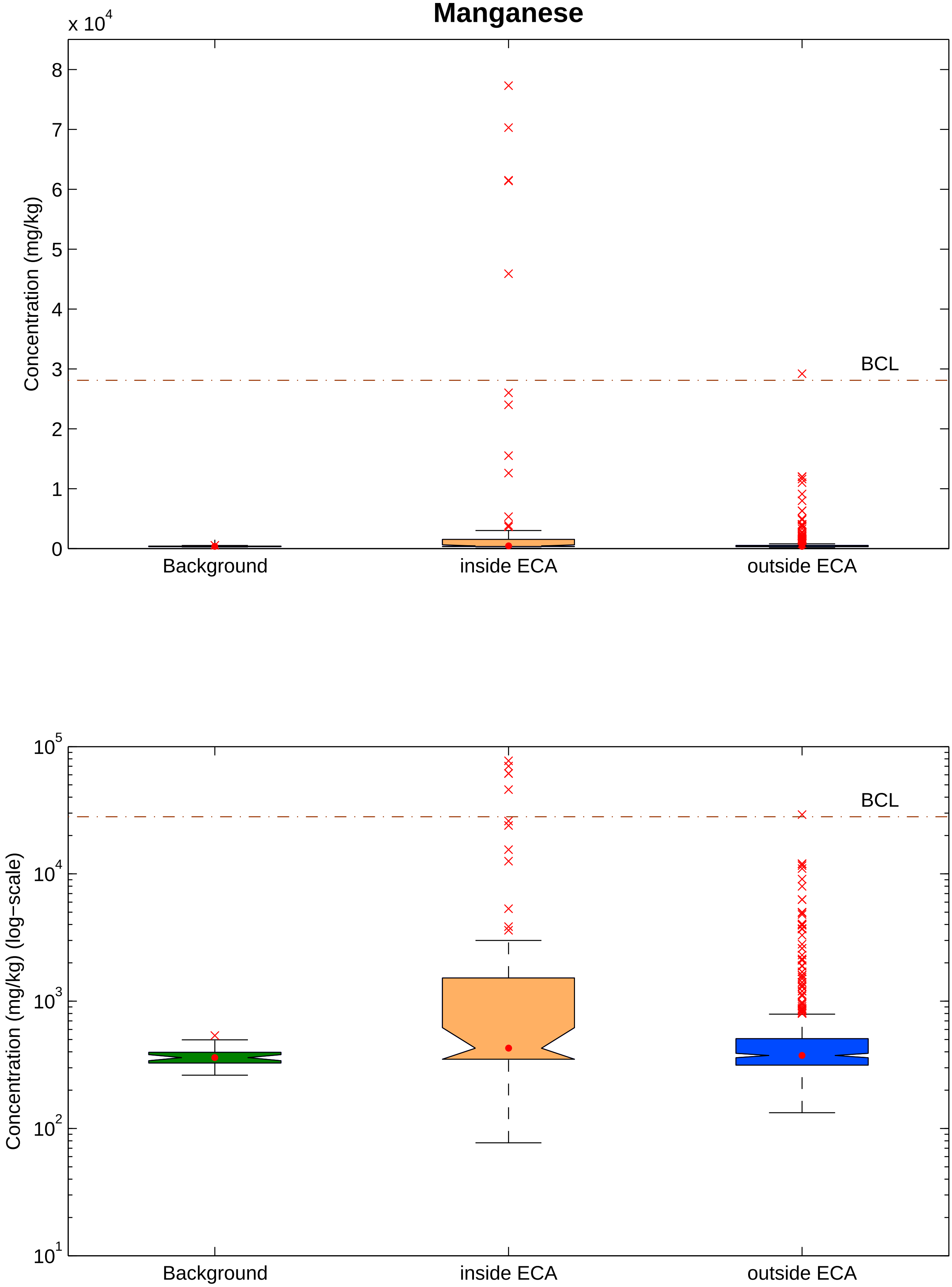
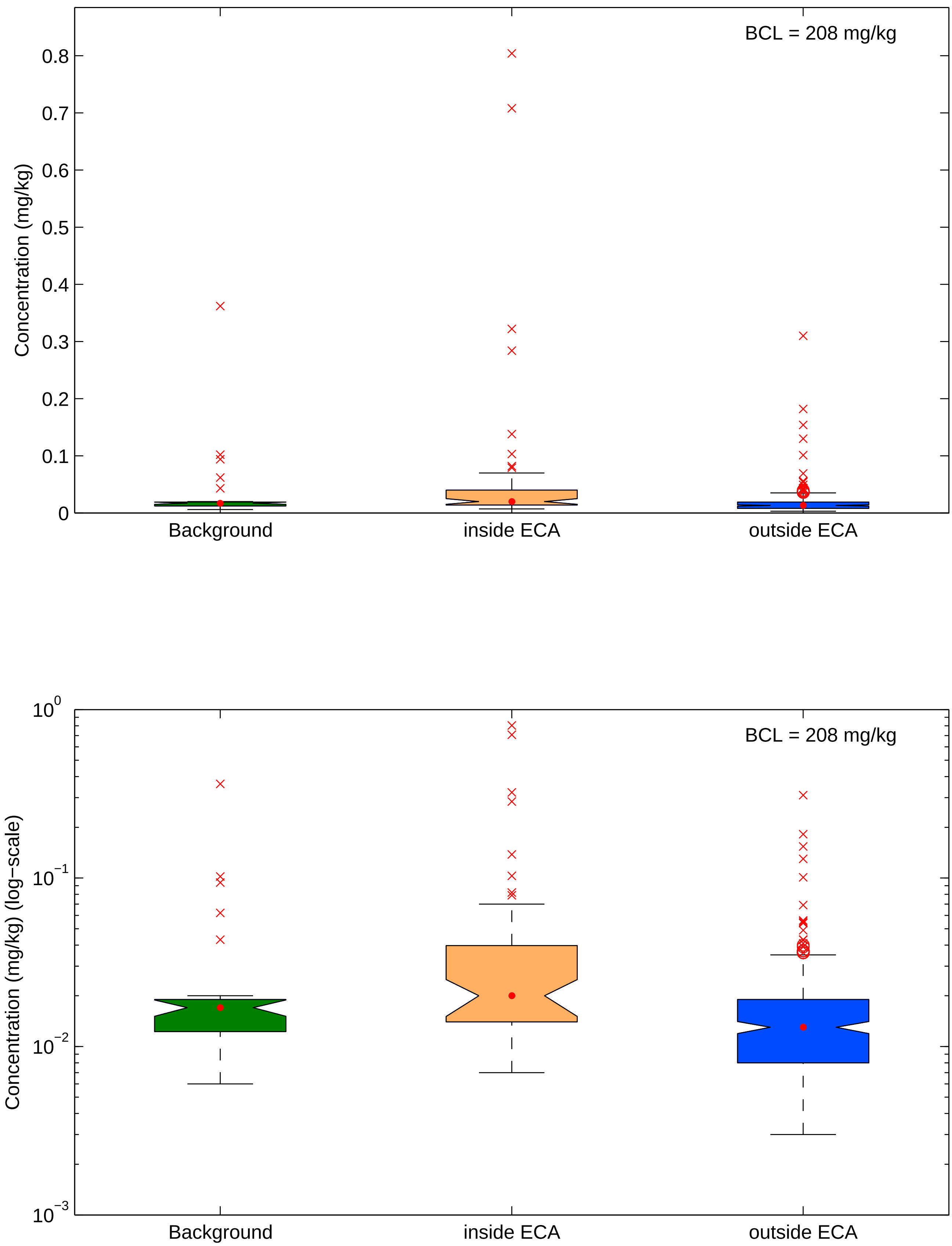
Figure C1−16. Background vs. Site Boxplots
Manganese



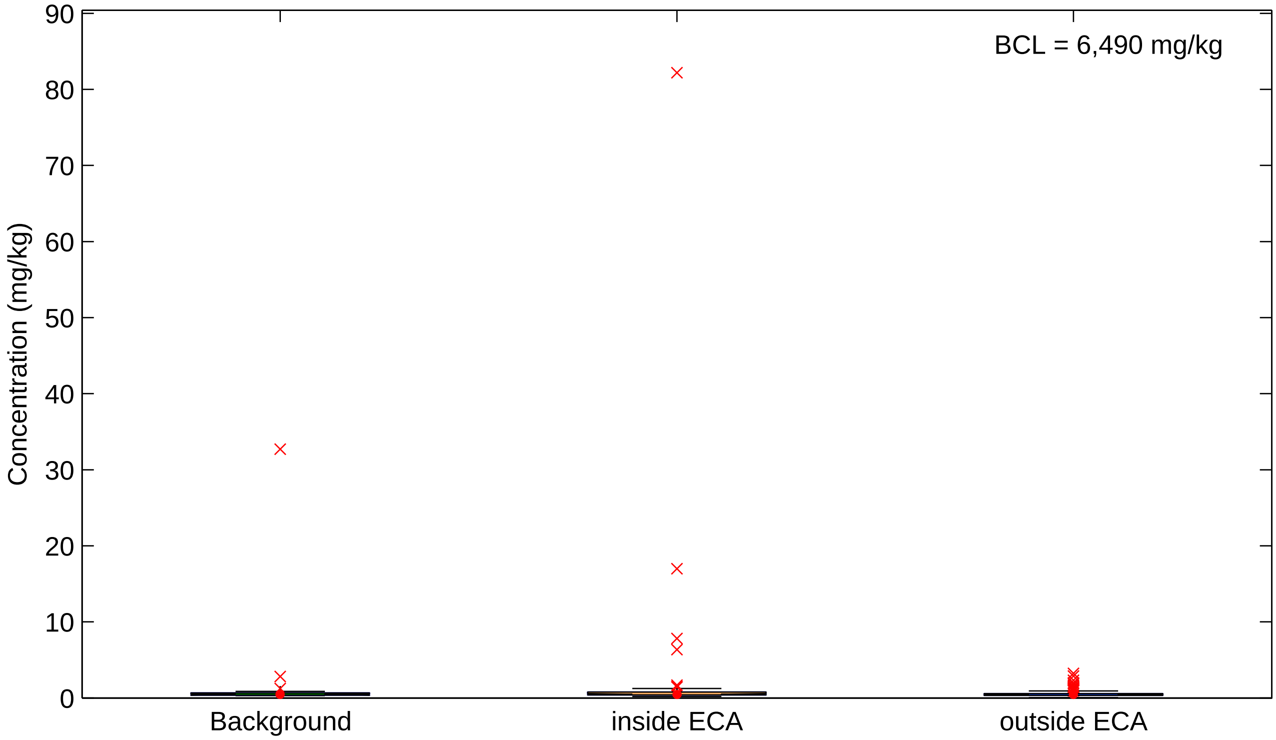
Ramboll Environ

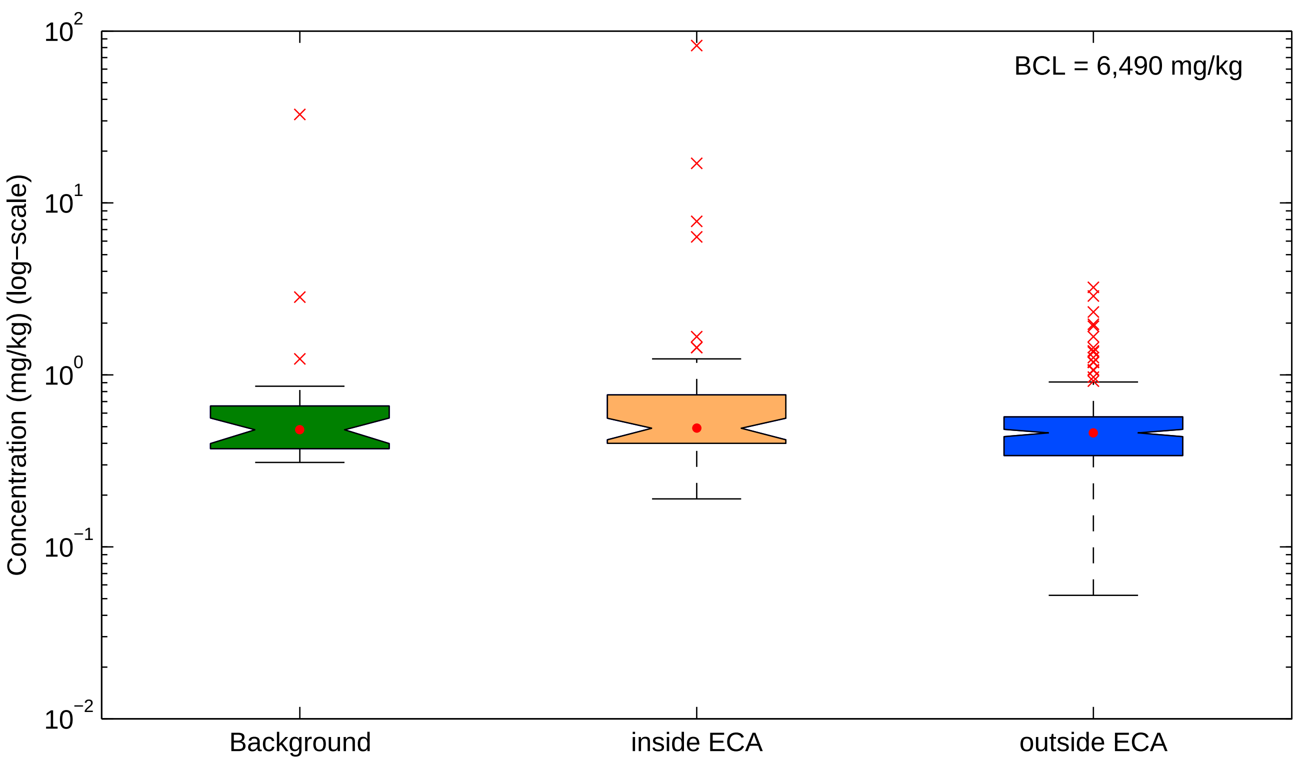
Figure C1−17. Background vs. Site Boxplots
Mercury



Ramboll Environ

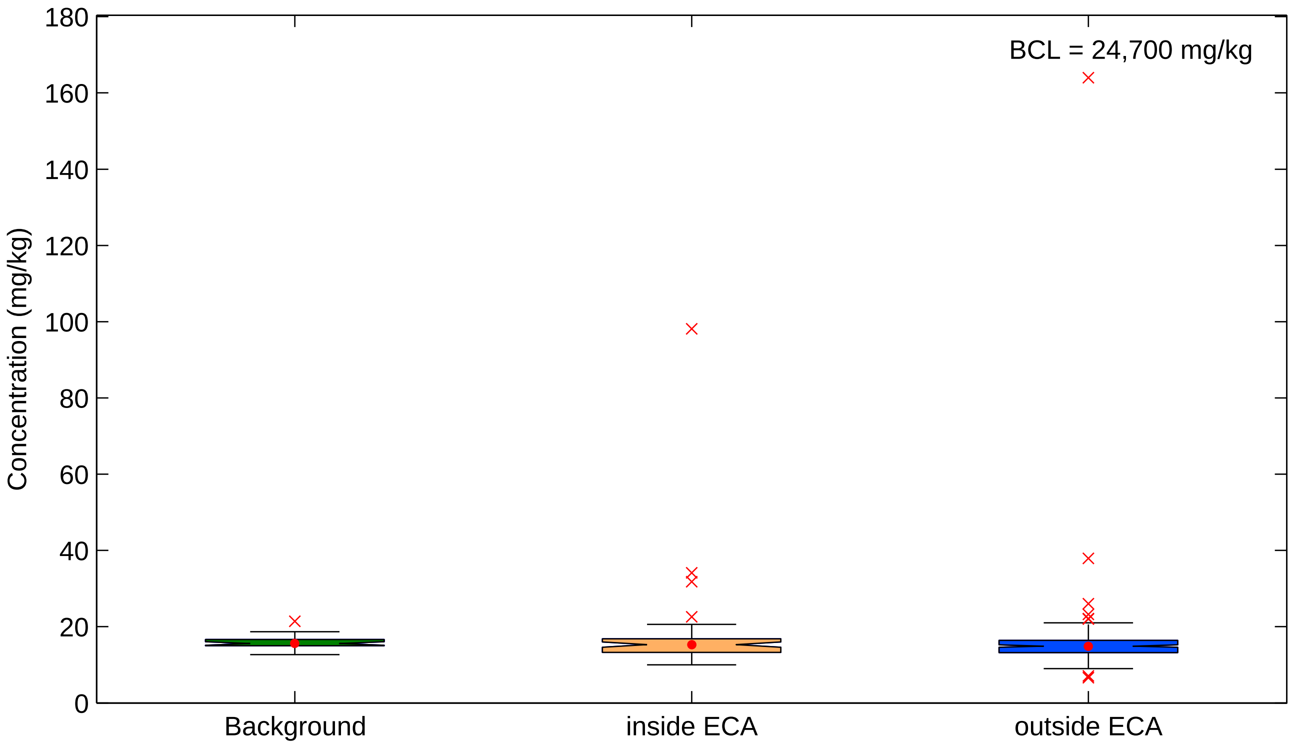
Figure C1−18. Background vs. Site Boxplots
Molybdenum





Ramboll Environ

Figure C1−19. Background vs. Site Boxplots
Nickel



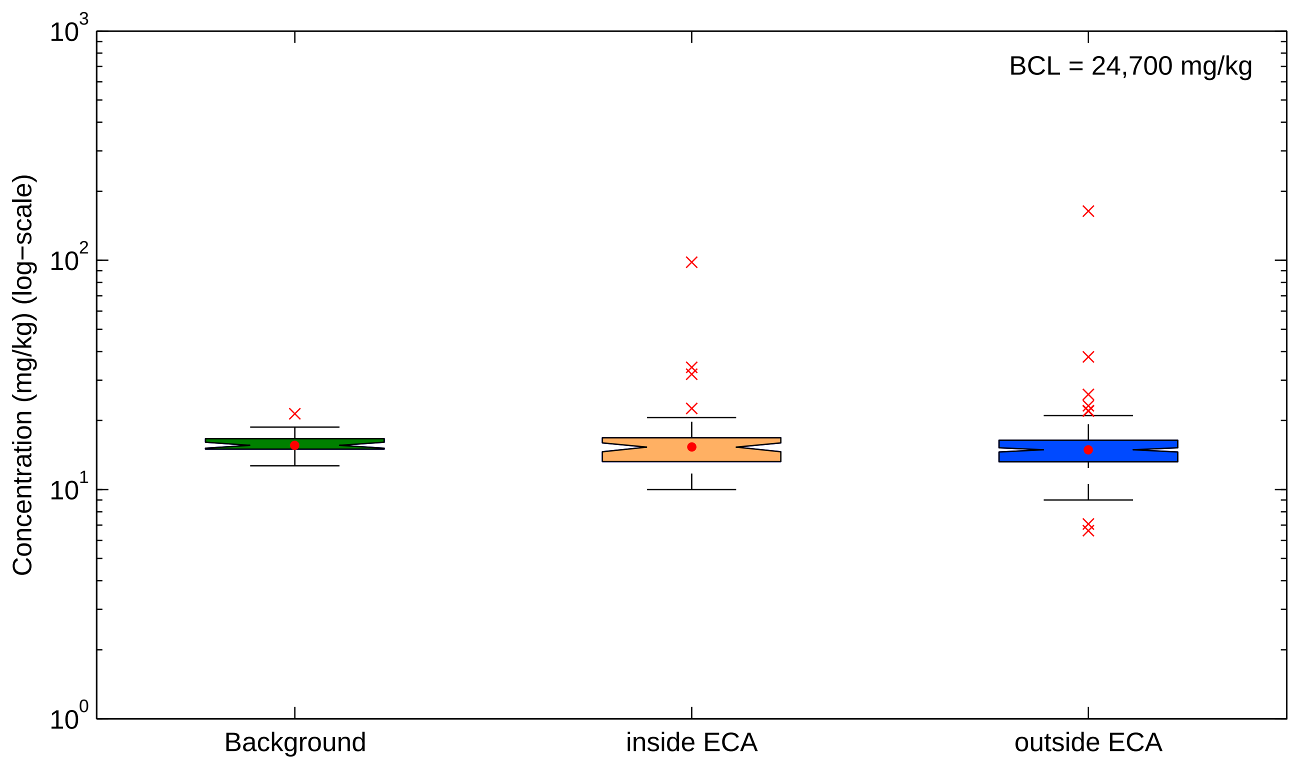
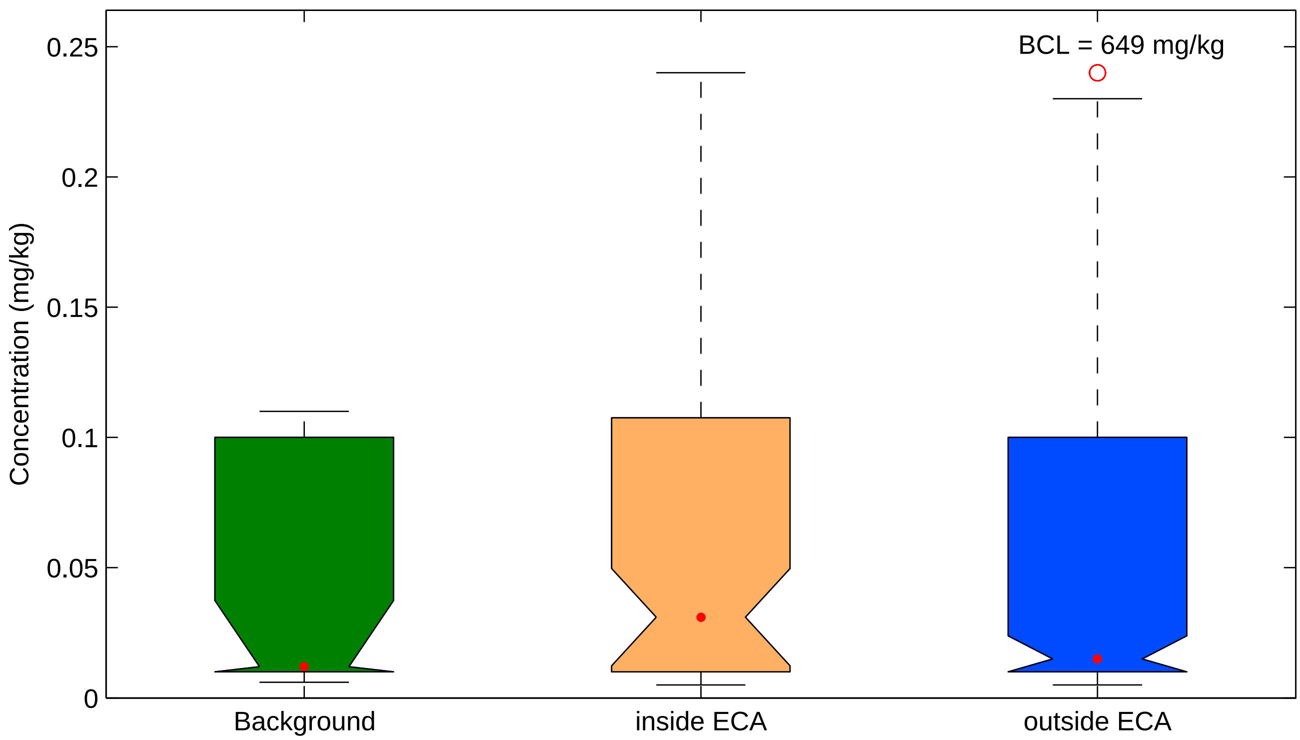
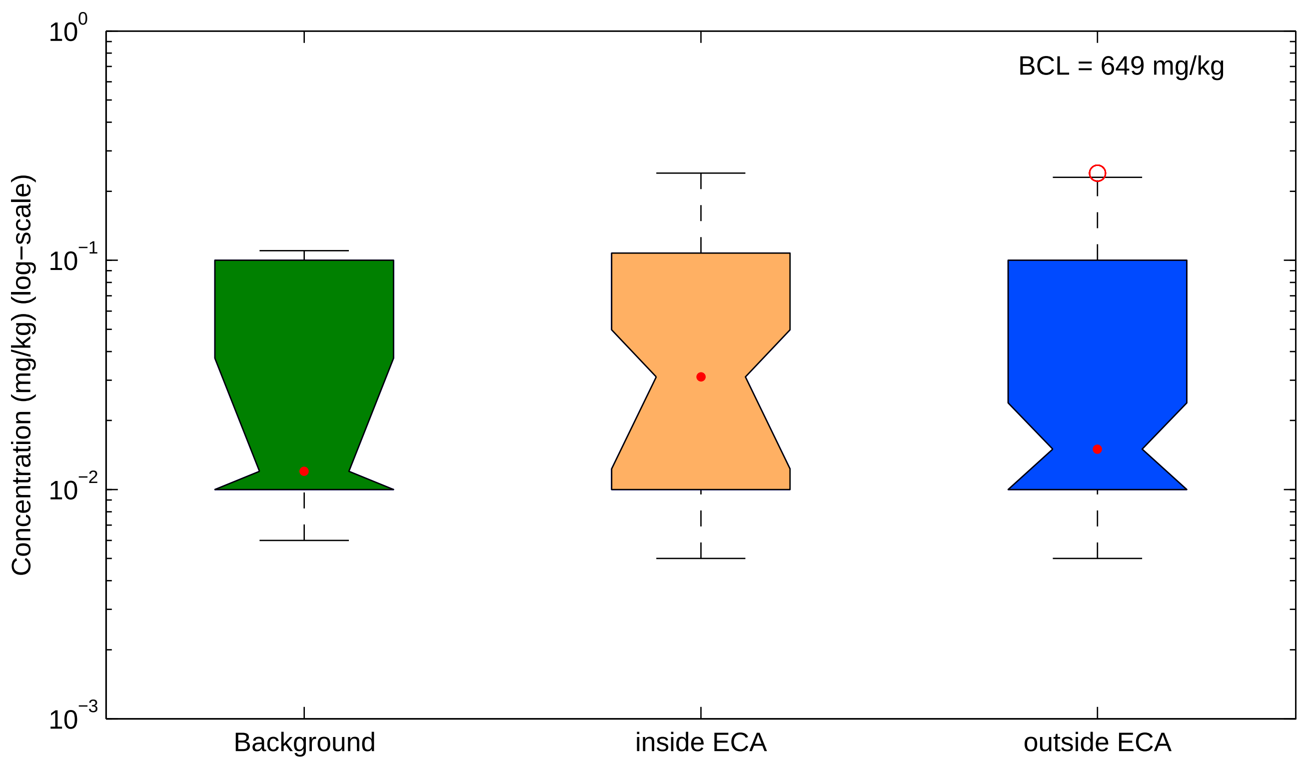


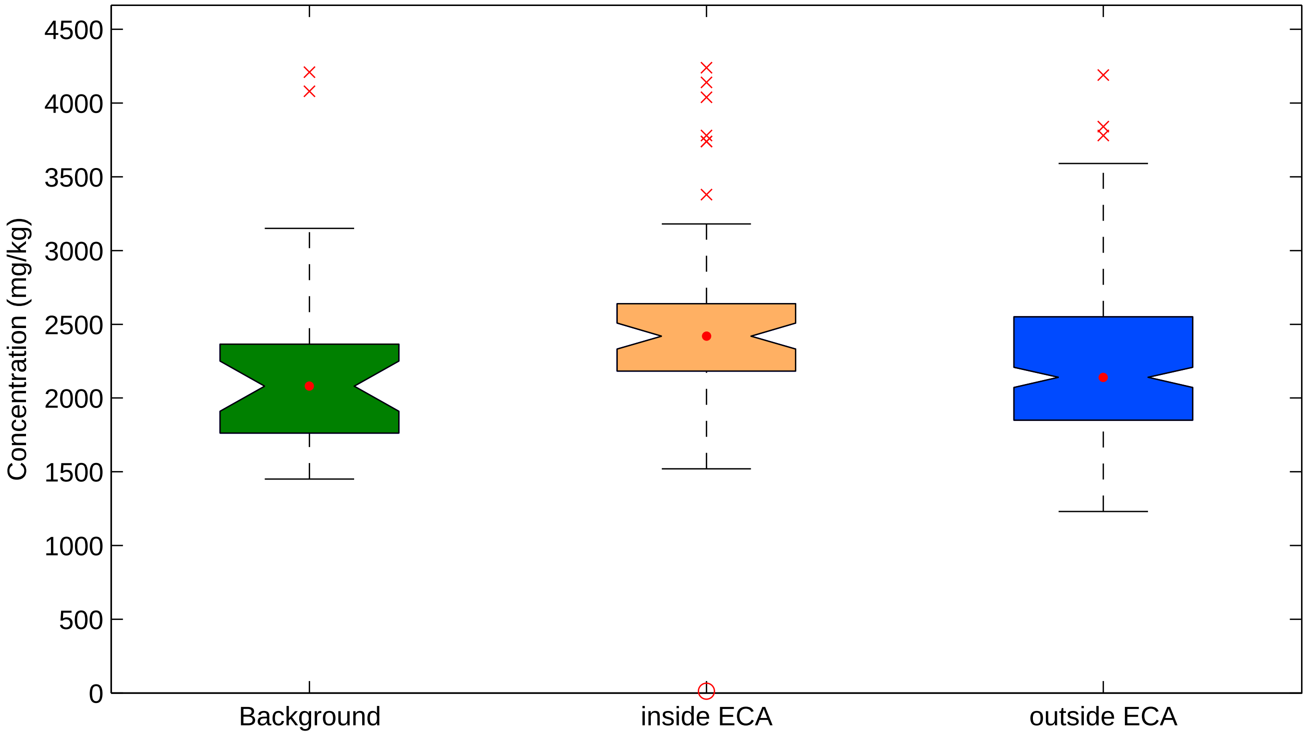
Figure C1−20. Background vs. Site Boxplots
Platinum

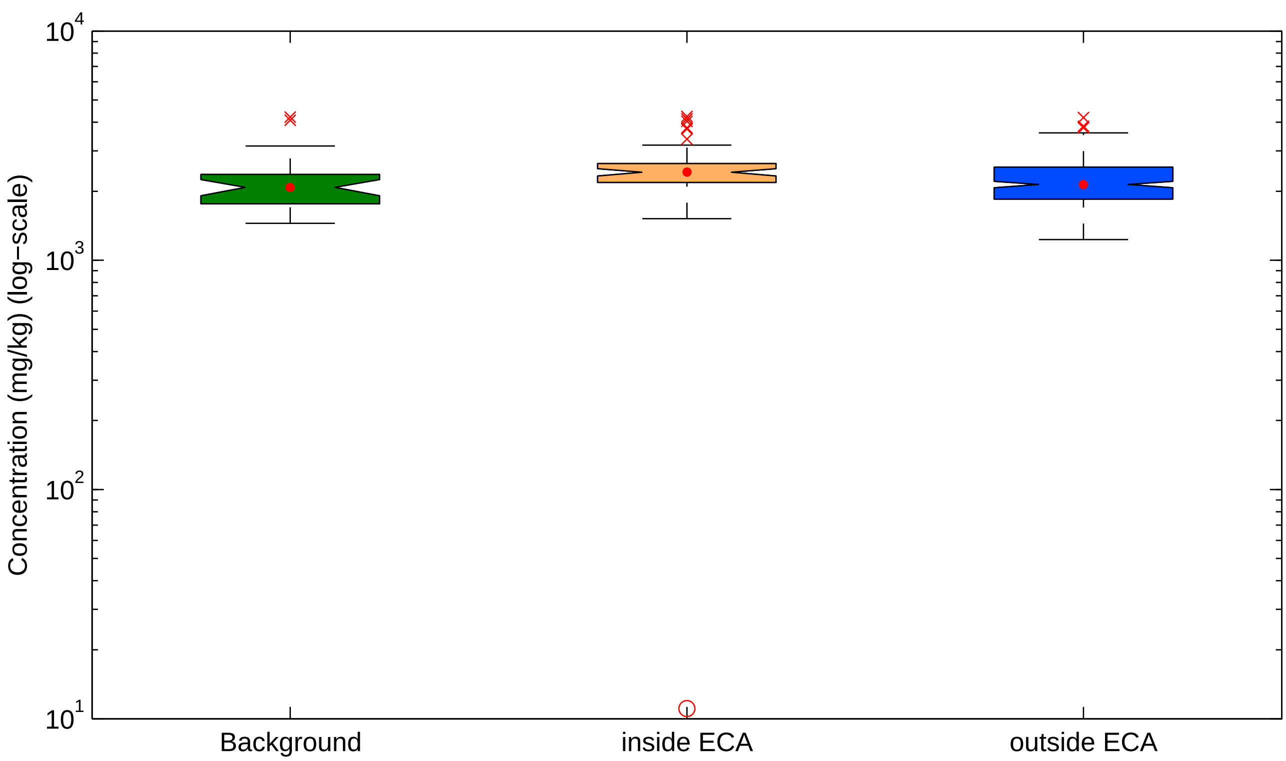




Ramboll Environ

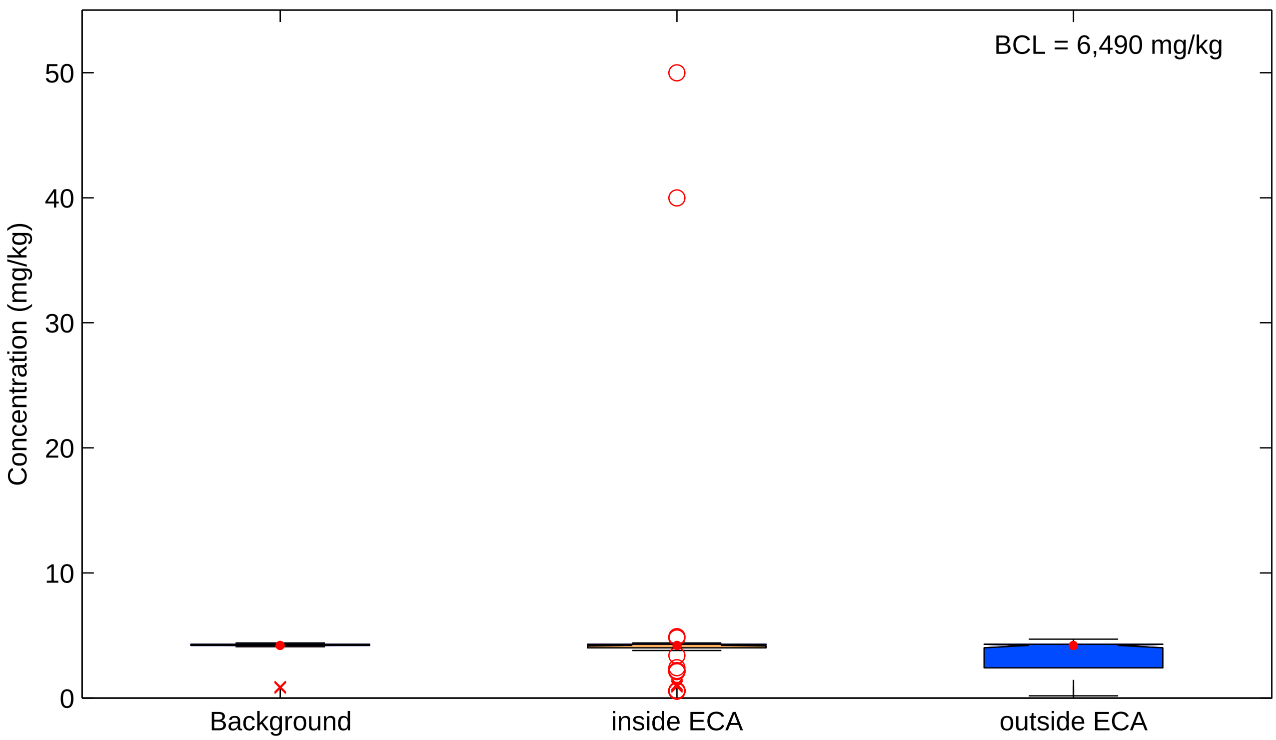
Figure C1−21. Background vs. Site Boxplots
Potassium





Ramboll Environ

Figure C1−22. Background vs. Site Boxplots
Selenium



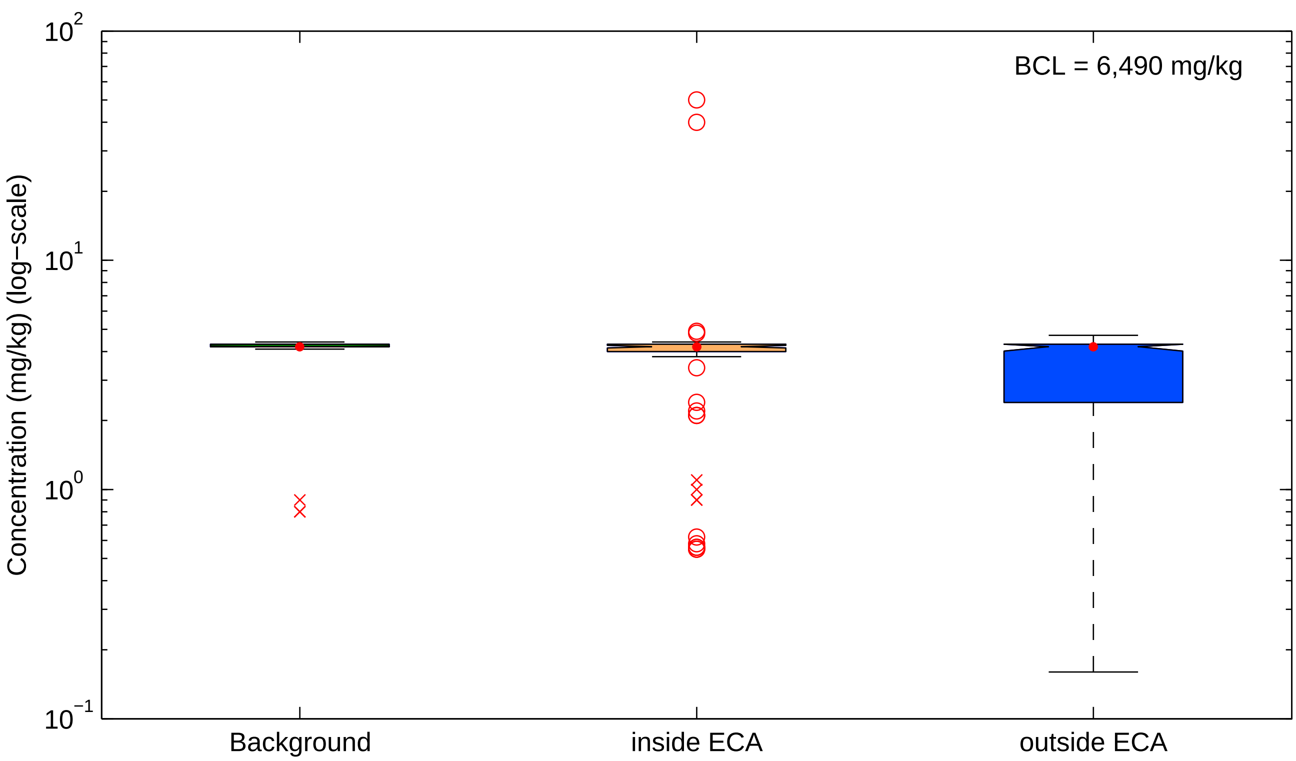
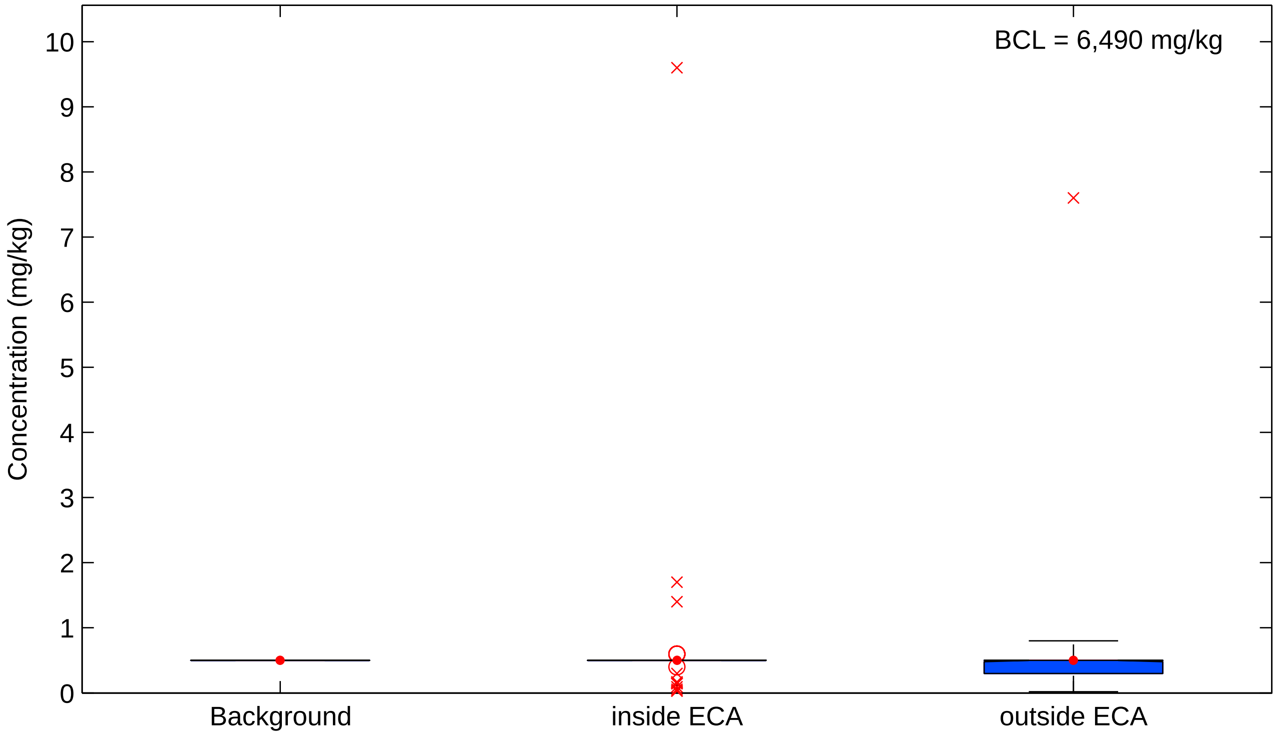


Figure C1−23. Background vs. Site Boxplots
Silver



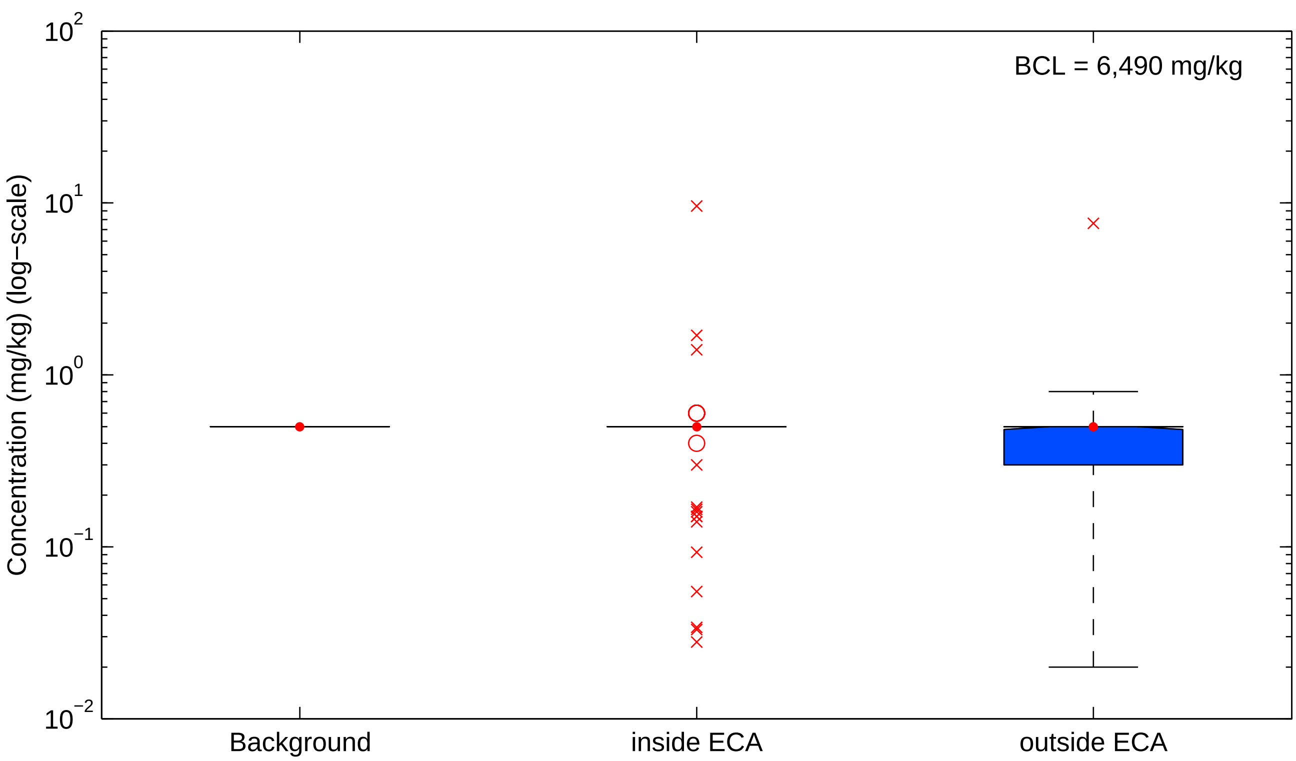
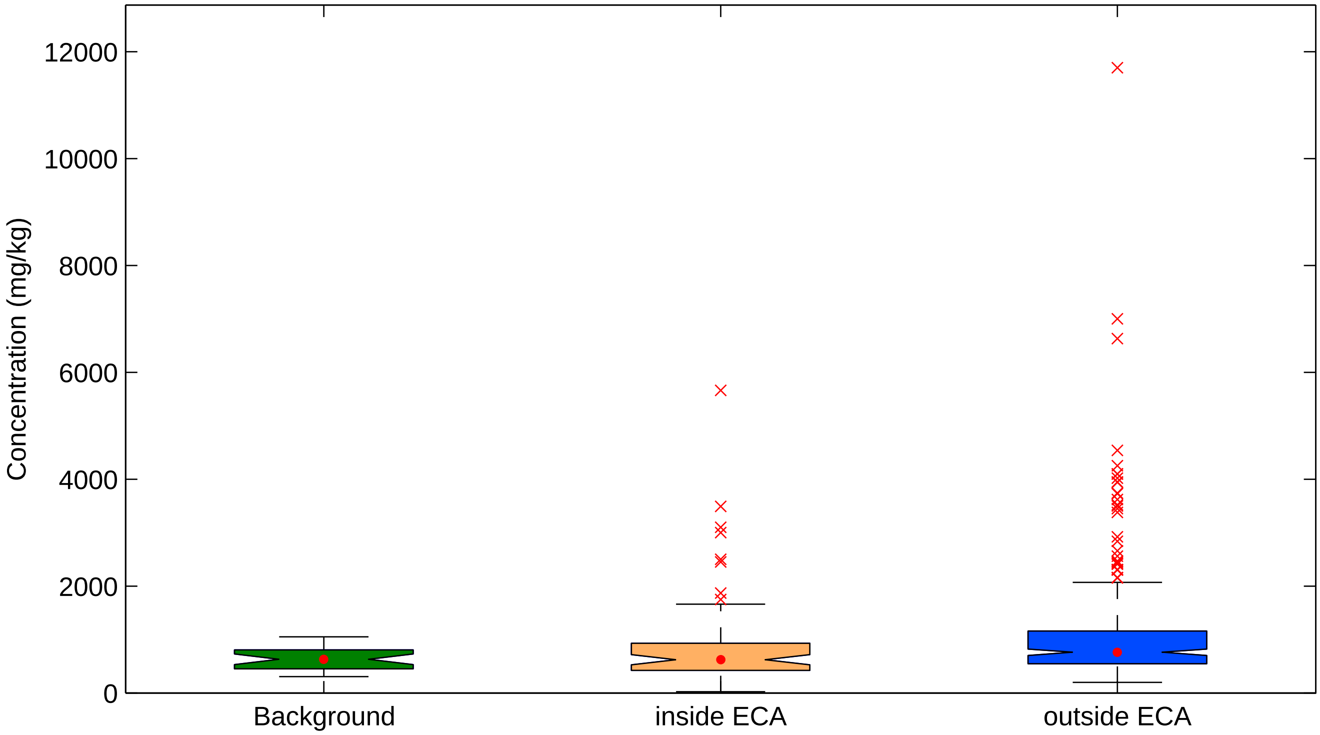
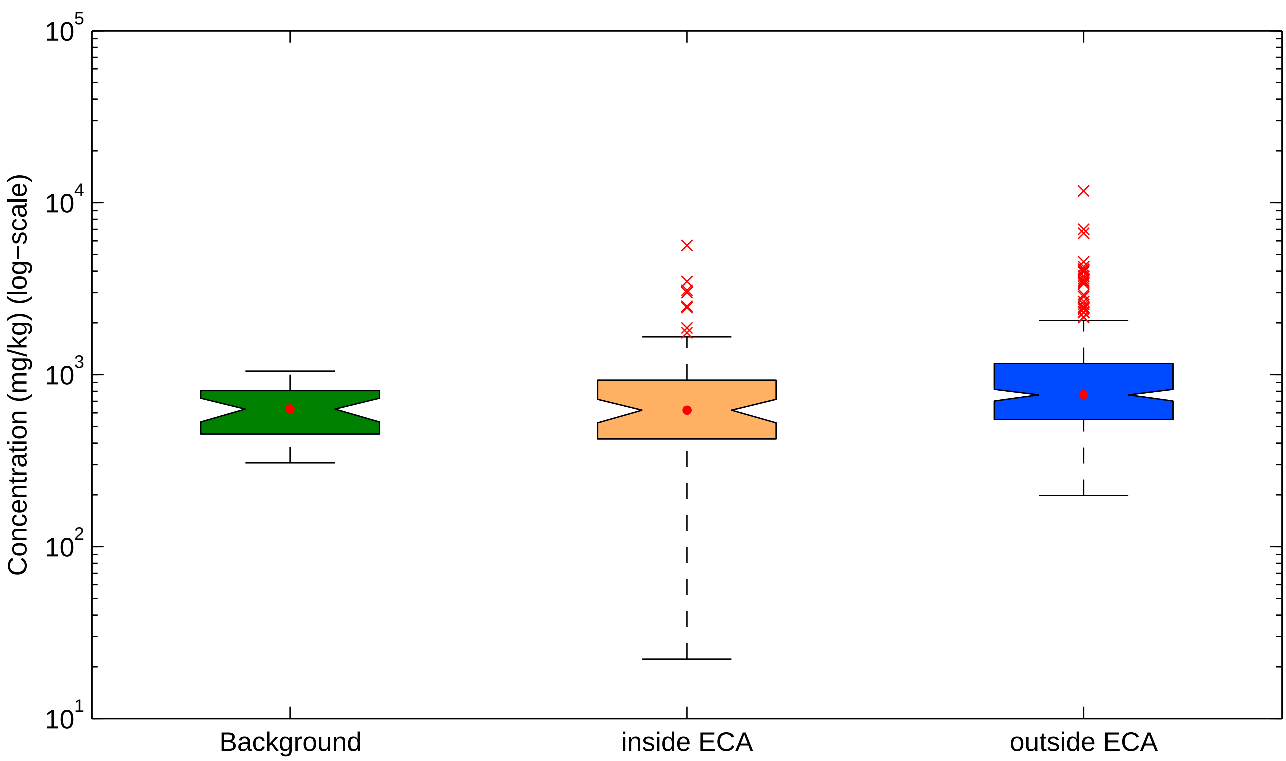


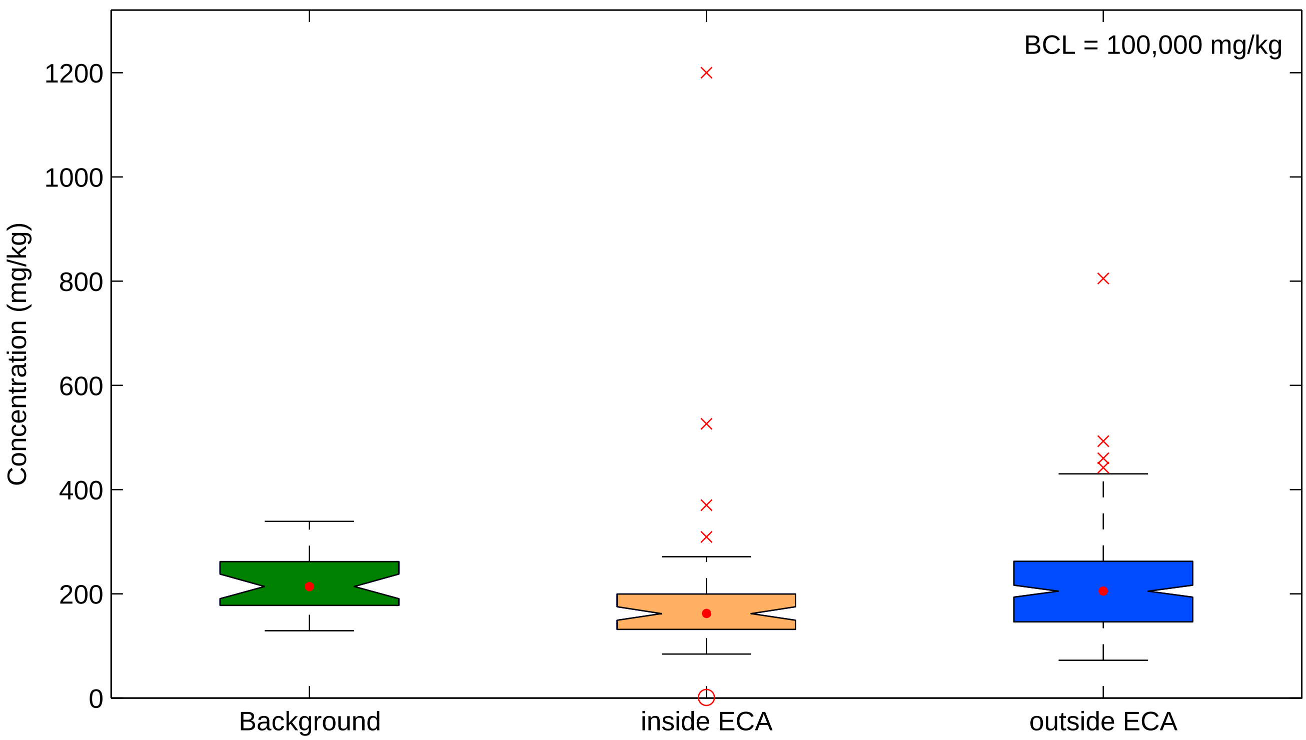
Figure C1−24. Background vs. Site Boxplots
Sodium

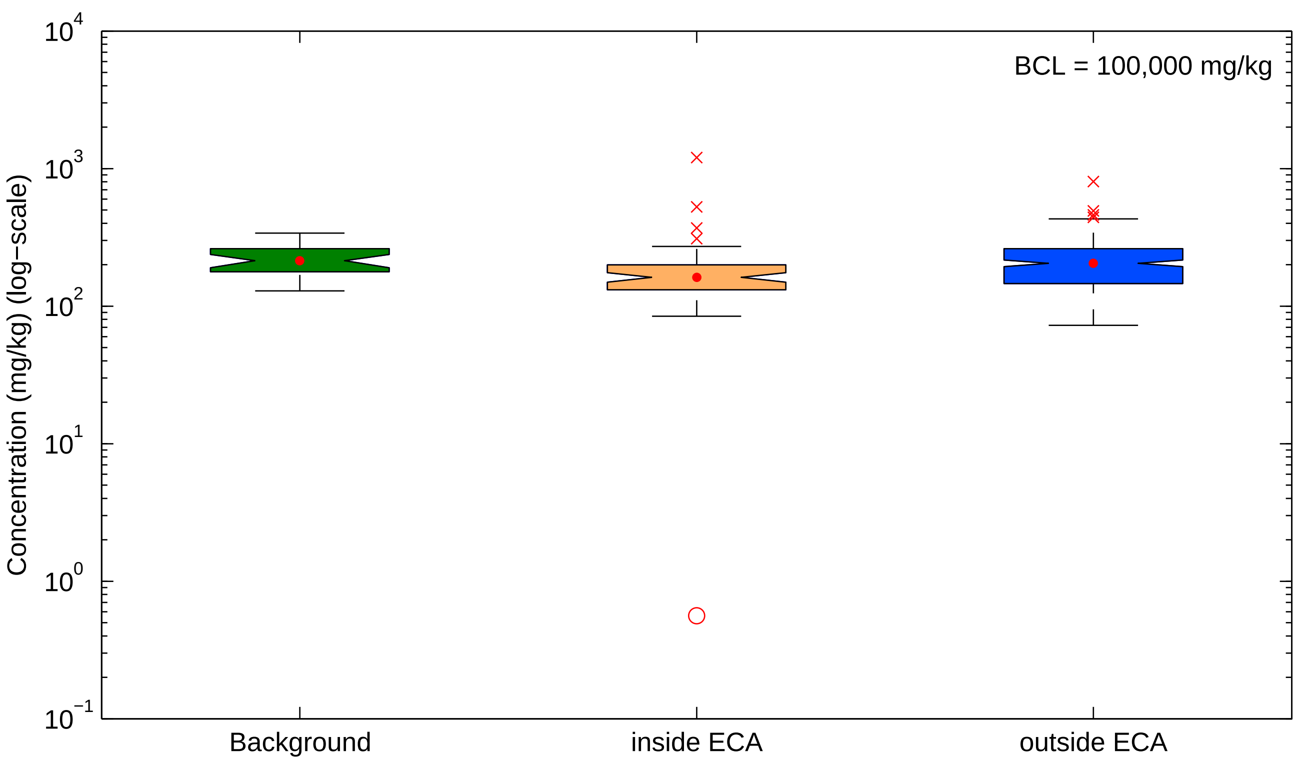




Ramboll Environ

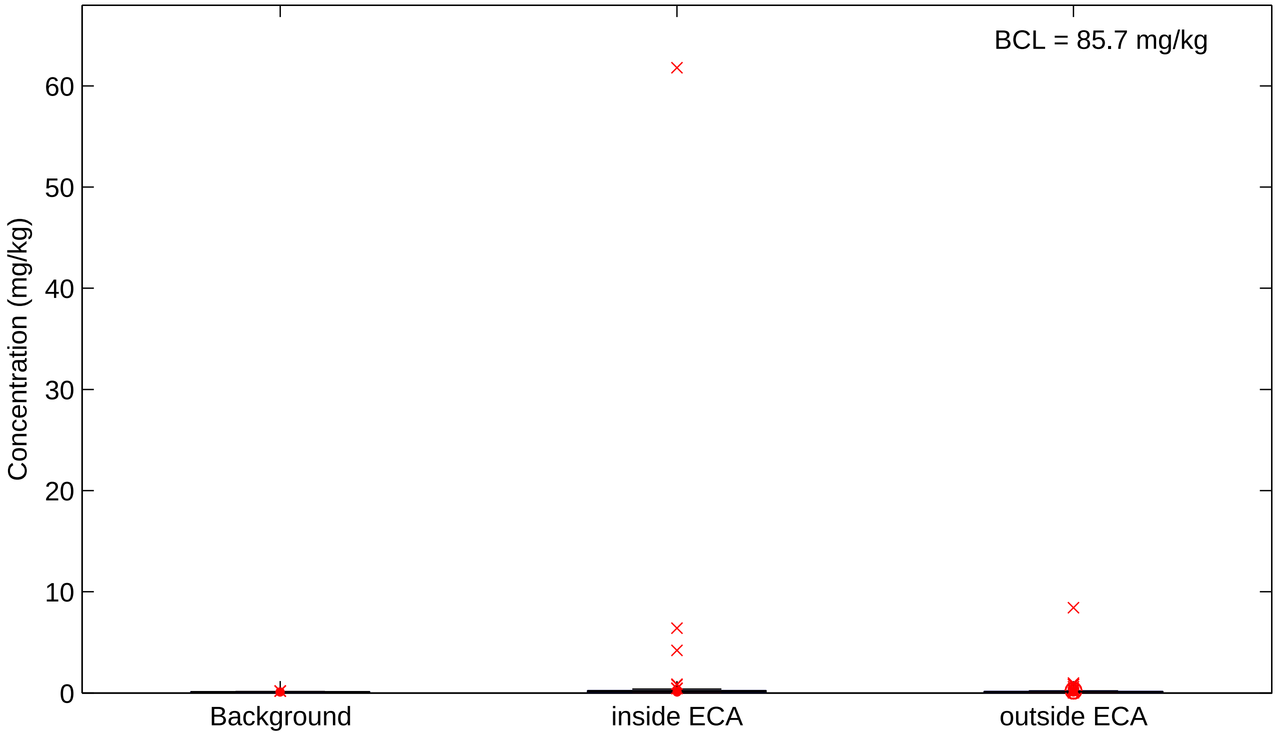
Figure C1−25. Background vs. Site Boxplots
Strontium

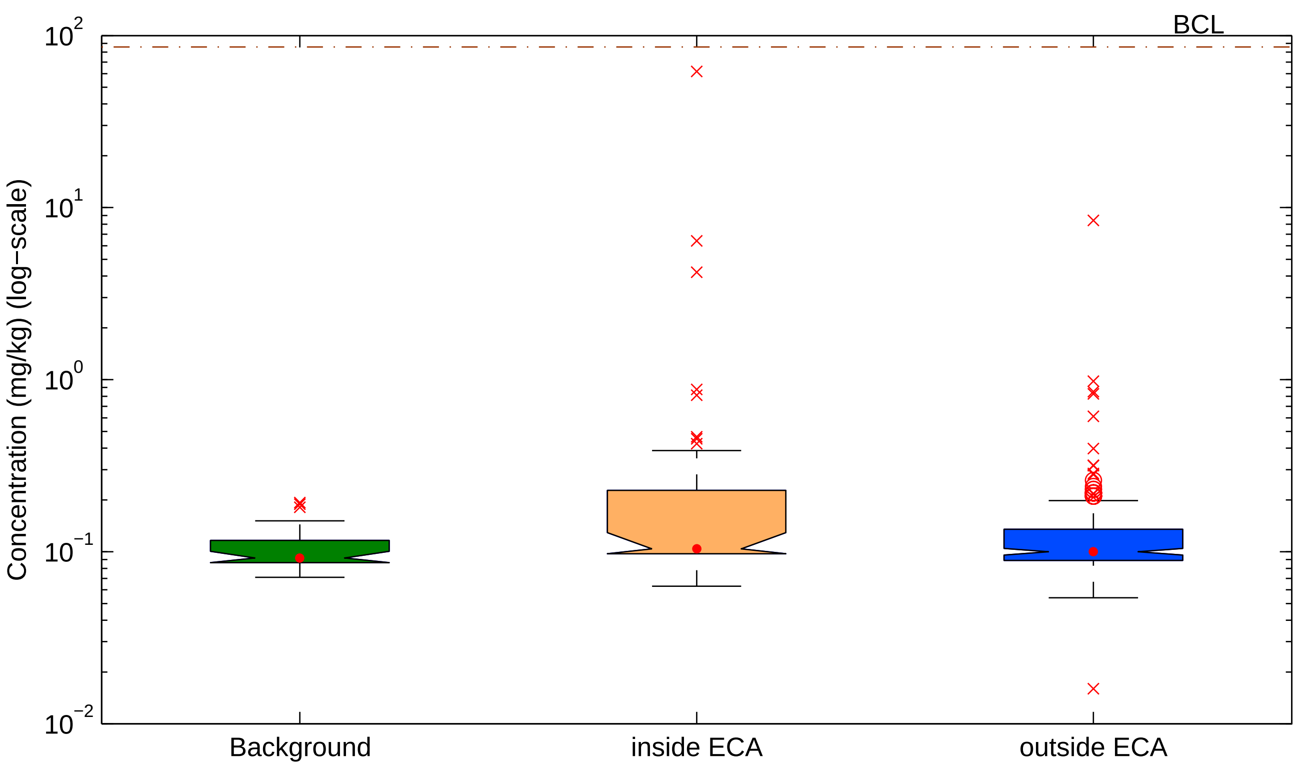




Ramboll Environ

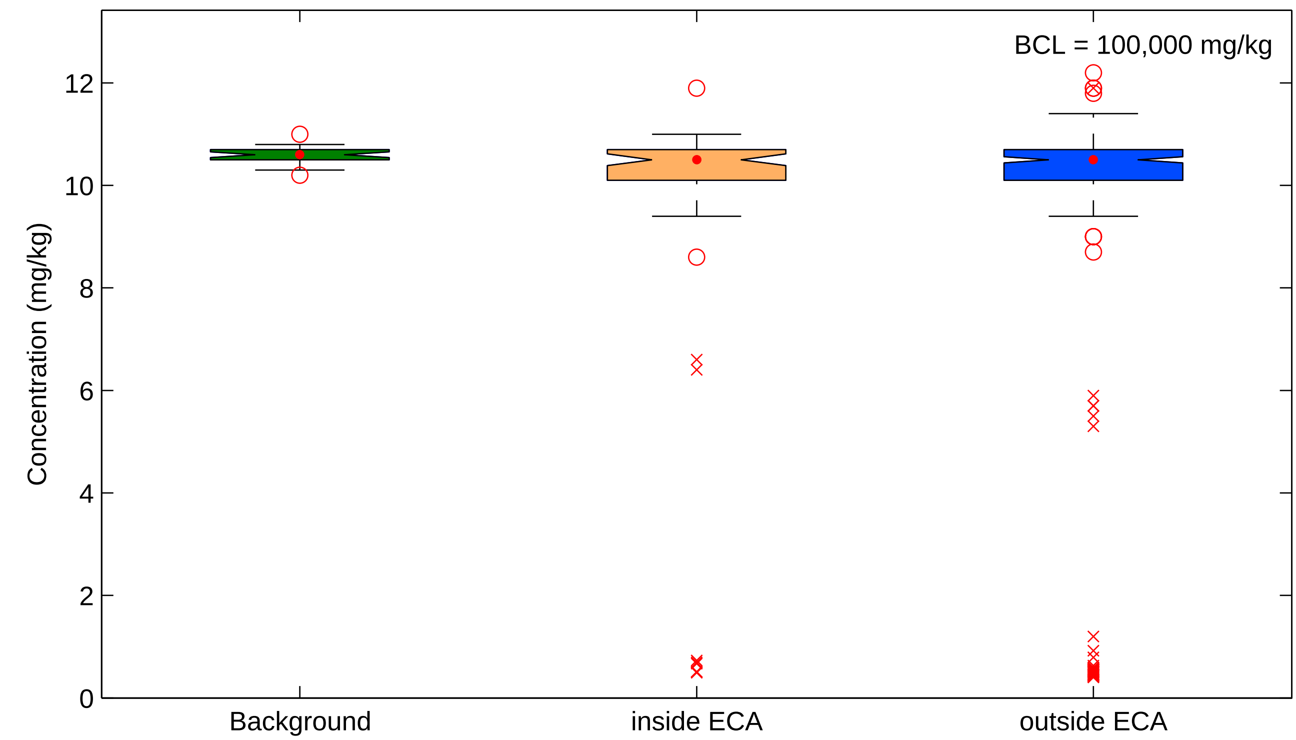
Figure C1−26. Background vs. Site Boxplots
Thallium





Ramboll Environ

Figure C1−27. Background vs. Site Boxplots
Tin



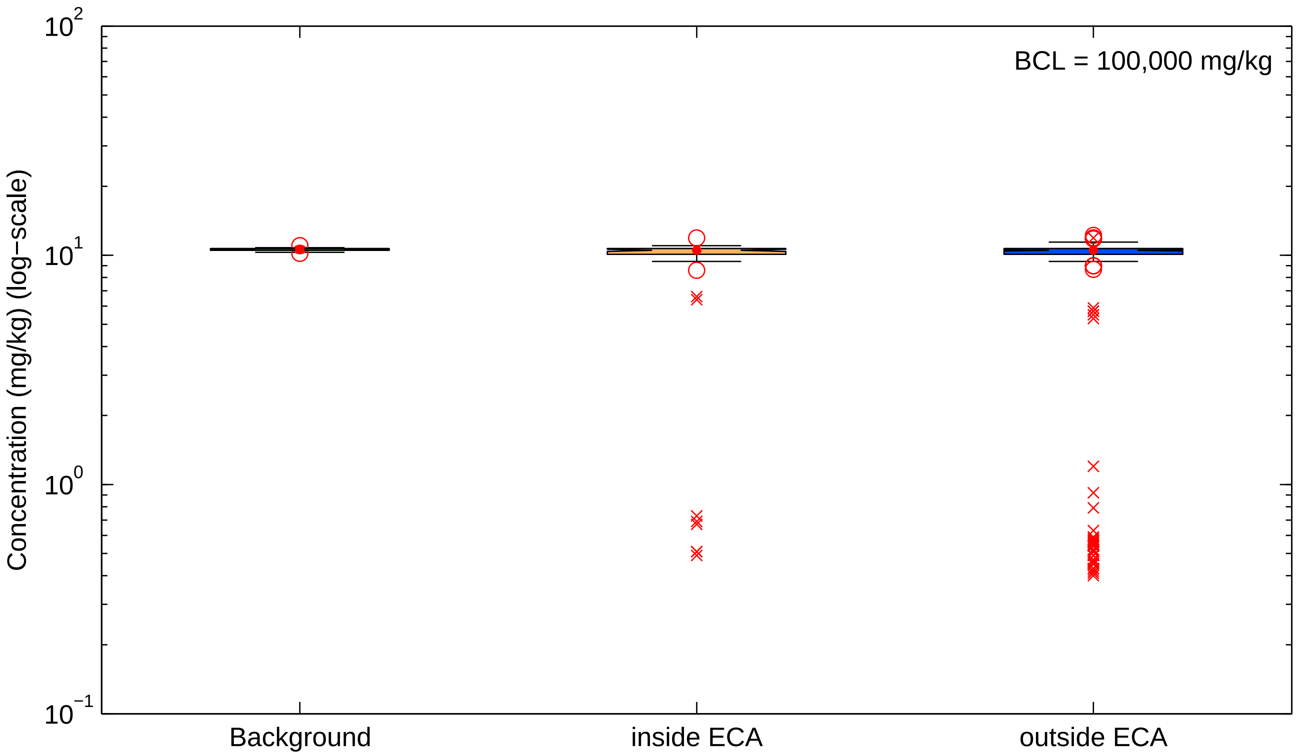
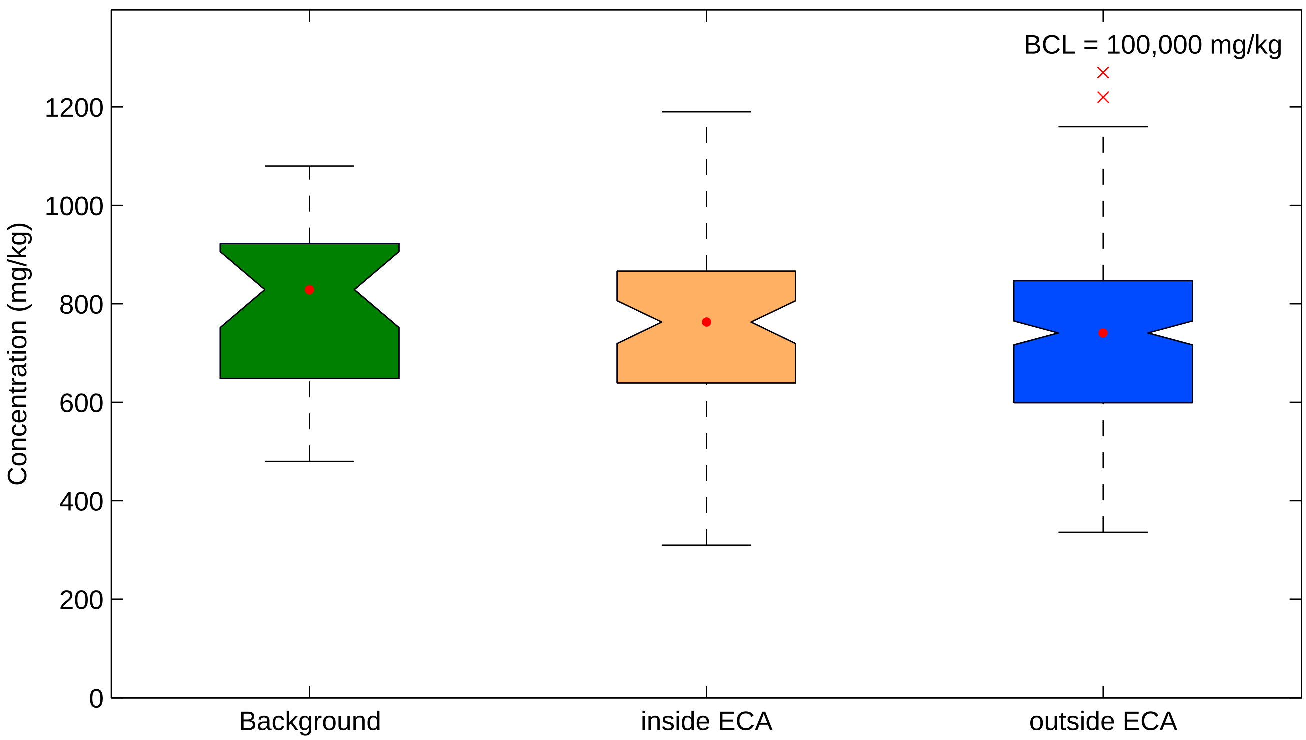
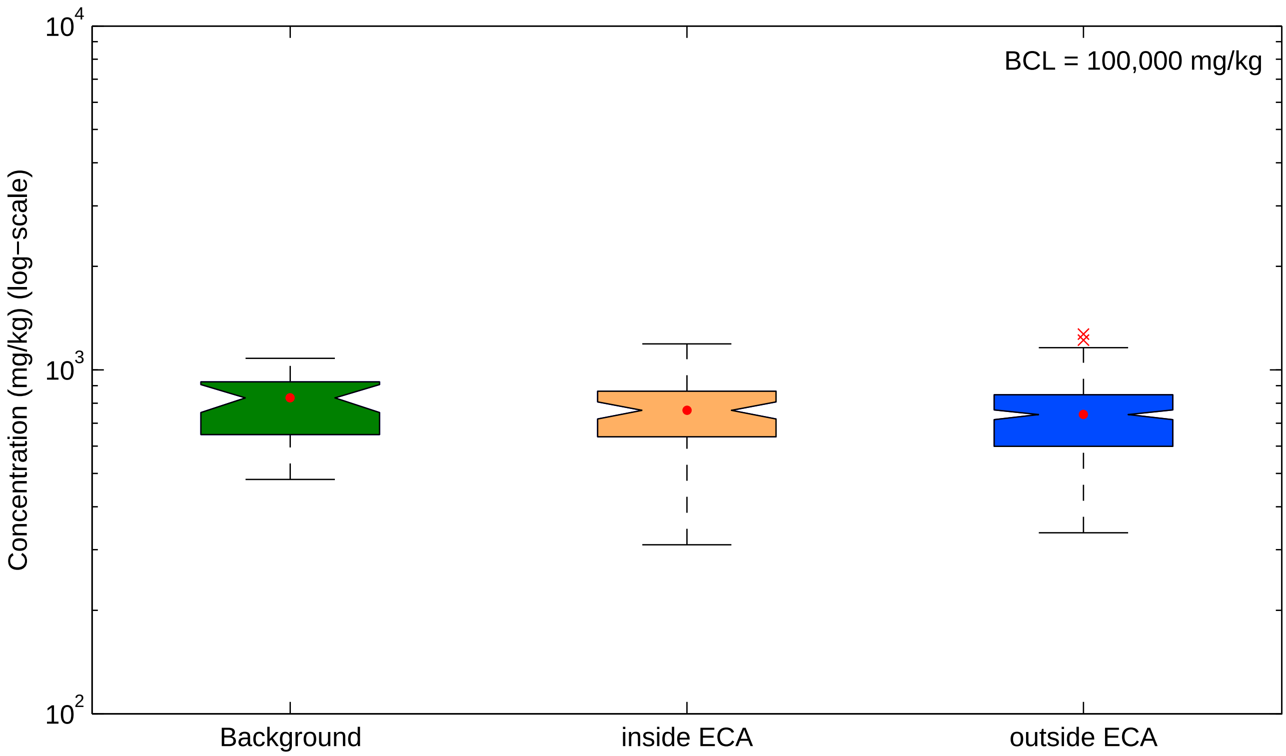


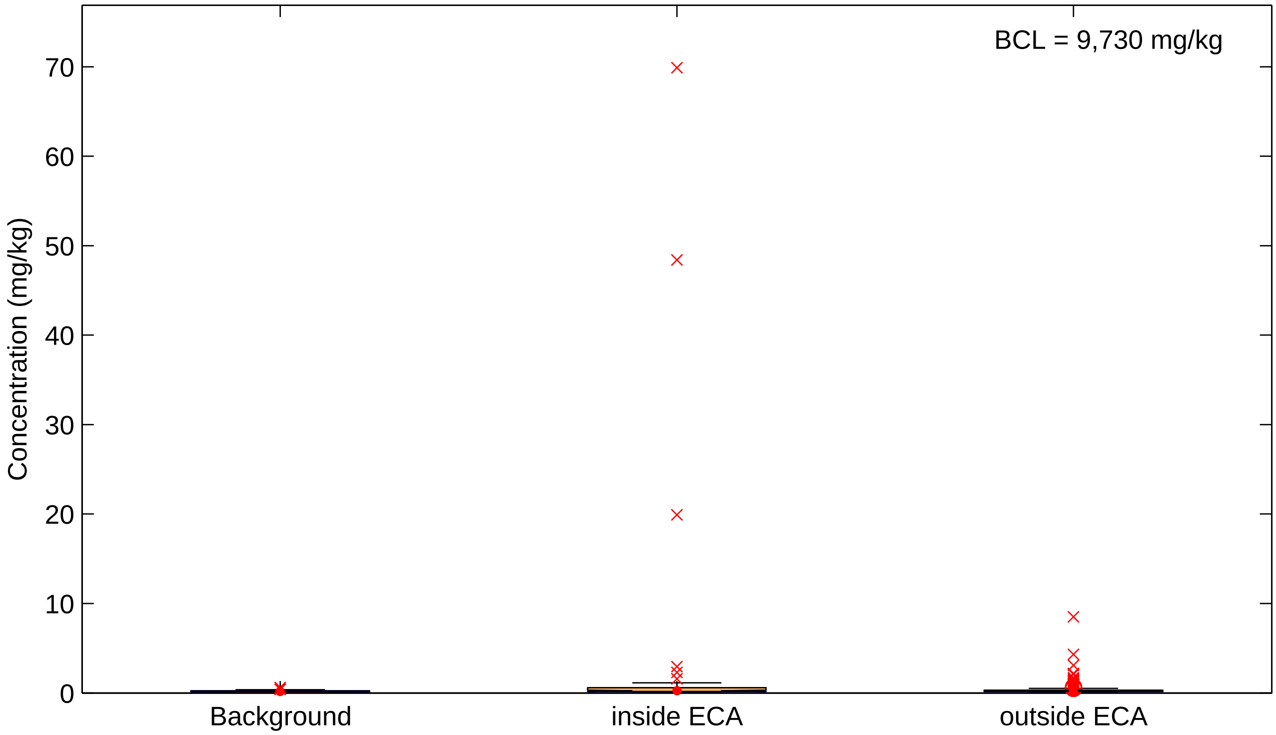
Figure C1−28. Background vs. Site Boxplots
Titanium





Ramboll Environ

Figure C1−29. Background vs. Site Boxplots
Tungsten



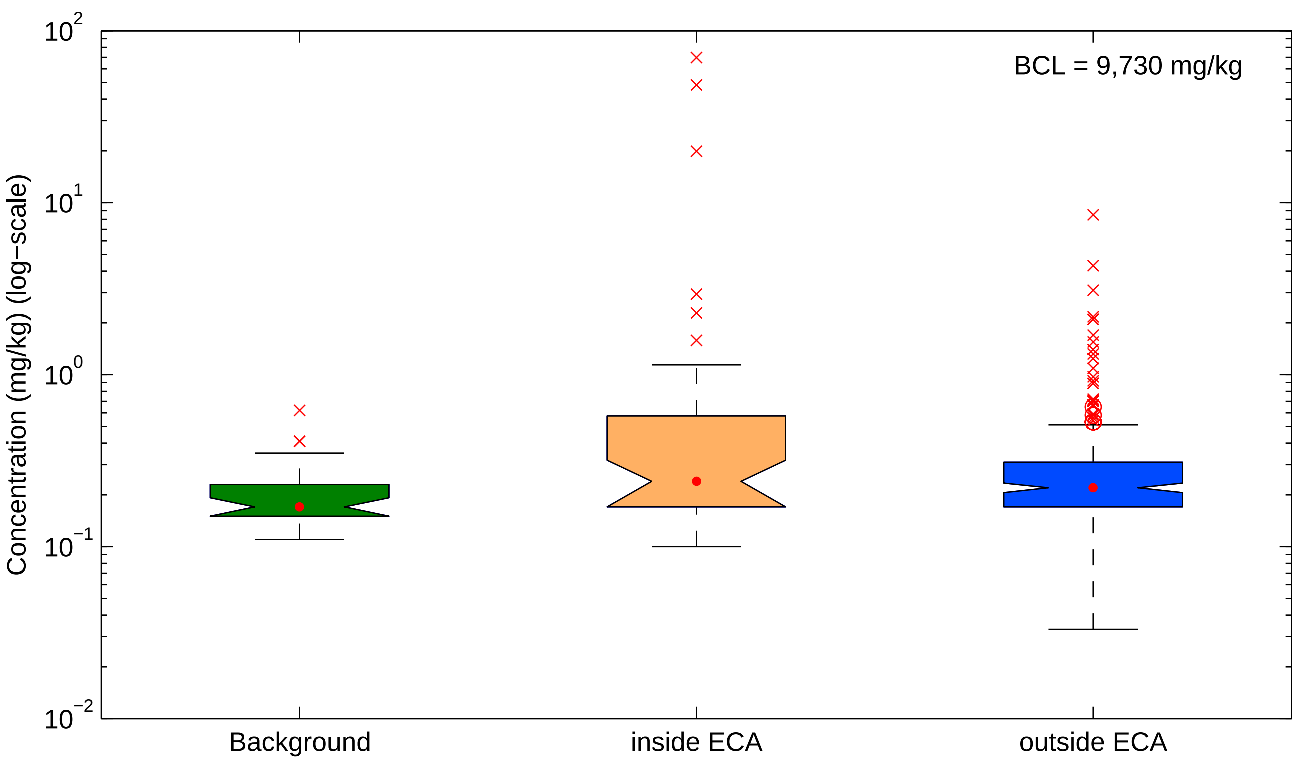
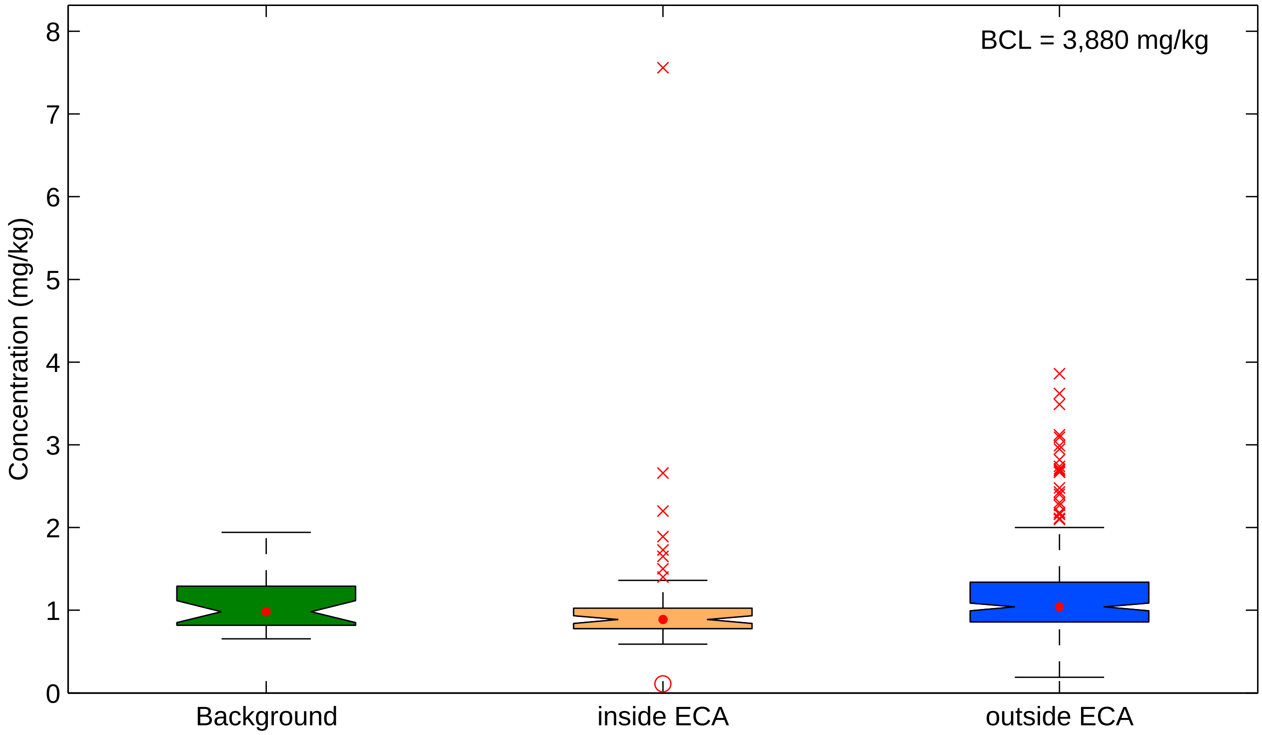
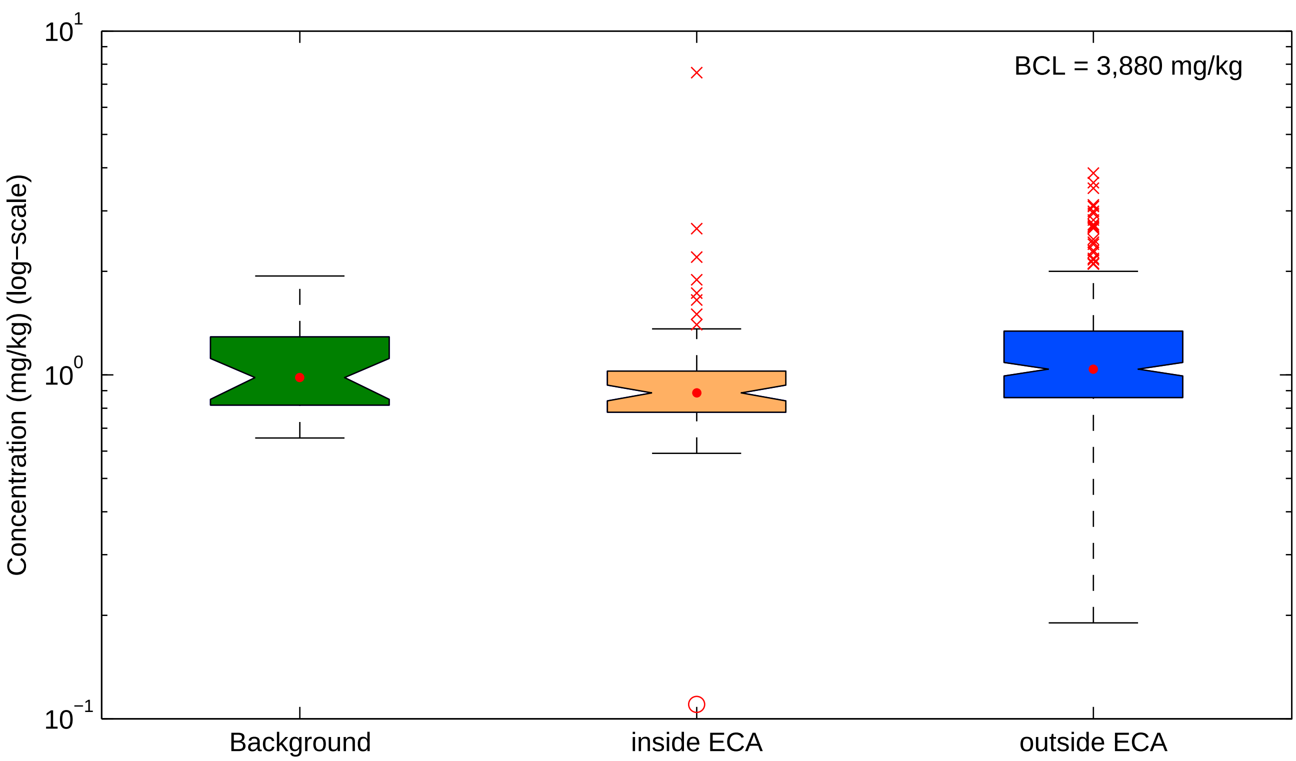


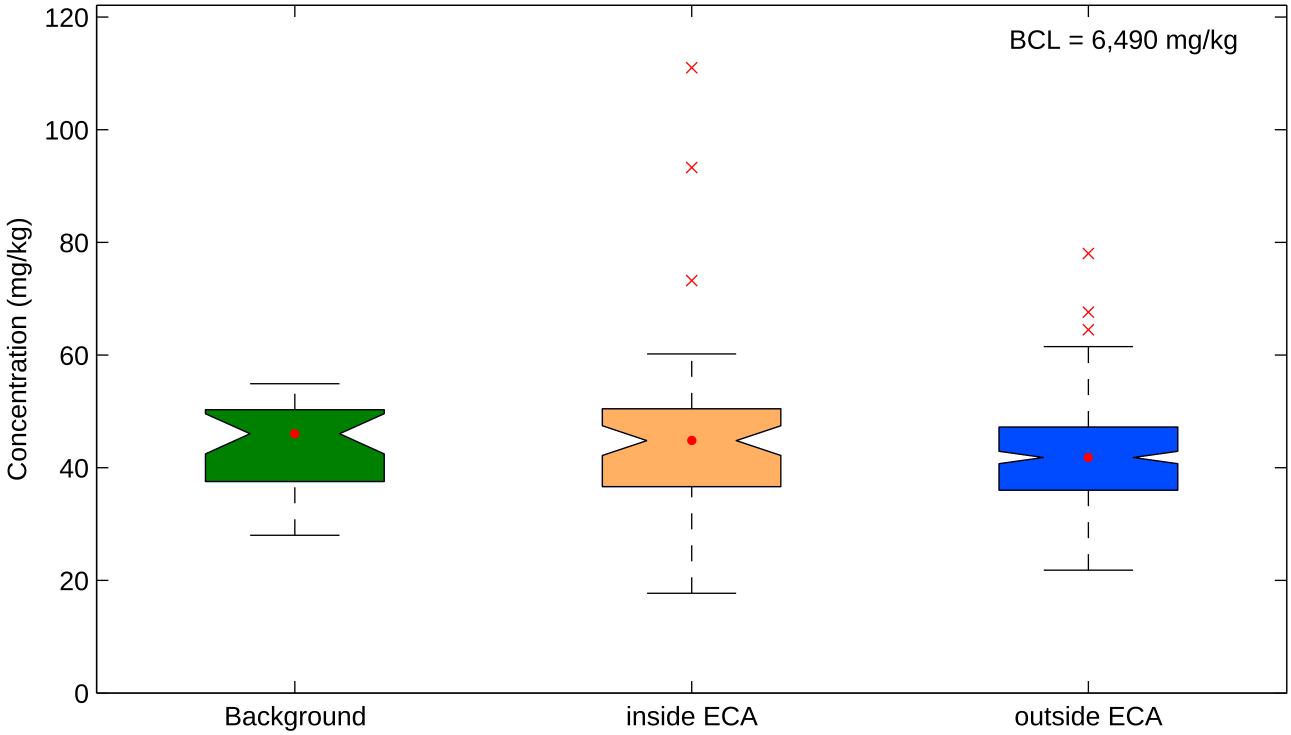
Figure C1−30. Background vs. Site Boxplots
Uranium





Ramboll Environ

Figure C1−31. Background vs. Site Boxplots
Vanadium



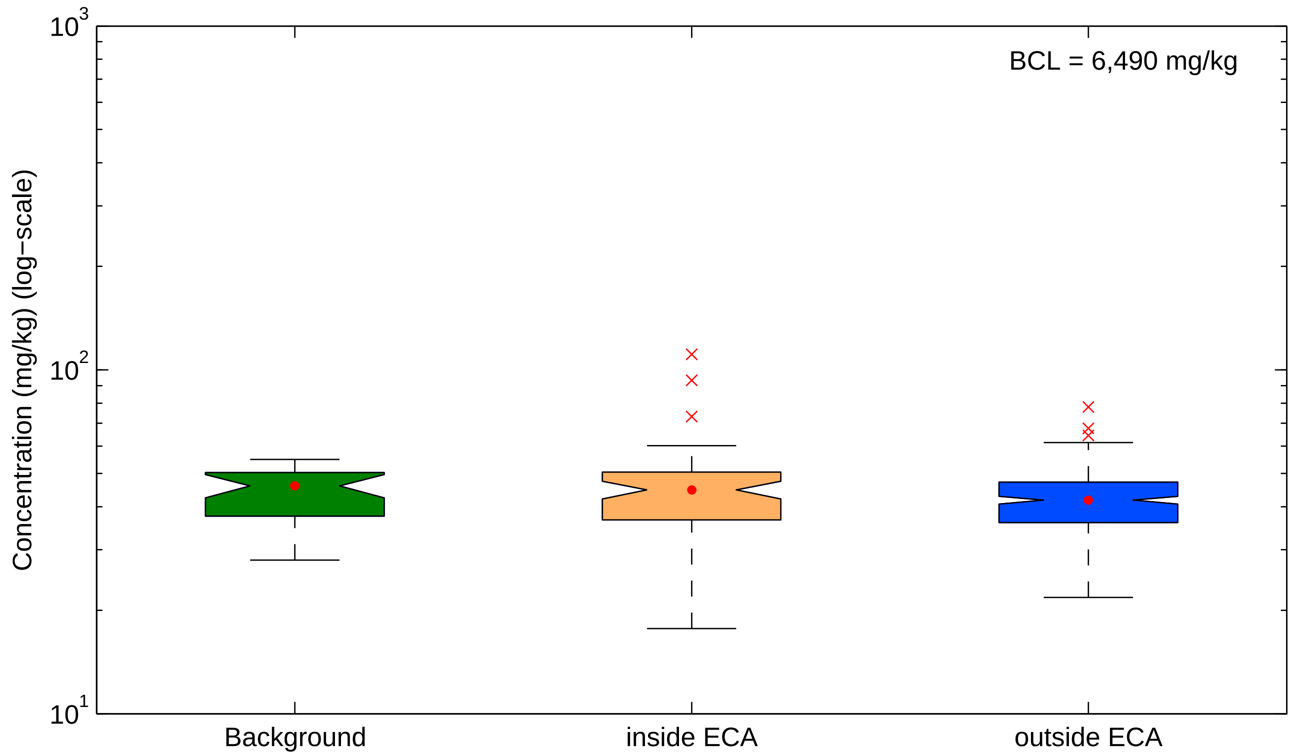
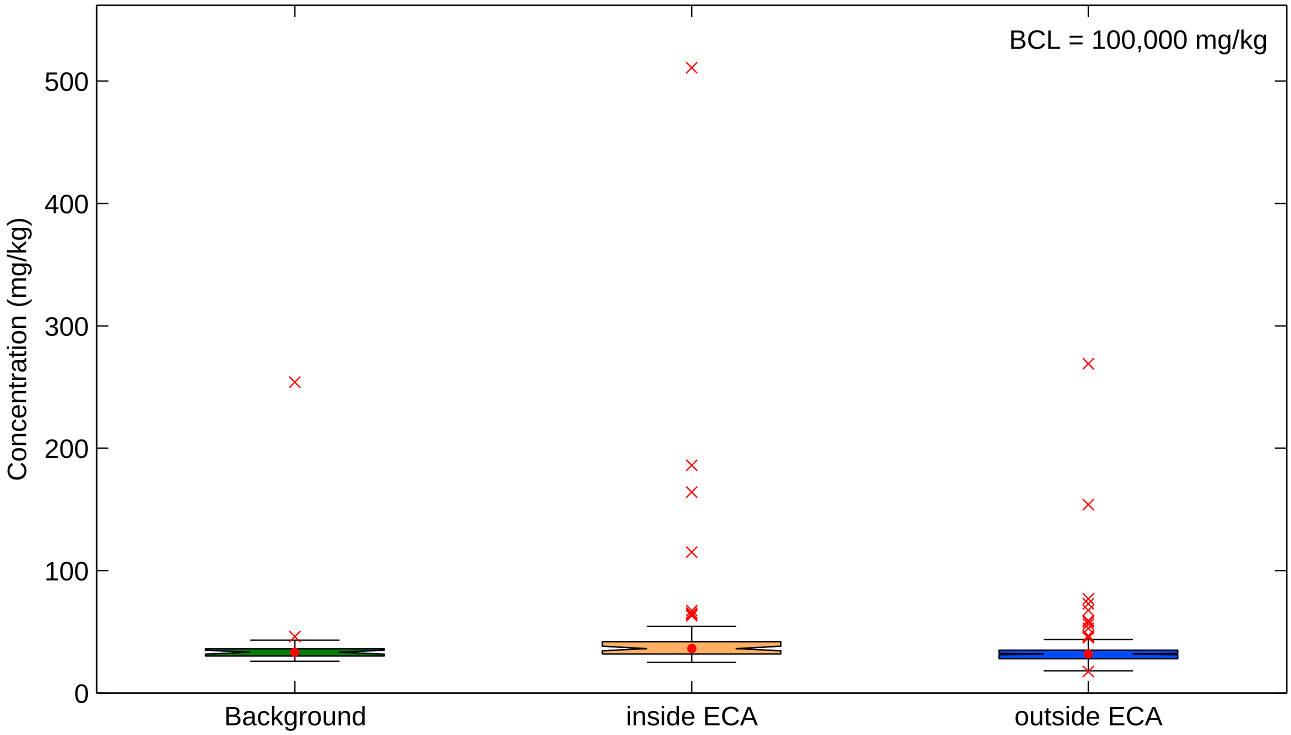


Figure C1−32. Background vs. Site Boxplots
Zinc



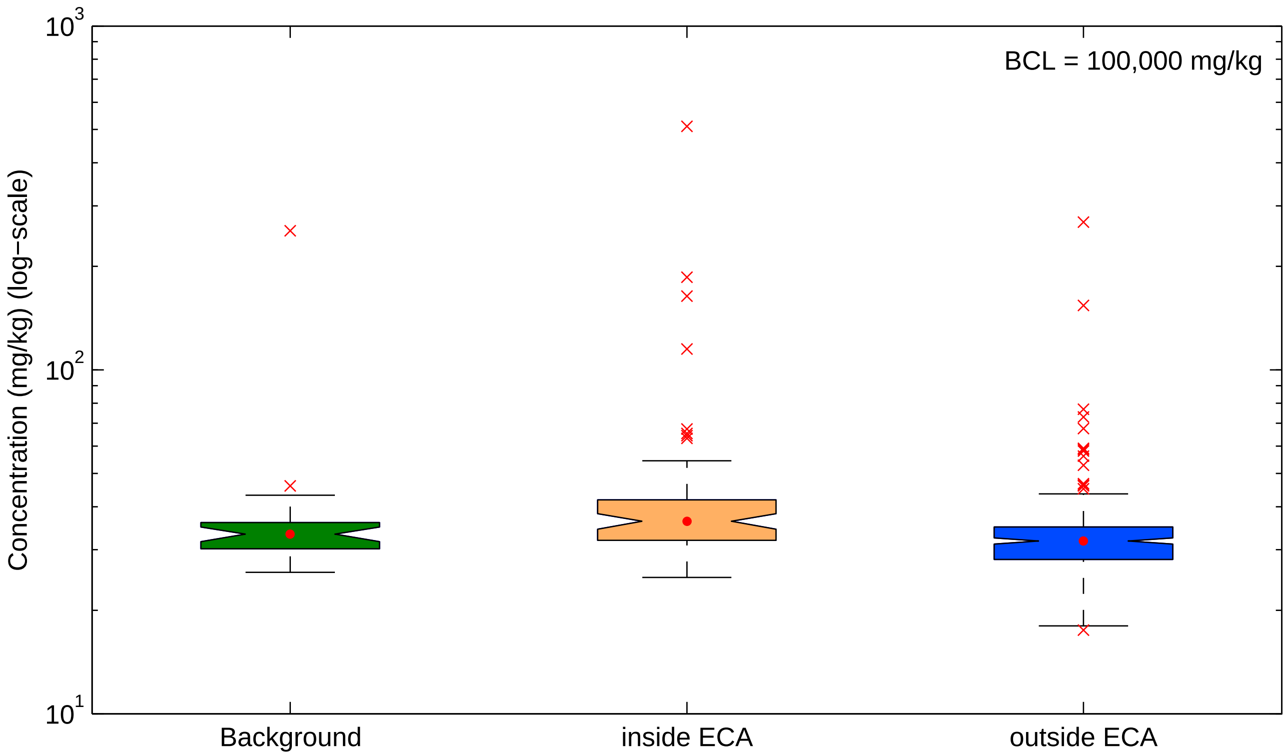
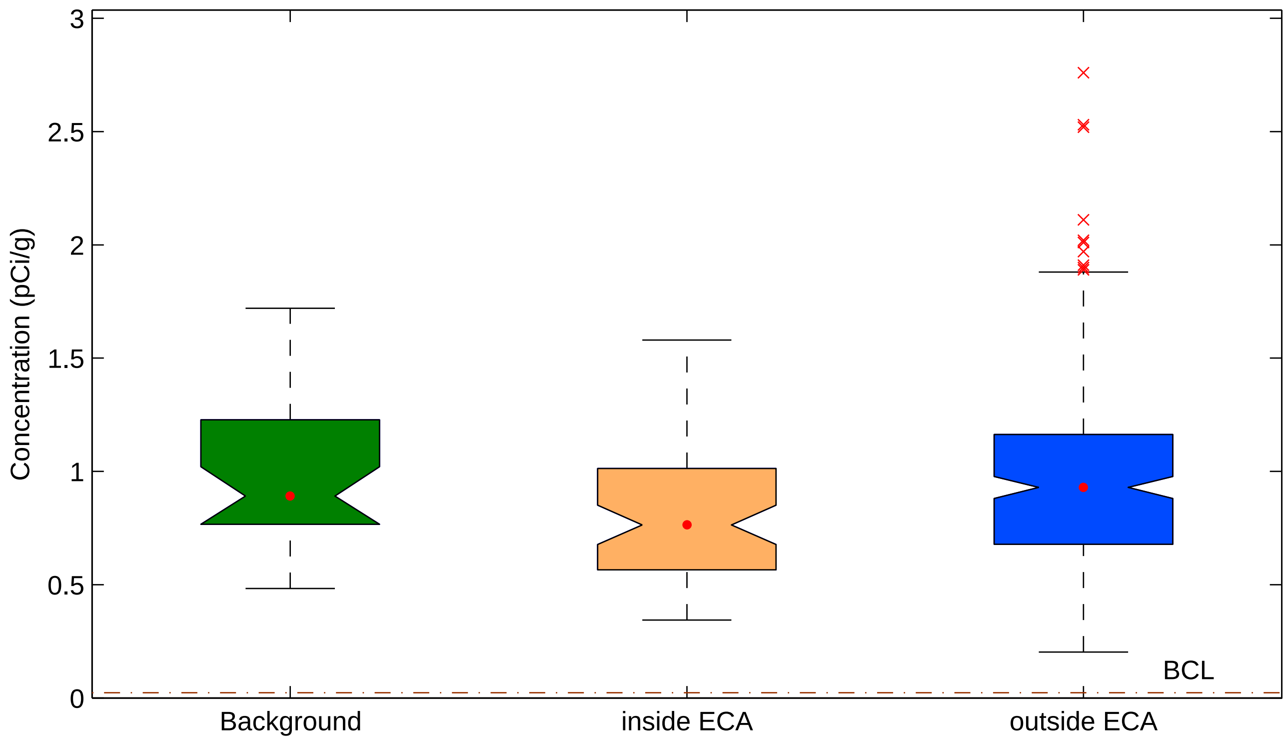
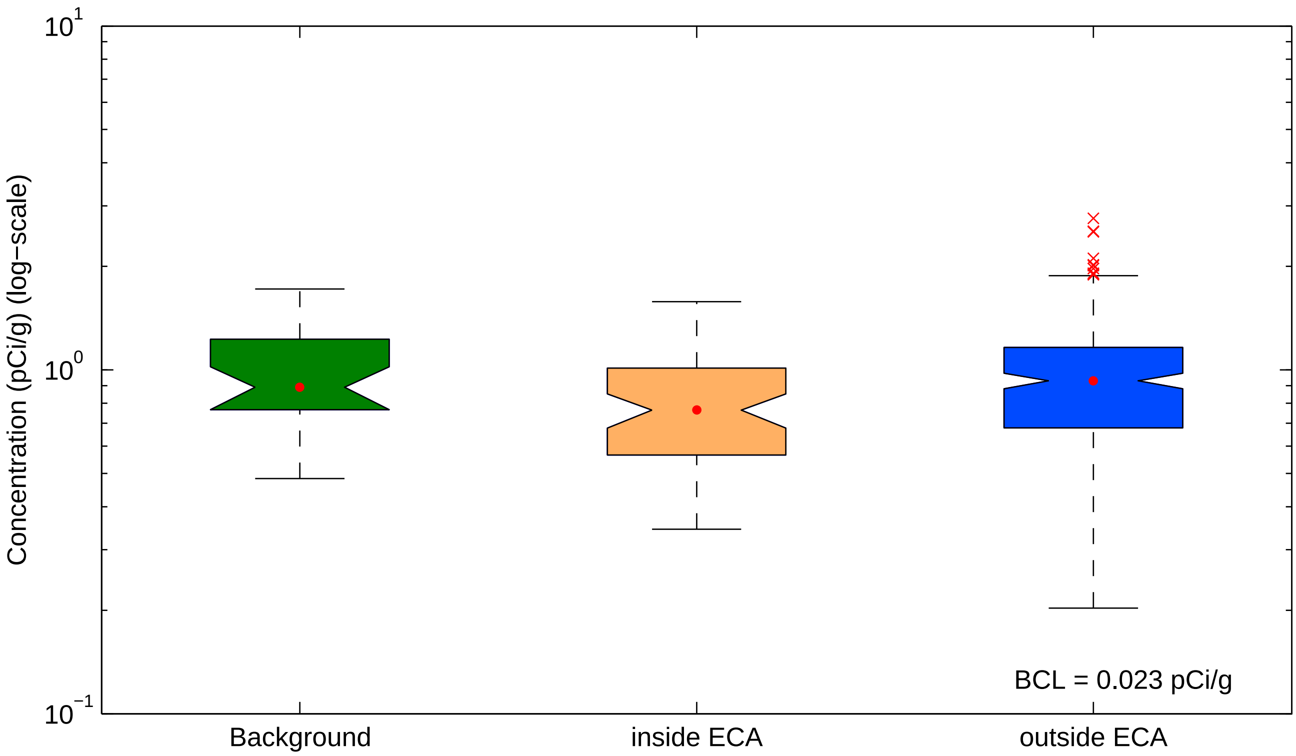


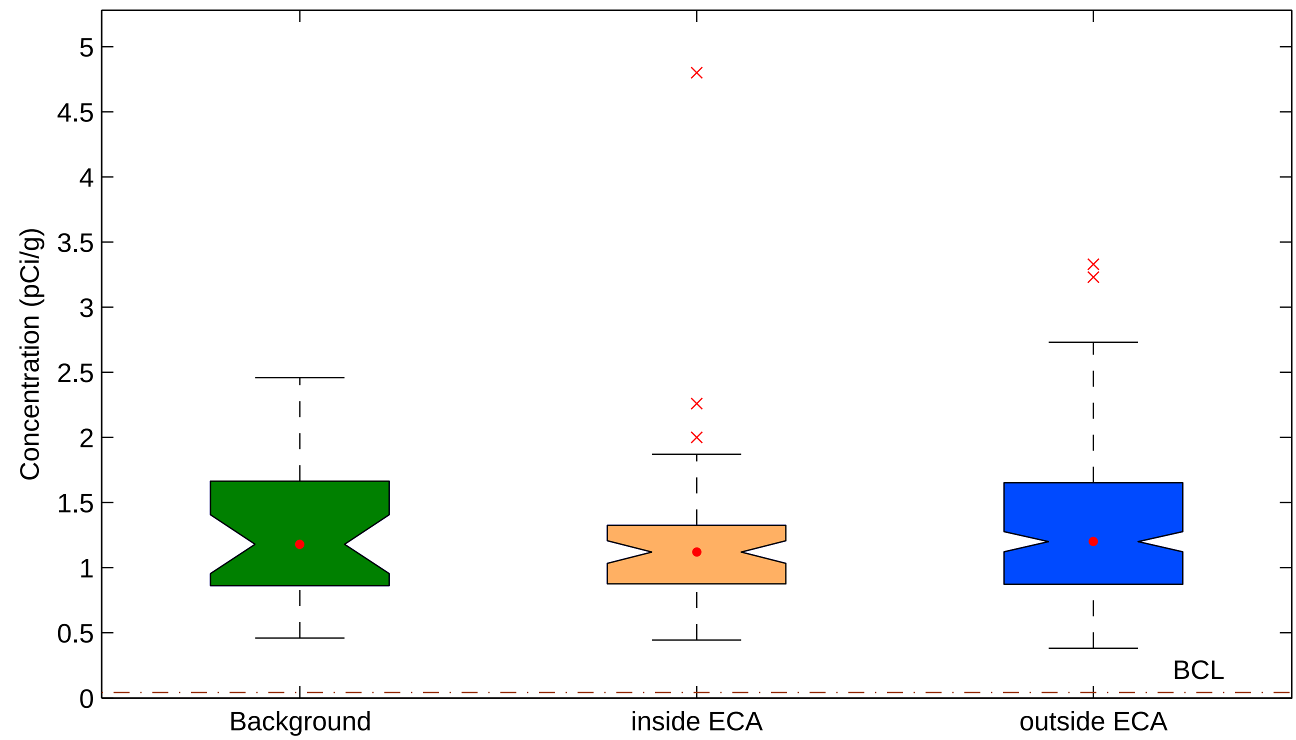
Figure C1−33. Background vs. Site Boxplots
Ra−226

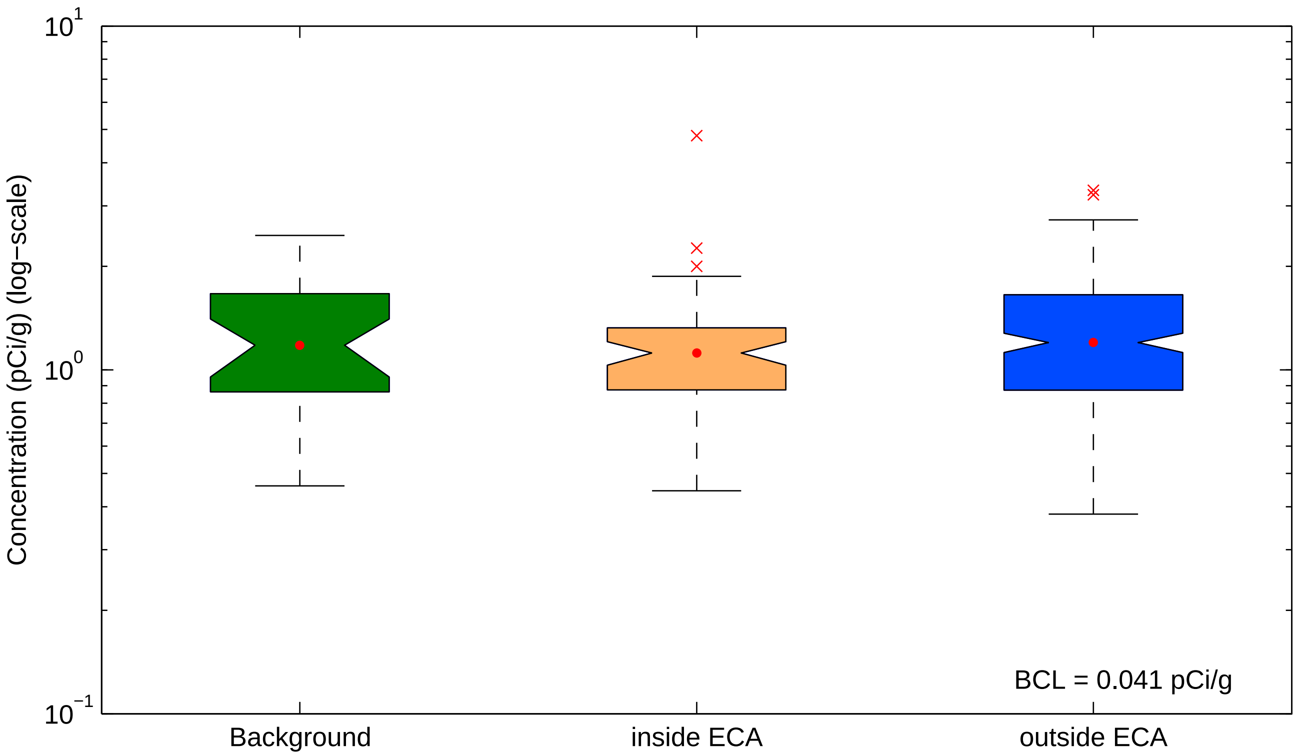




Ramboll Environ

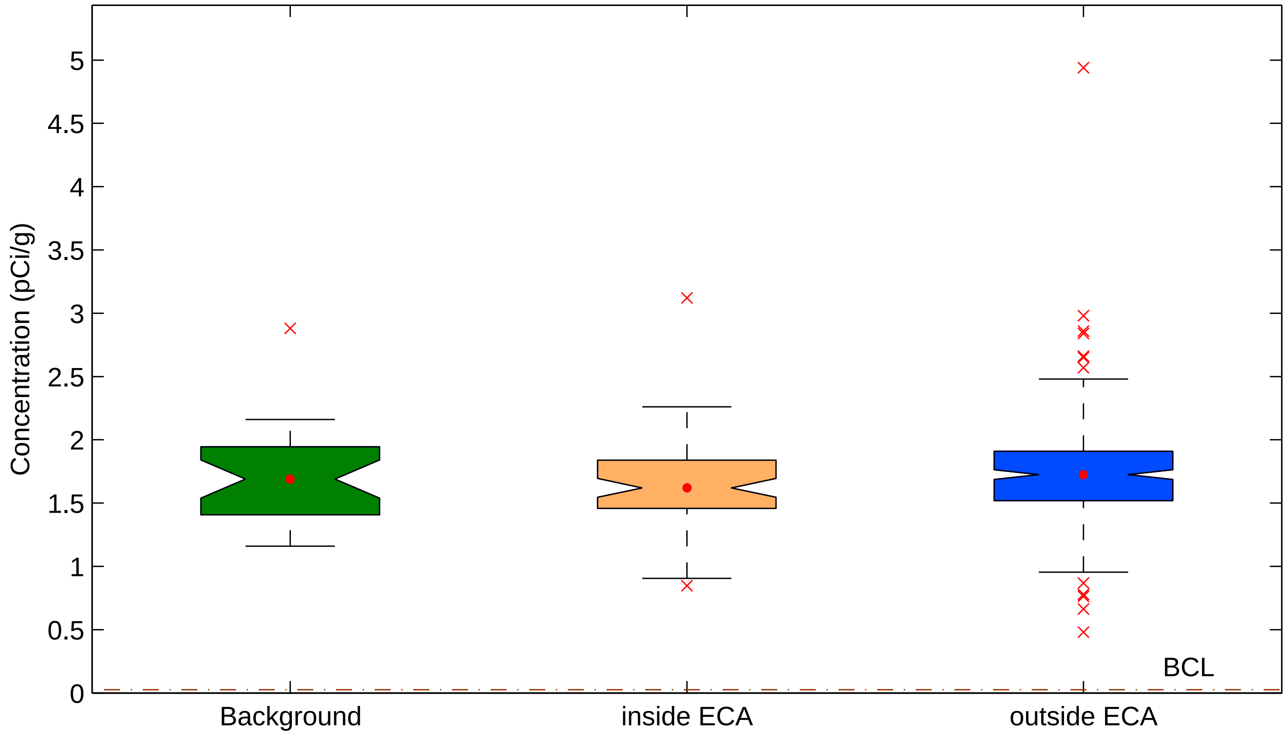
Figure C1−34. Background vs. Site Boxplots
Ra−228





Ramboll Environ

Figure C1−35. Background vs. Site Boxplots
Th−228



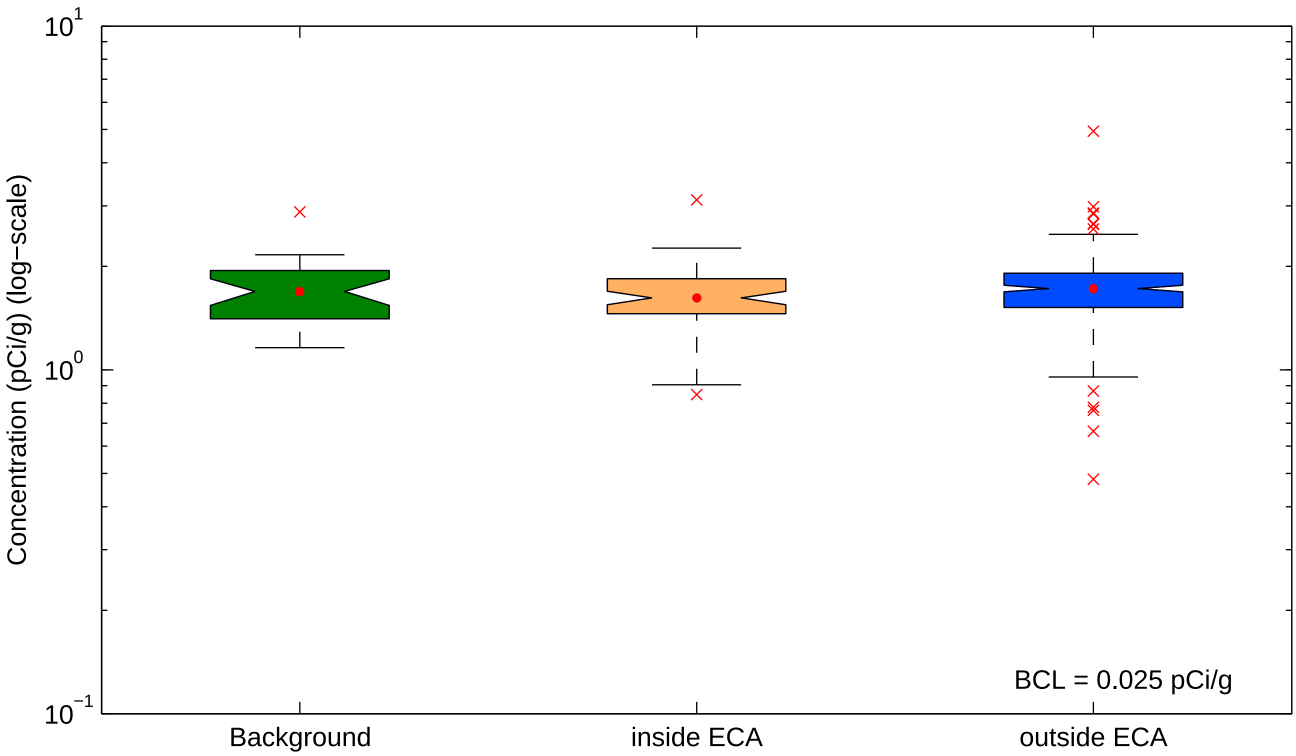
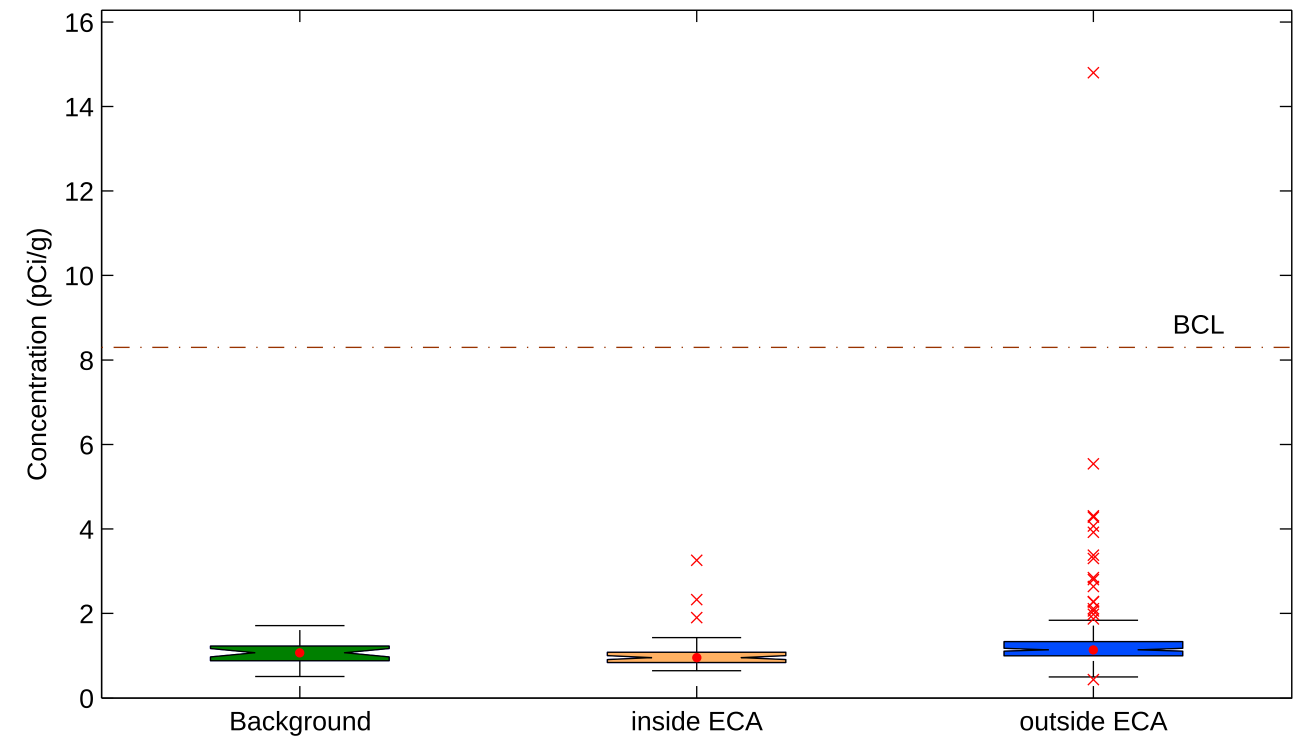


Figure C1−36. Background vs. Site Boxplots
Th−230



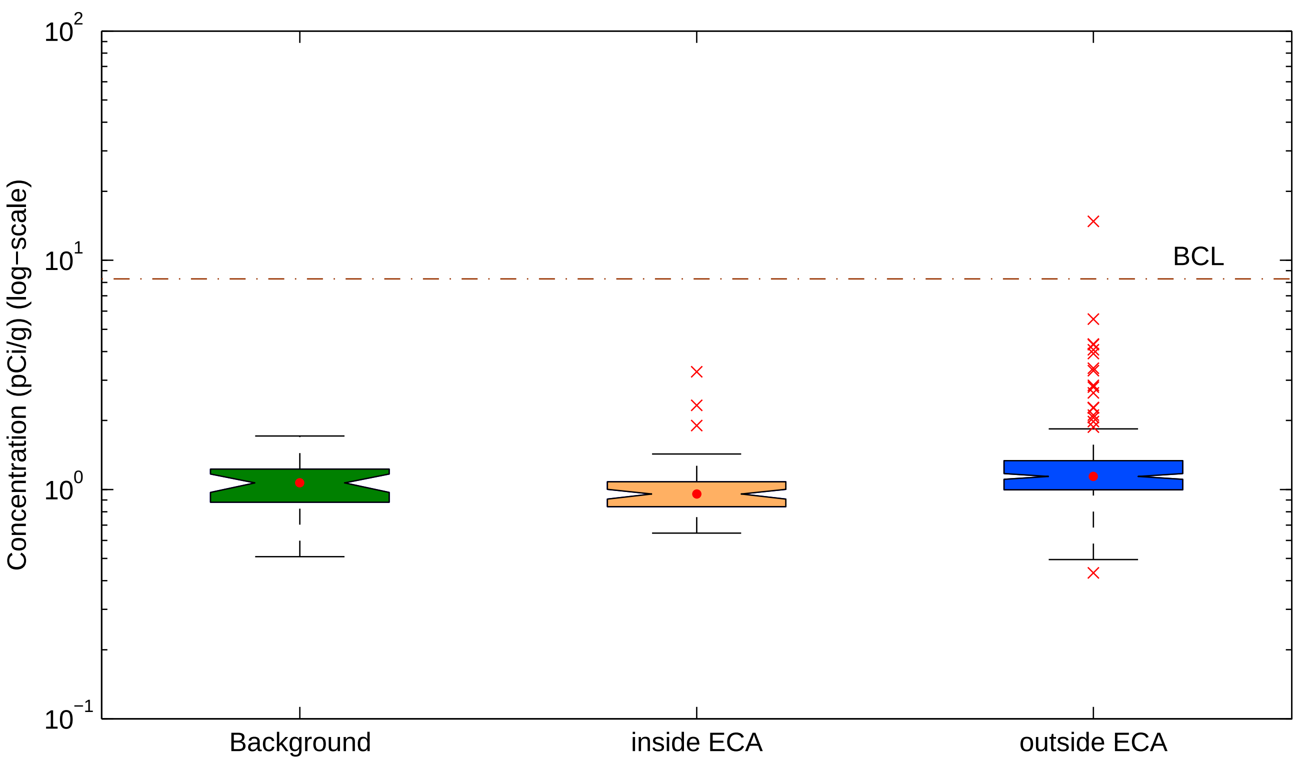
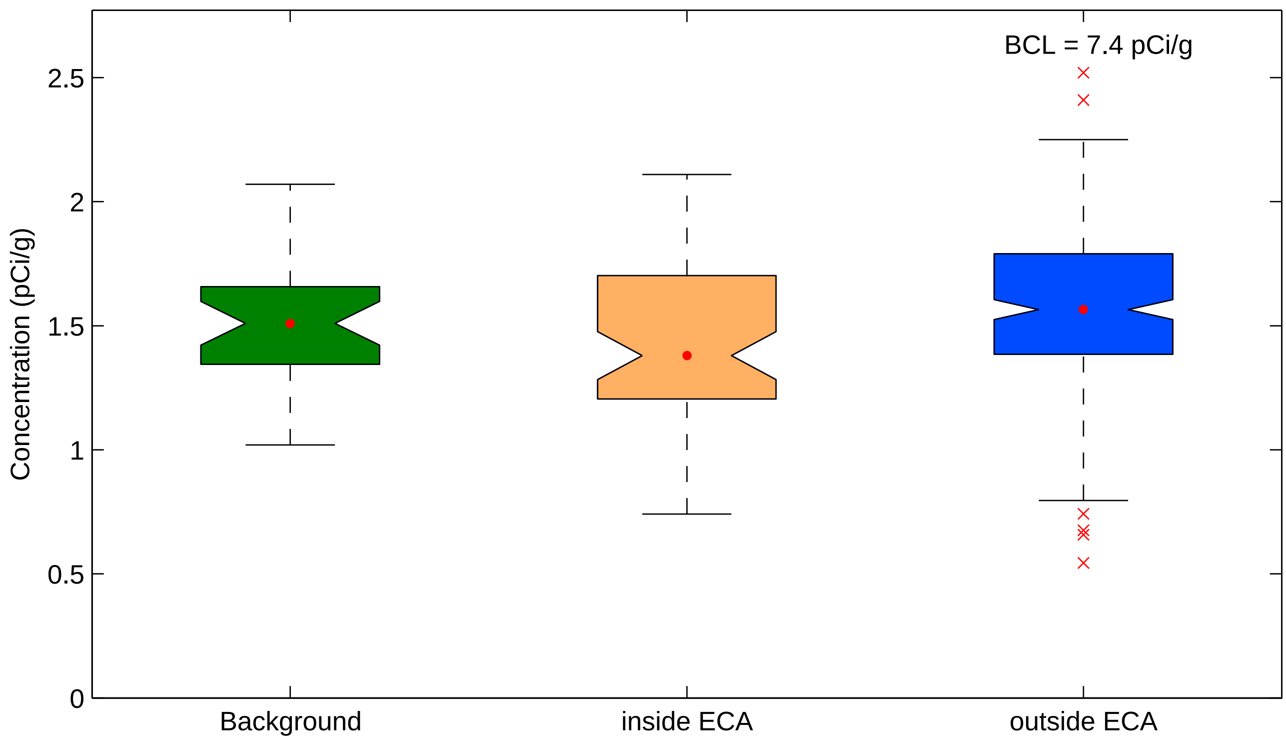
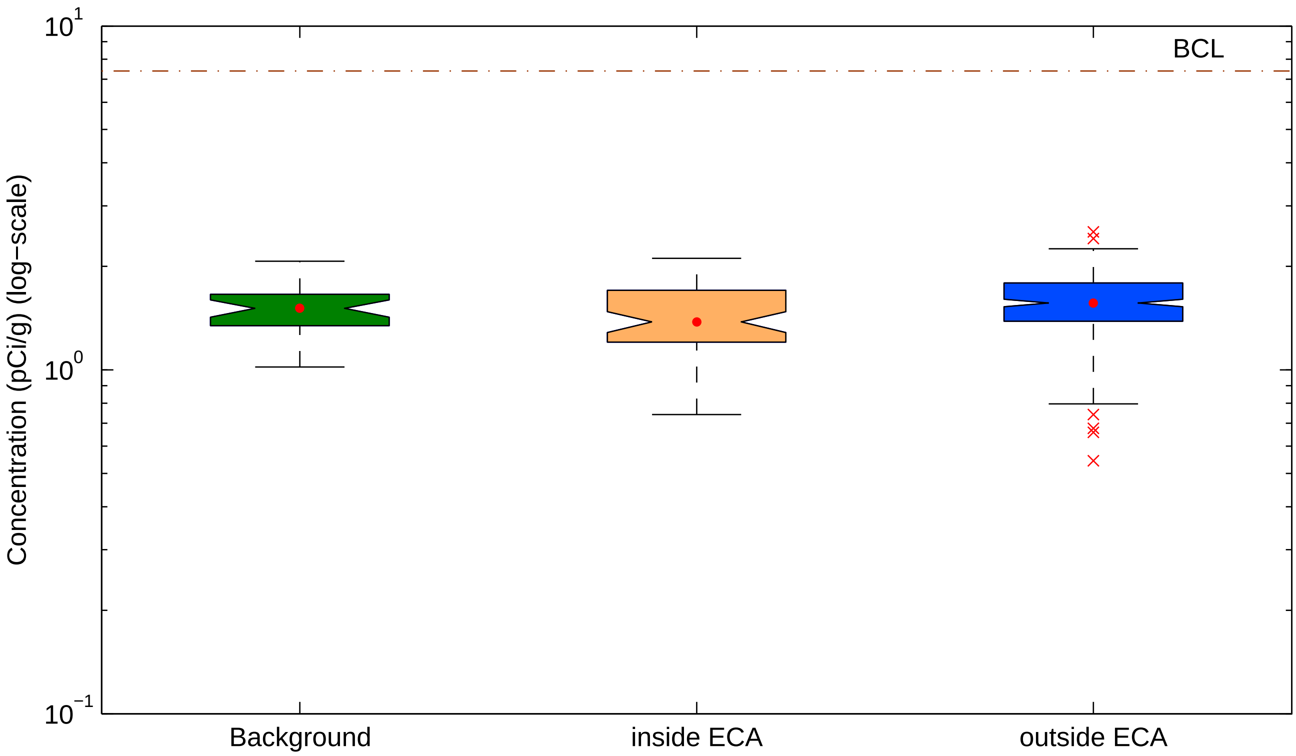


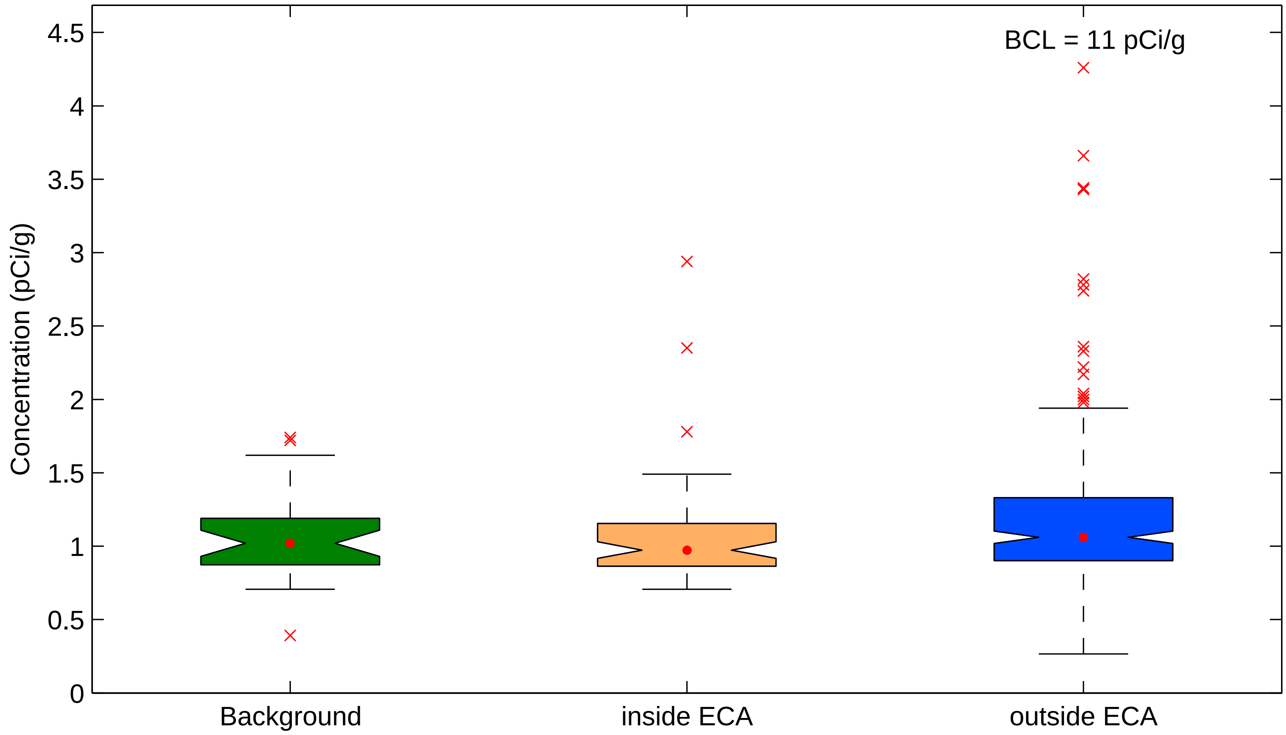
Figure C1−37. Background vs. Site Boxplots
Th−232





Ramboll Environ

Figure C1−38. Background vs. Site Boxplots
U−234



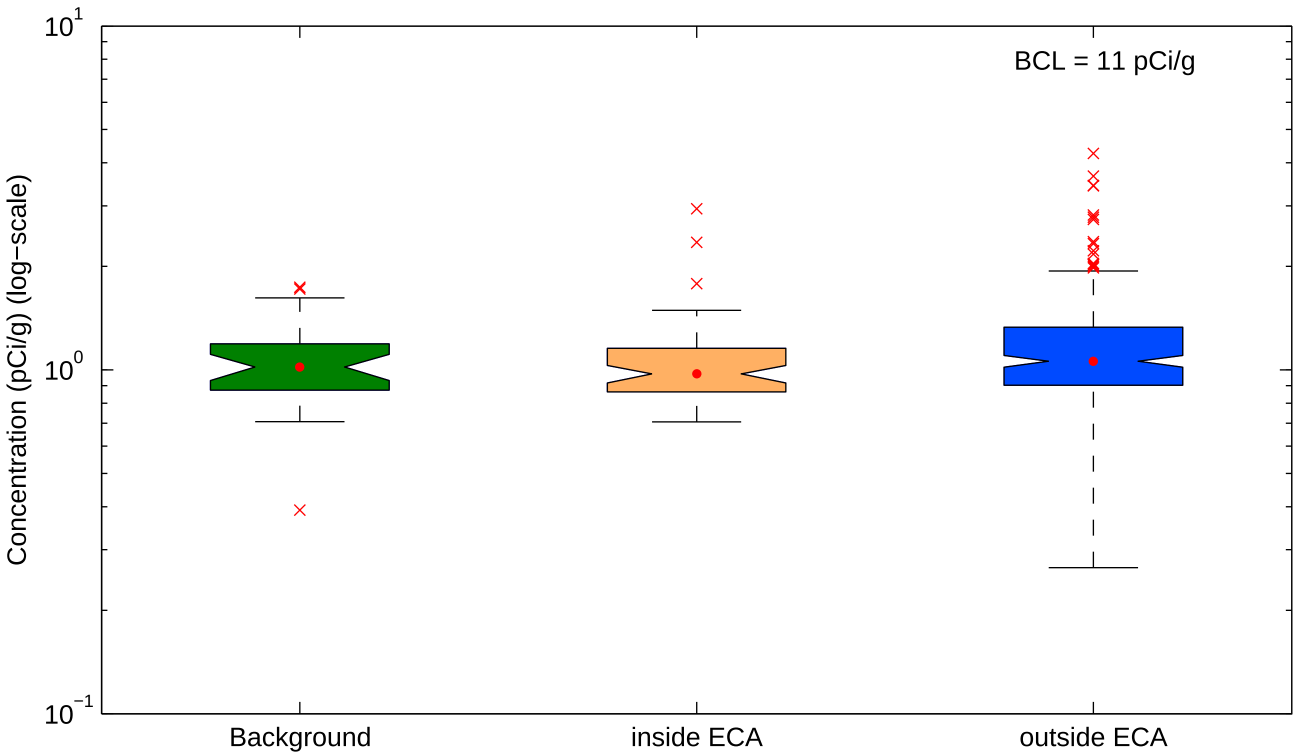
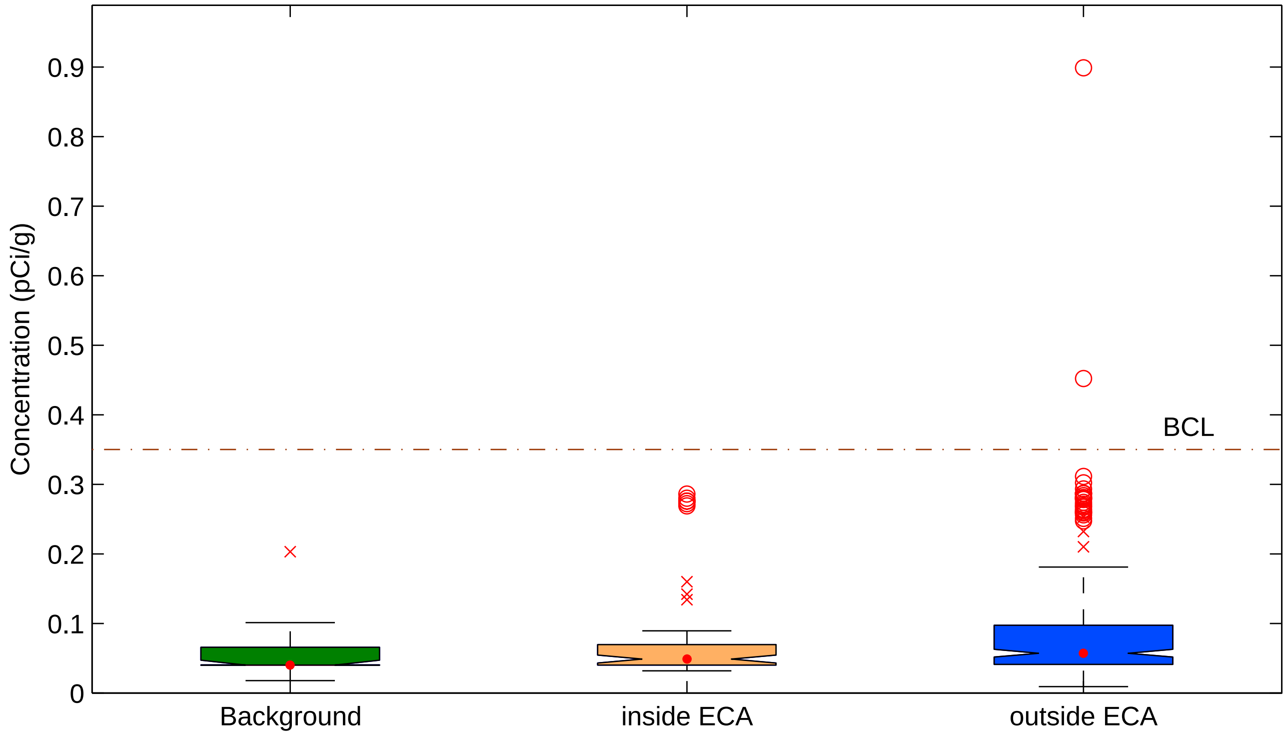
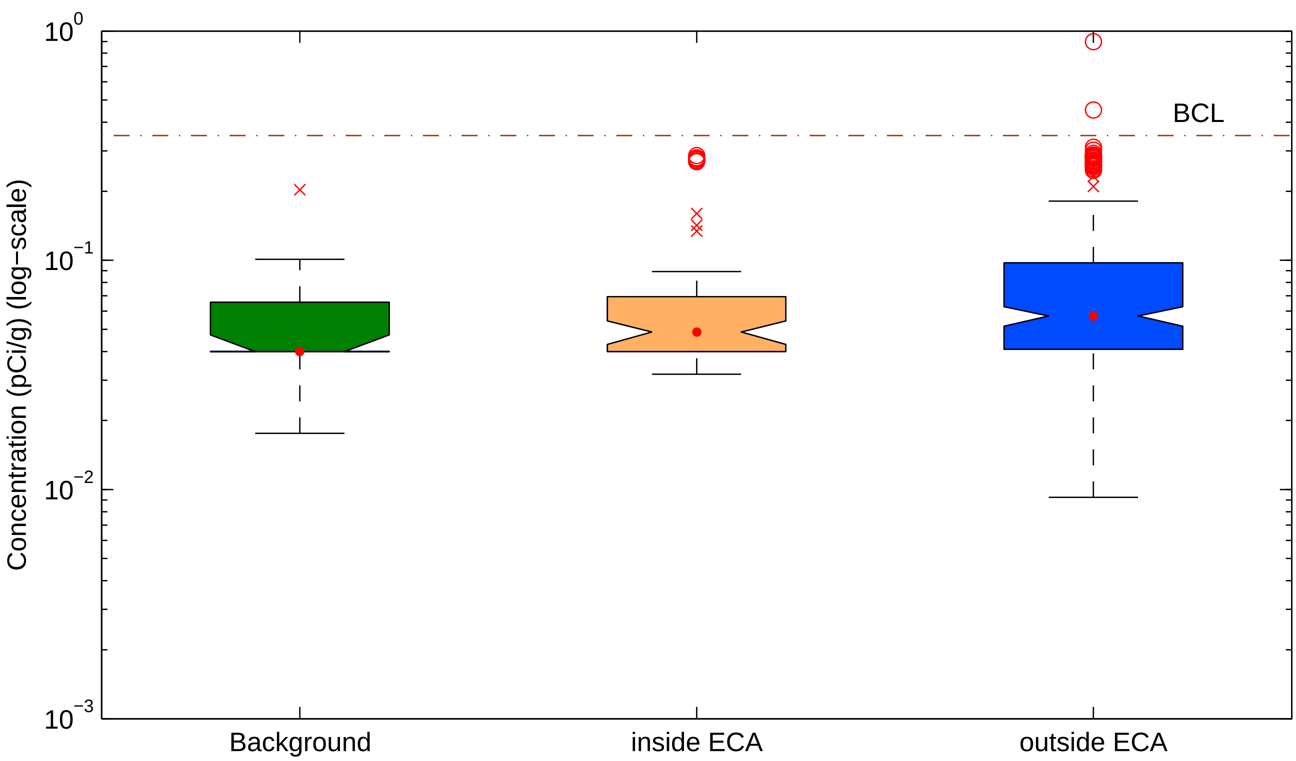


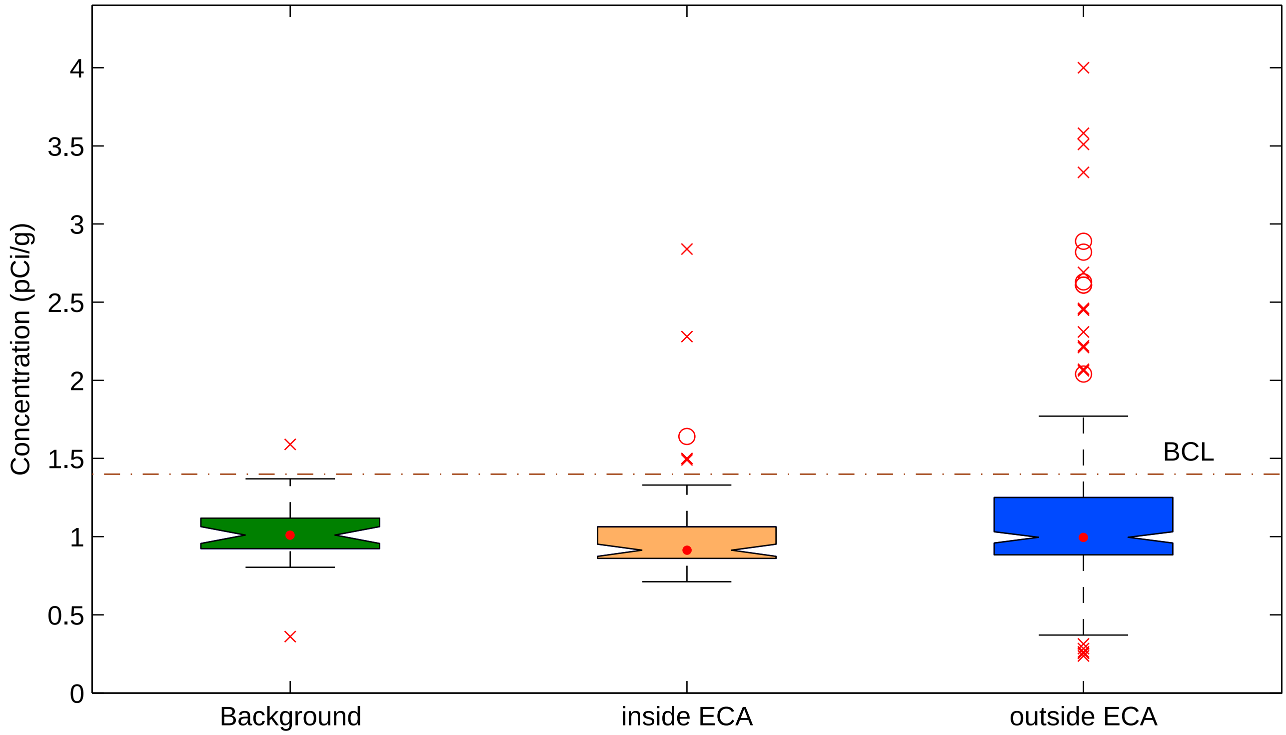
Figure C1−39. Background vs. Site Boxplots
U−235

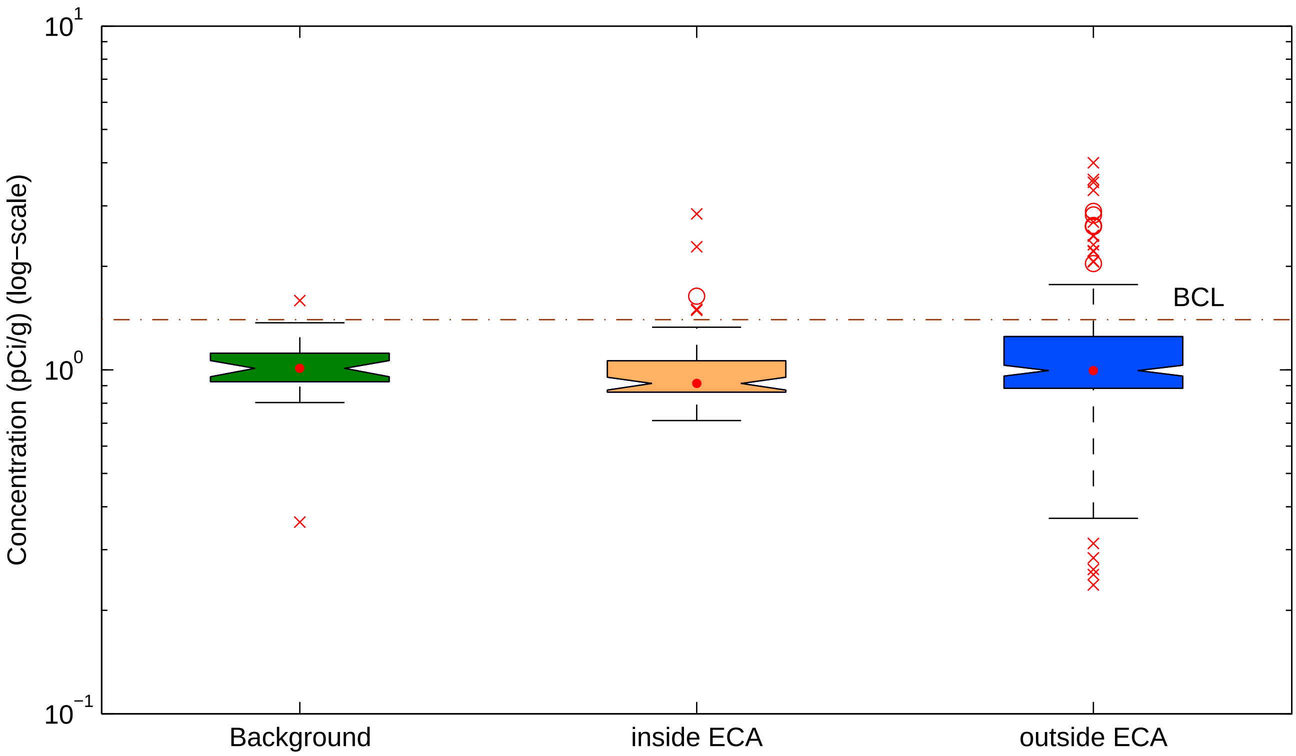




Ramboll Environ

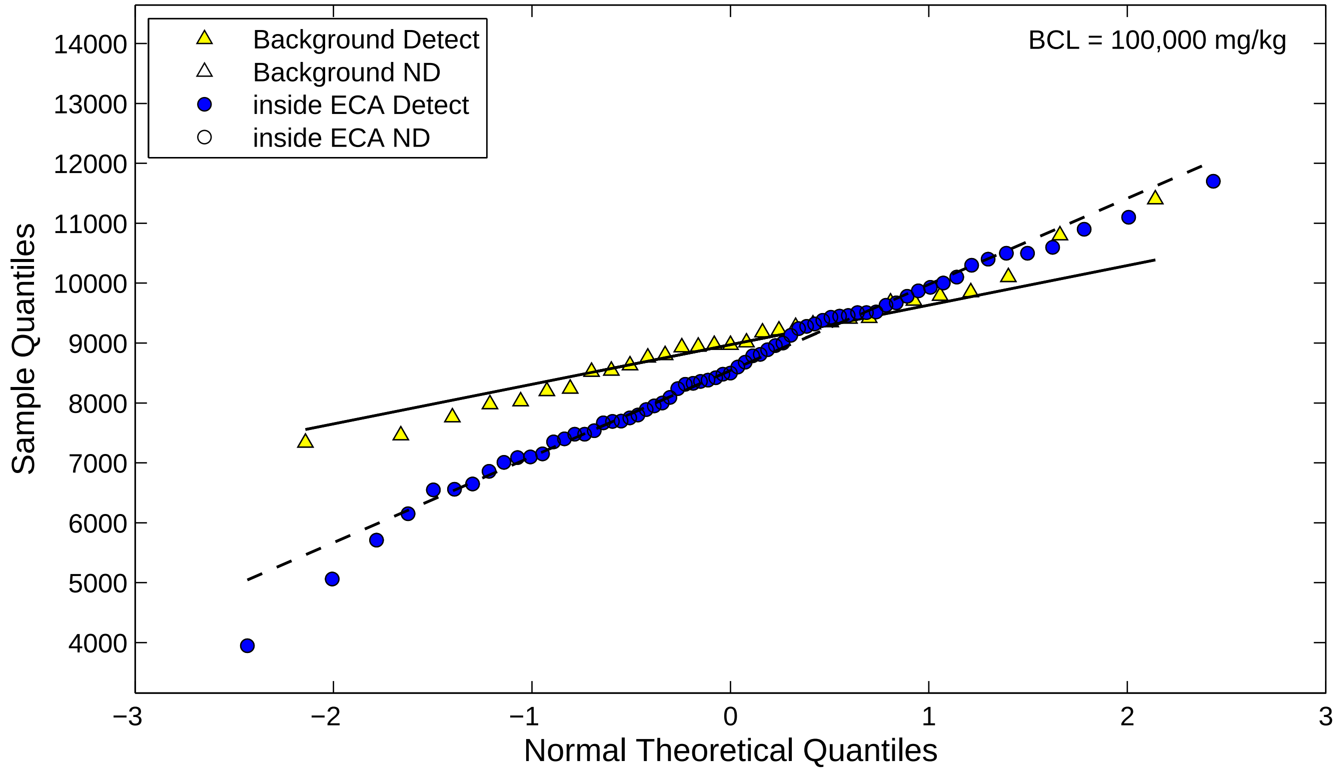
Figure C1−40. Background vs. Site Boxplots
U−238





Ramboll Environ

Figure C2−1A. Normal Q−Q Plots
Aluminum



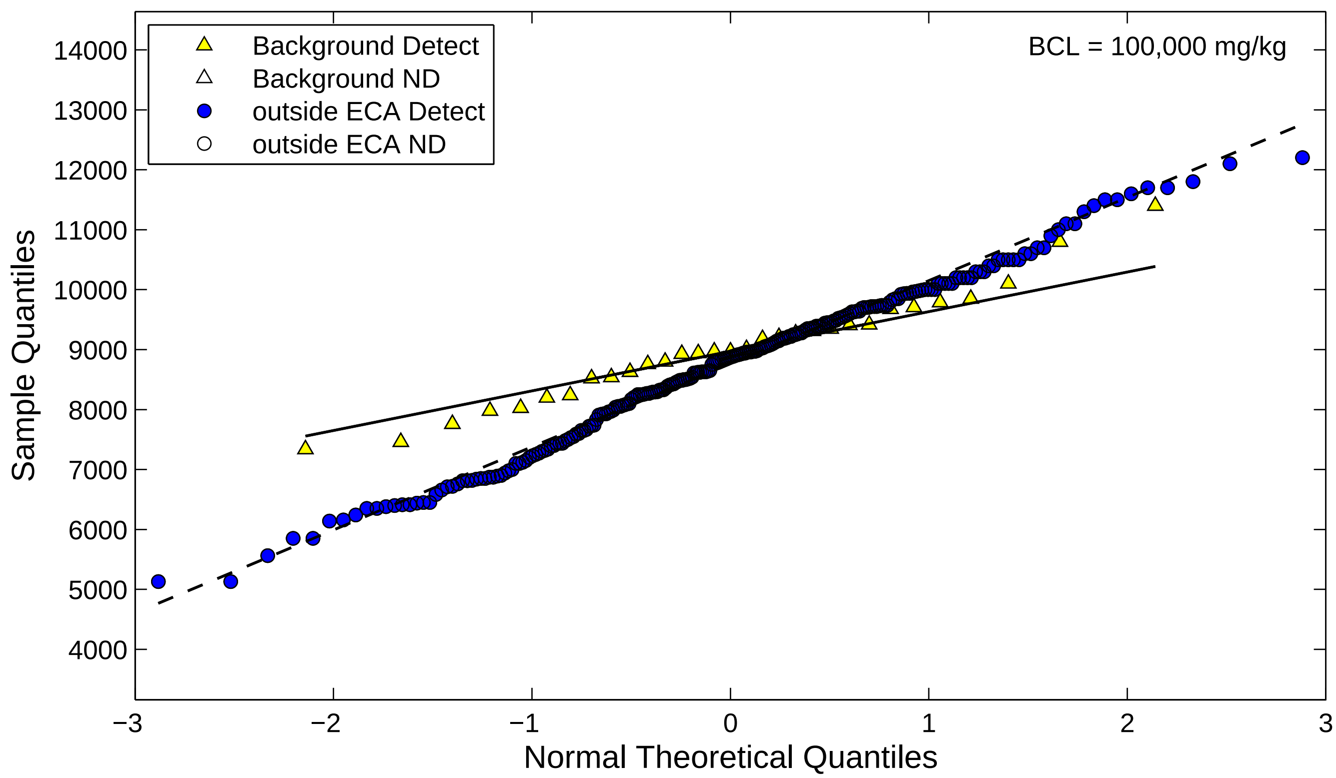
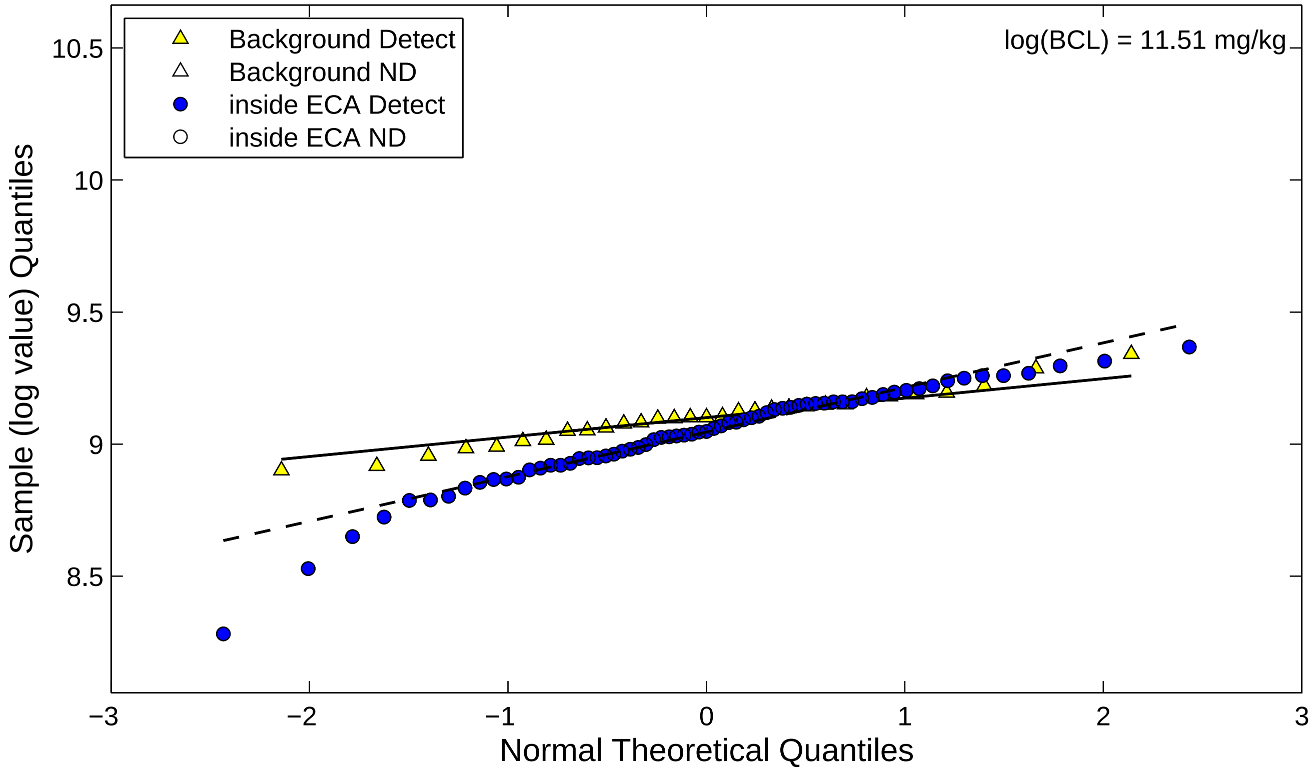


Figure C2−1B. Lognormal Q−Q Plots
Aluminum



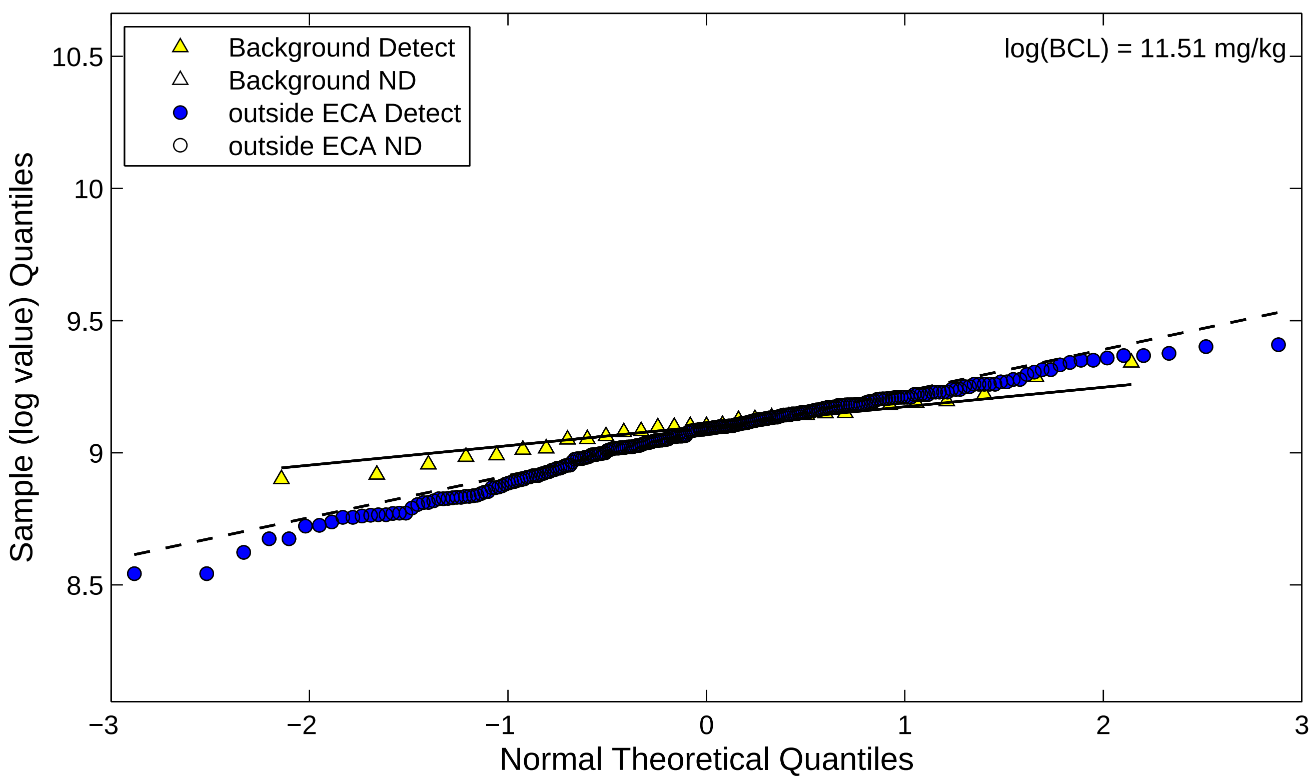
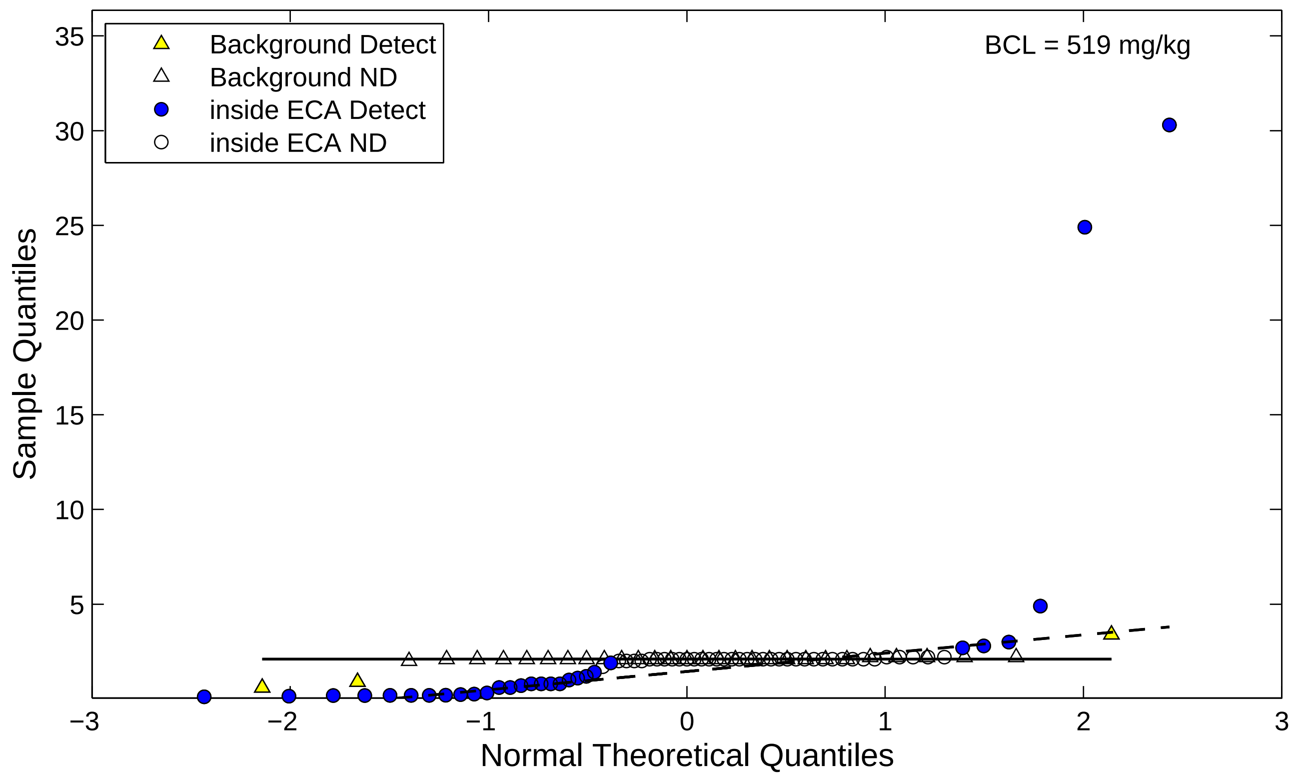


Figure C2−2A. Normal Q−Q Plots
Antimony



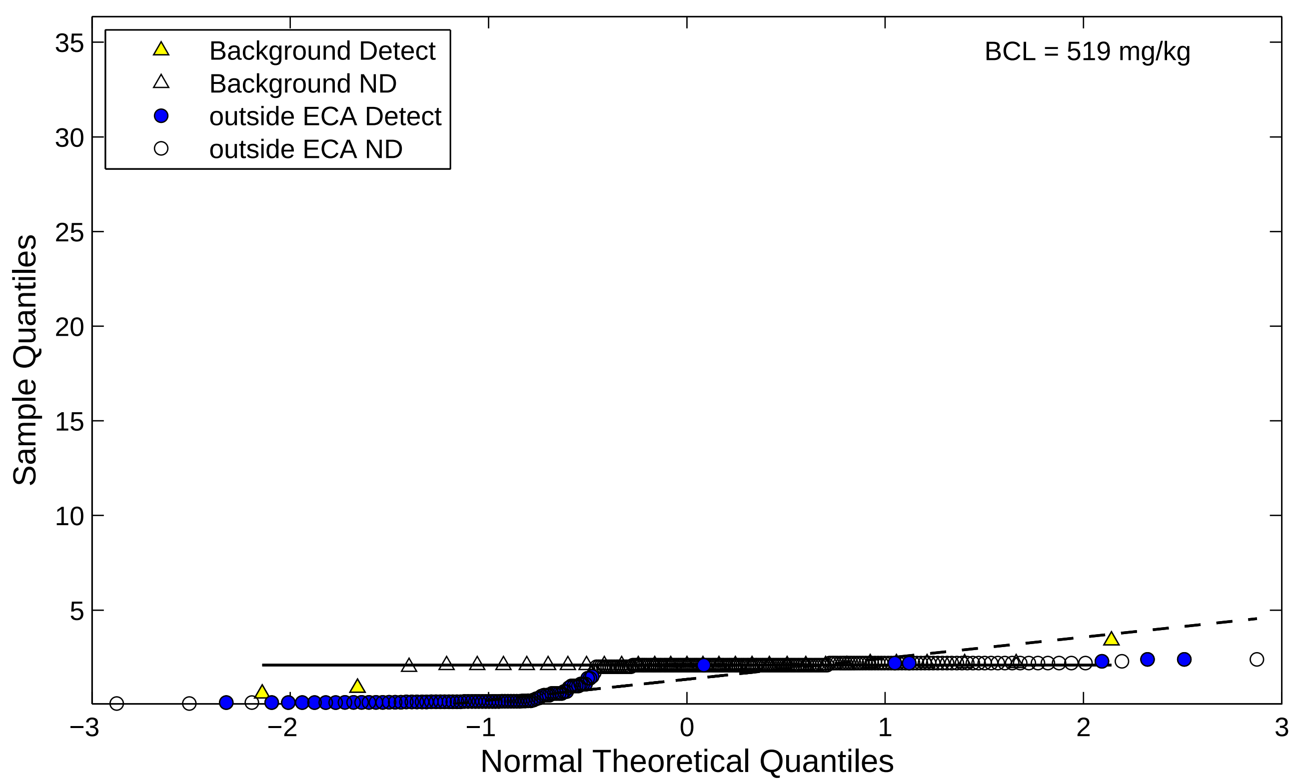
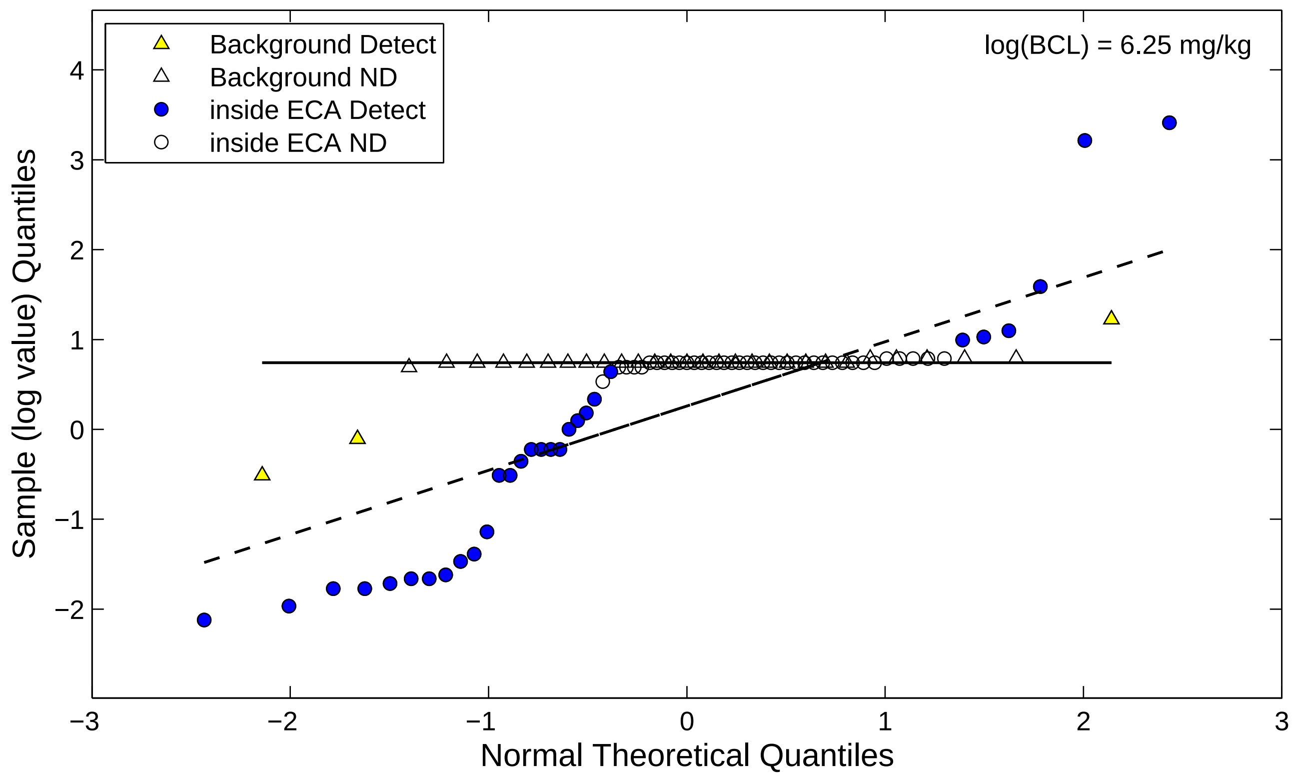
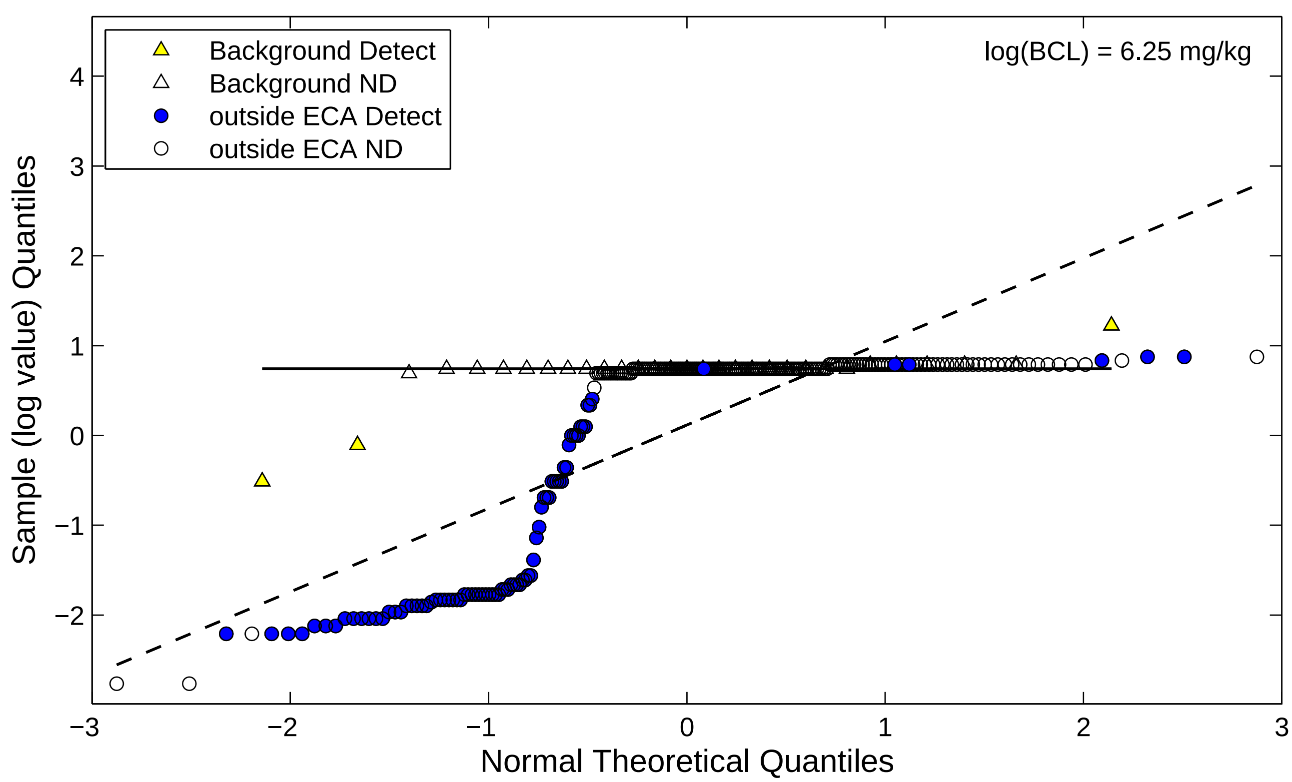


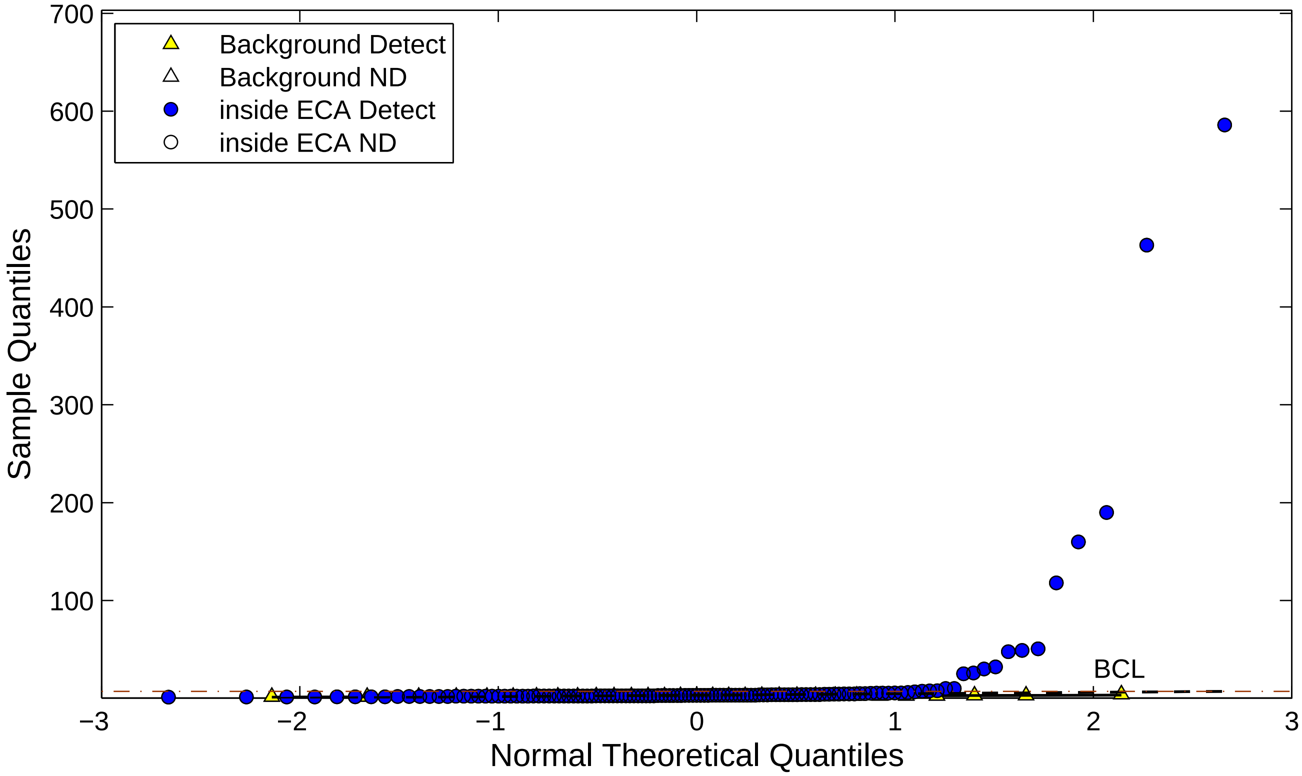
Figure C2−2B. Lognormal Q−Q Plots
Antimony





Ramboll Environ

Figure C2−3A. Normal Q−Q Plots
Arsenic



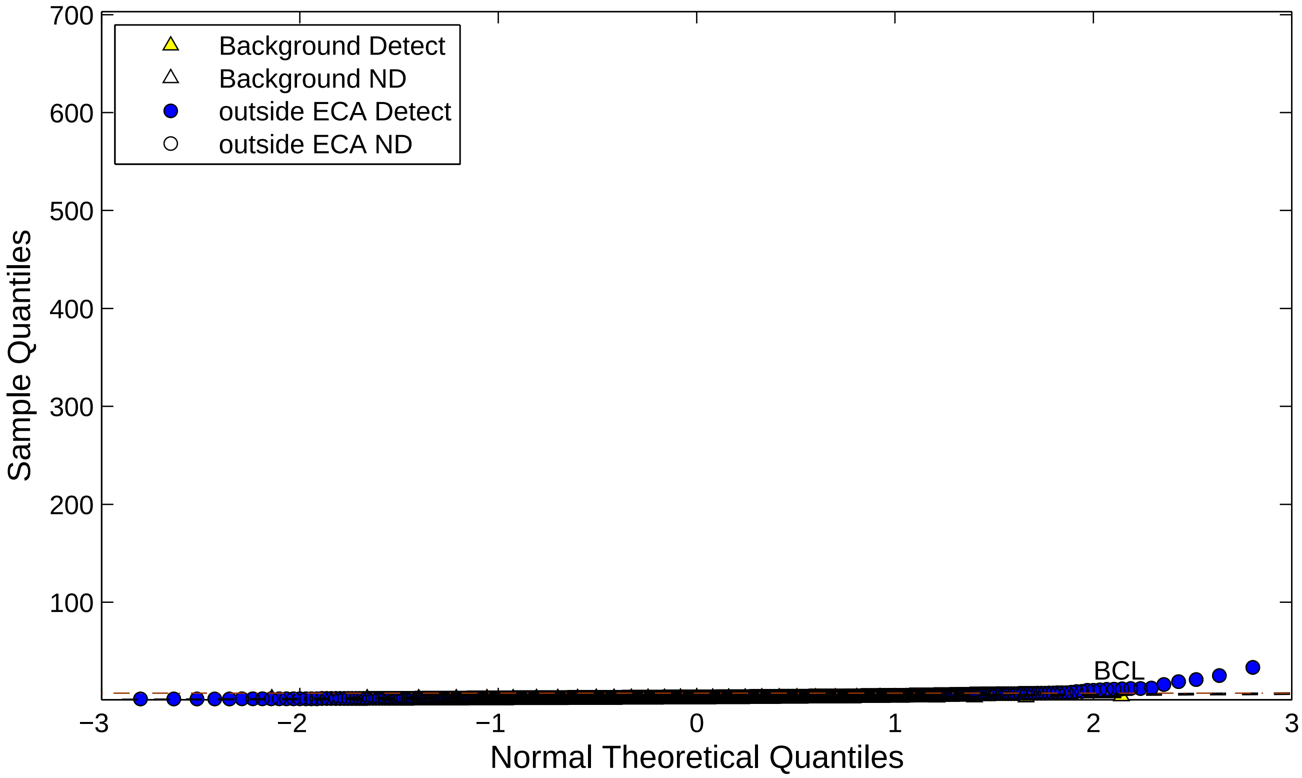
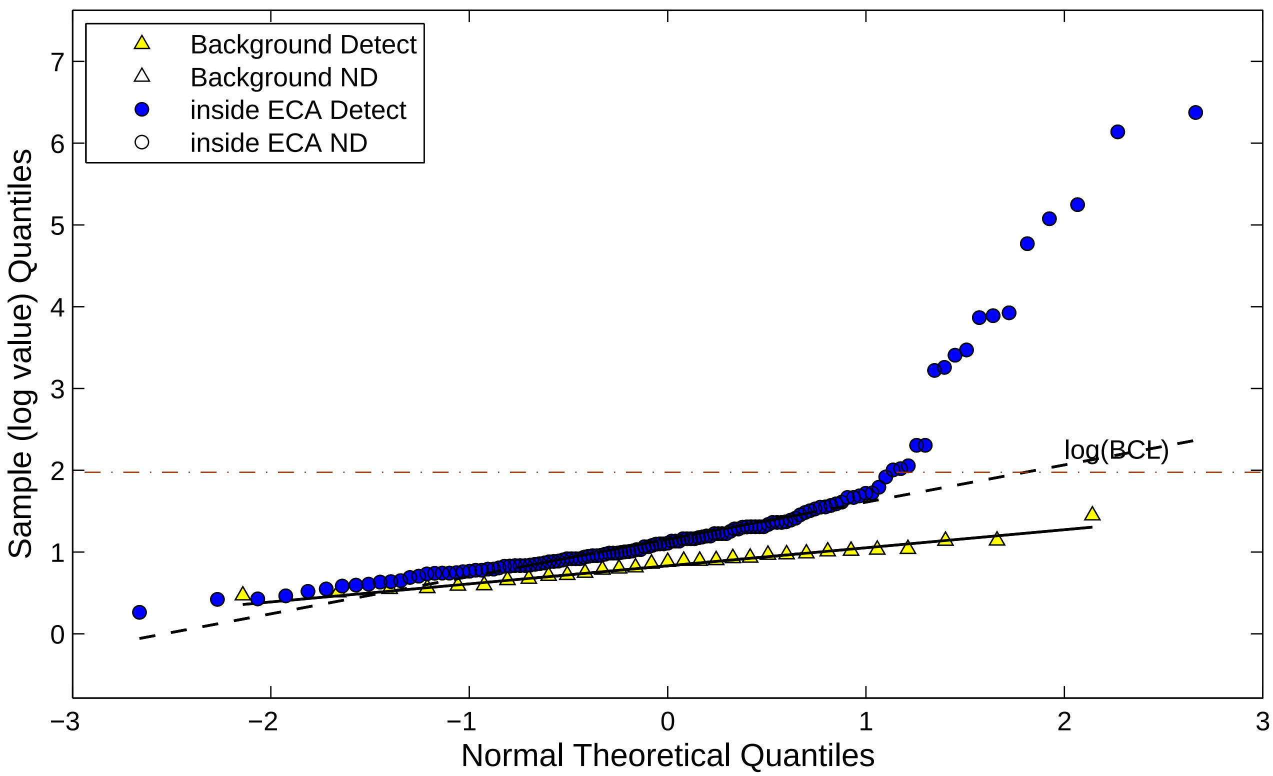
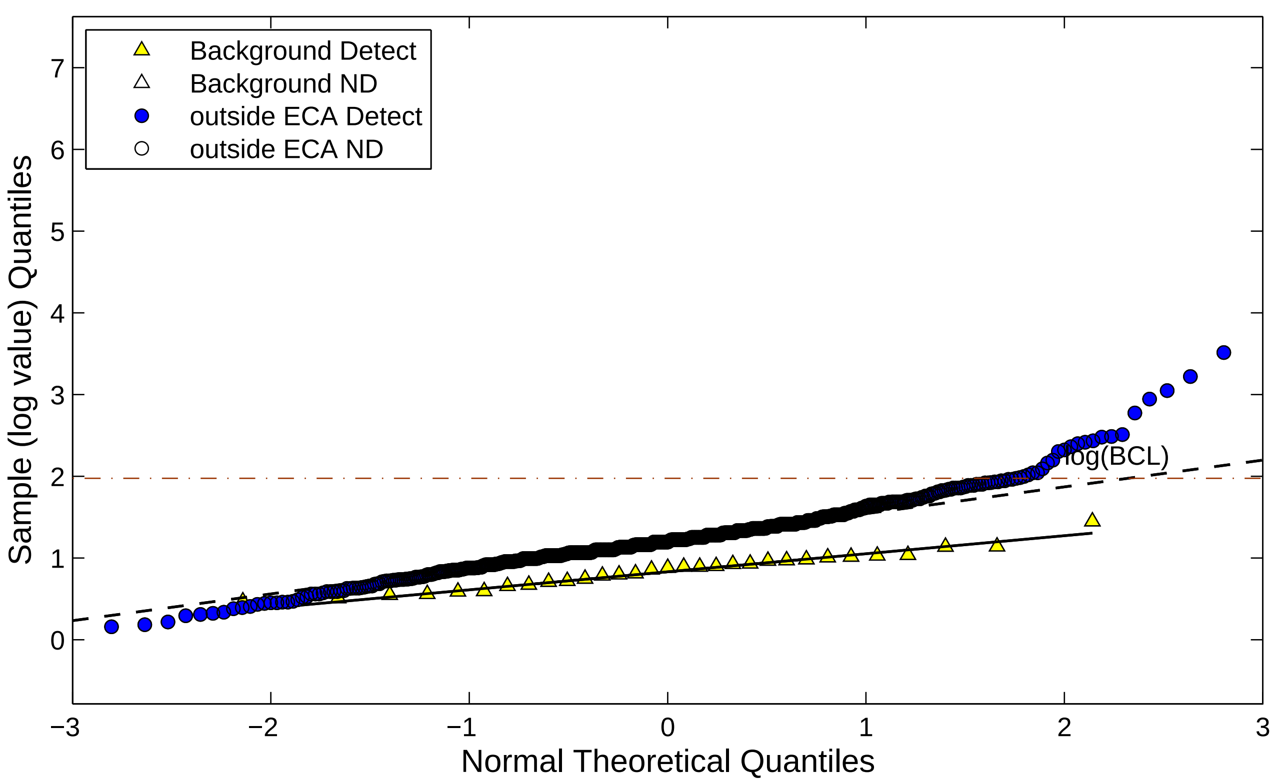


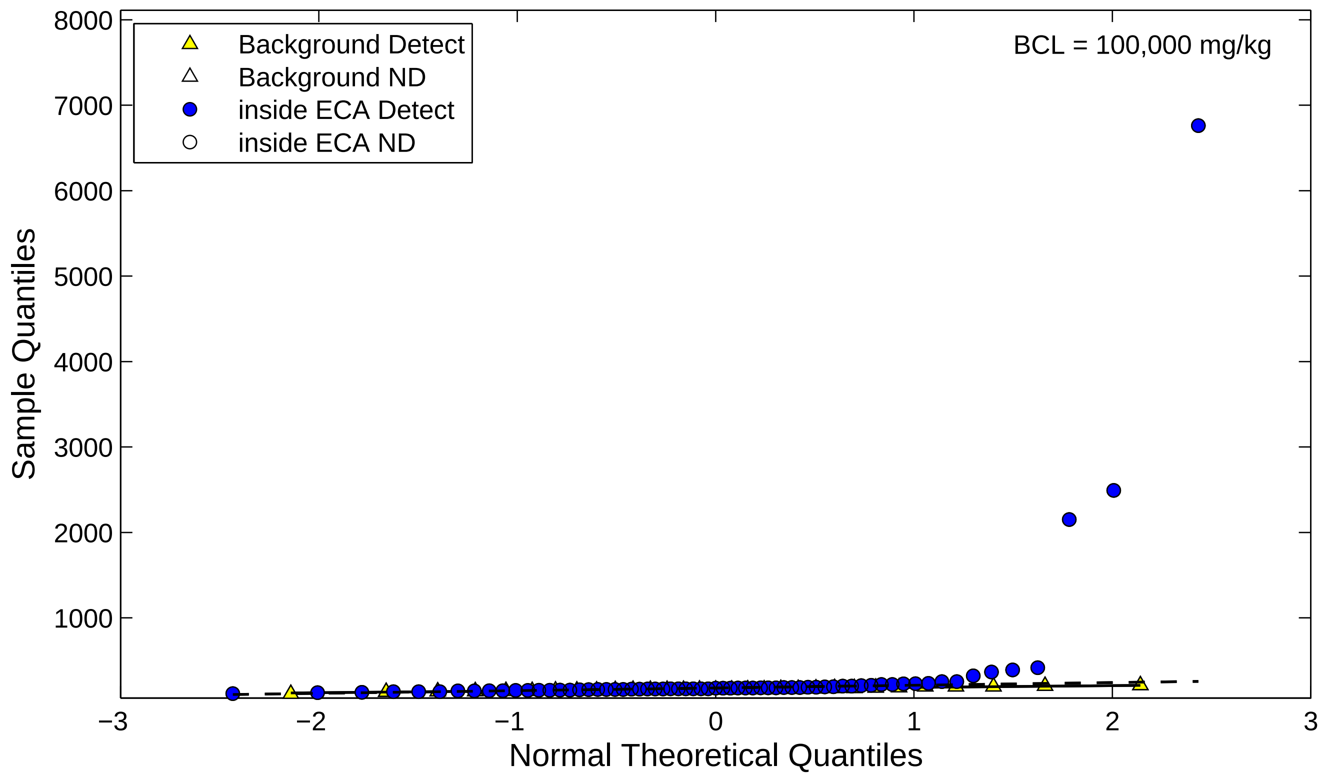
Figure C2−3B. Lognormal Q−Q Plots
Arsenic





Ramboll Environ

Figure C2−4A. Normal Q−Q Plots
Barium



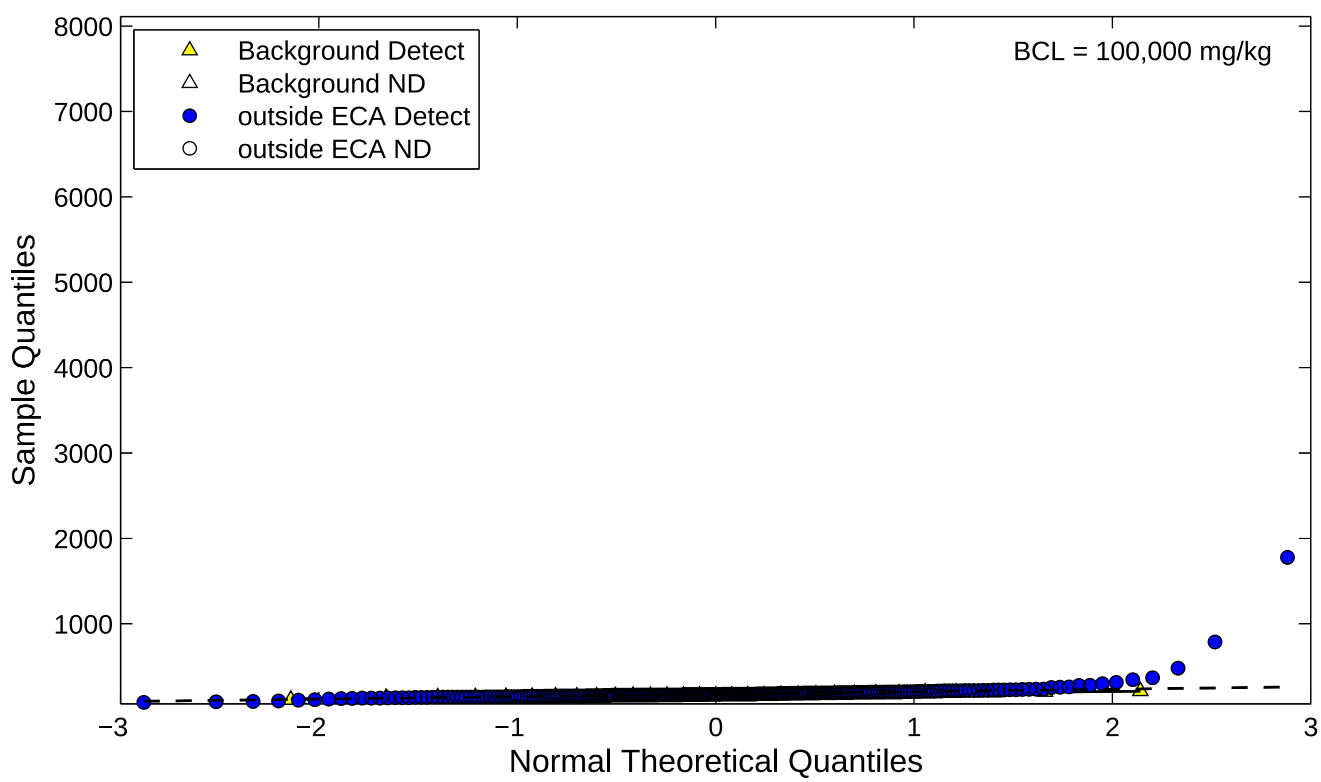
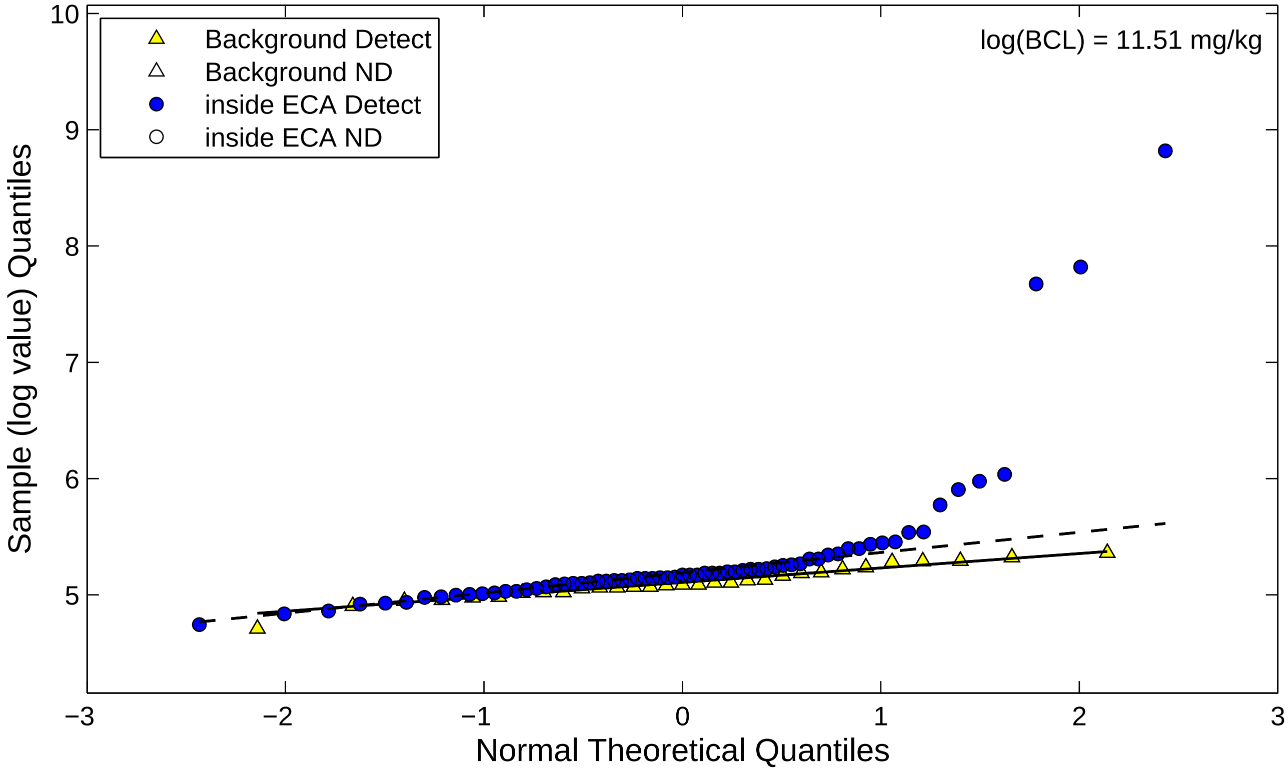
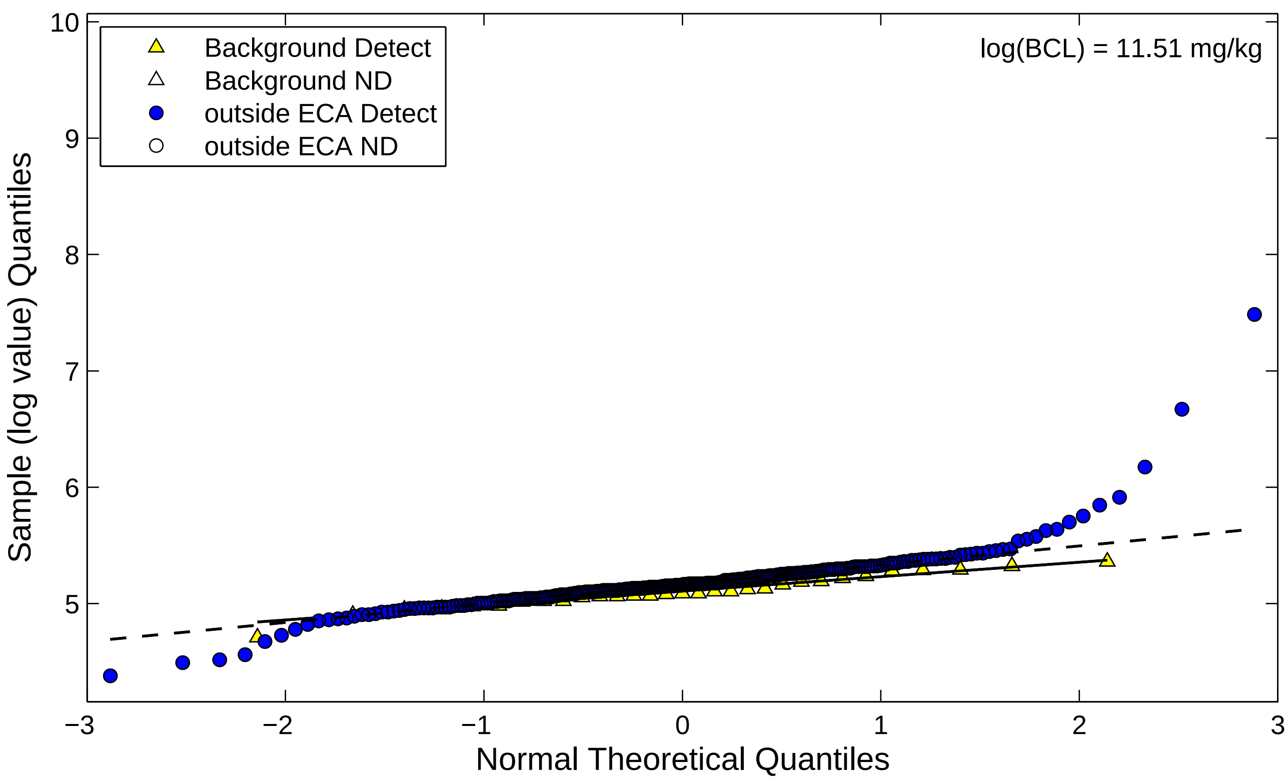


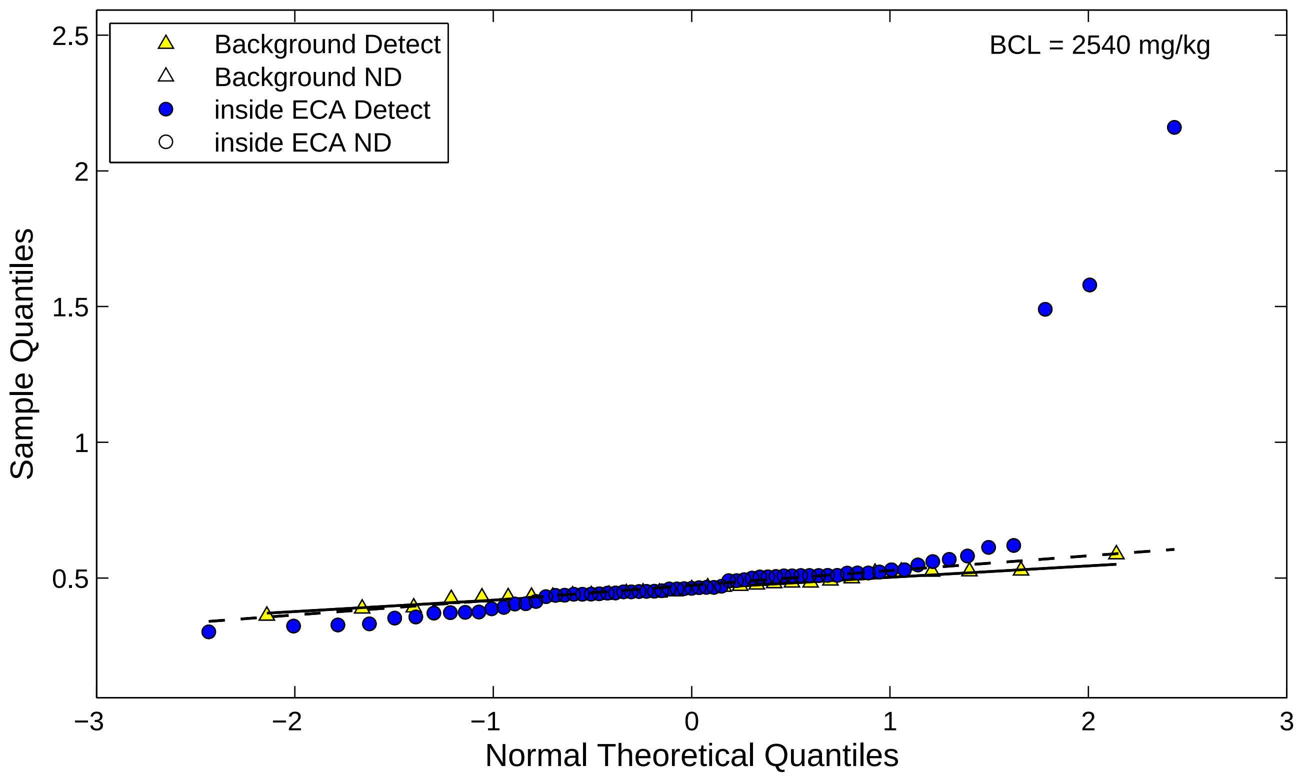
Figure C2−4B. Lognormal Q−Q Plots
Barium





Ramboll Environ

Figure C2−5A. Normal Q−Q Plots
Beryllium



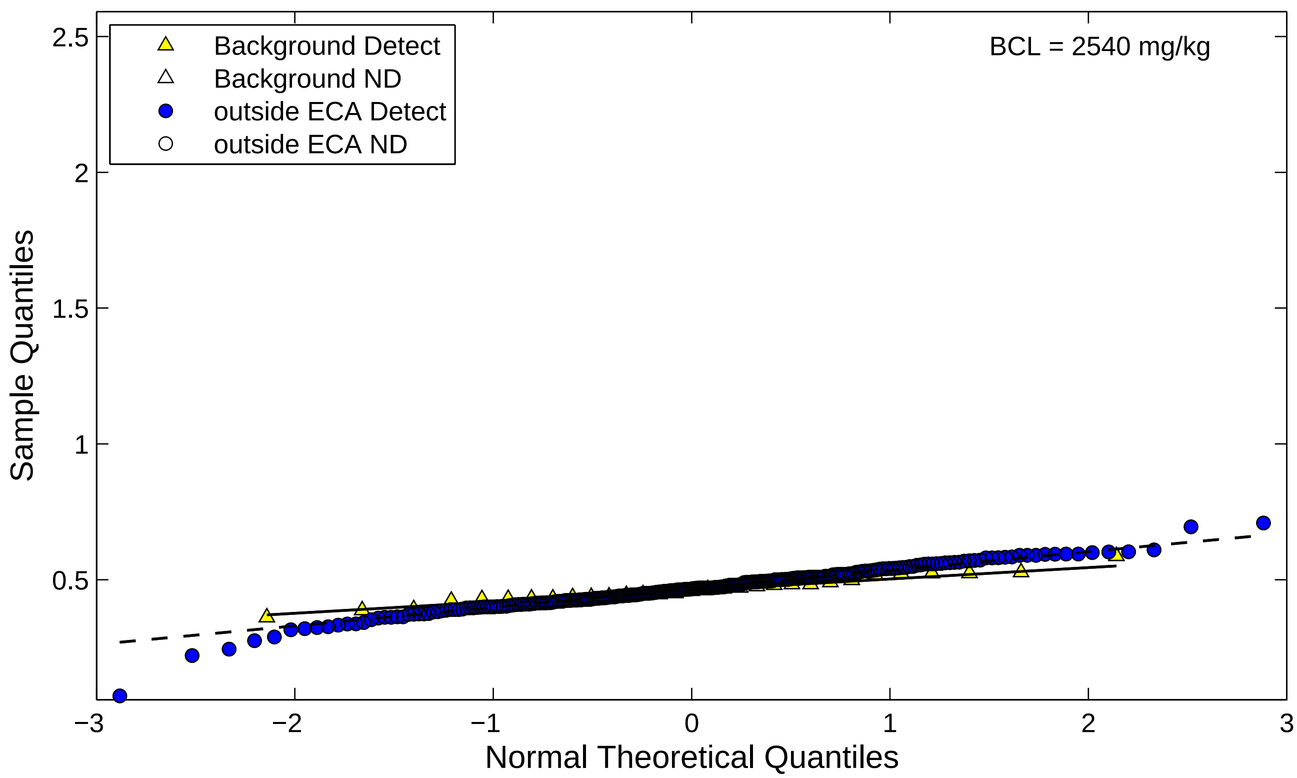
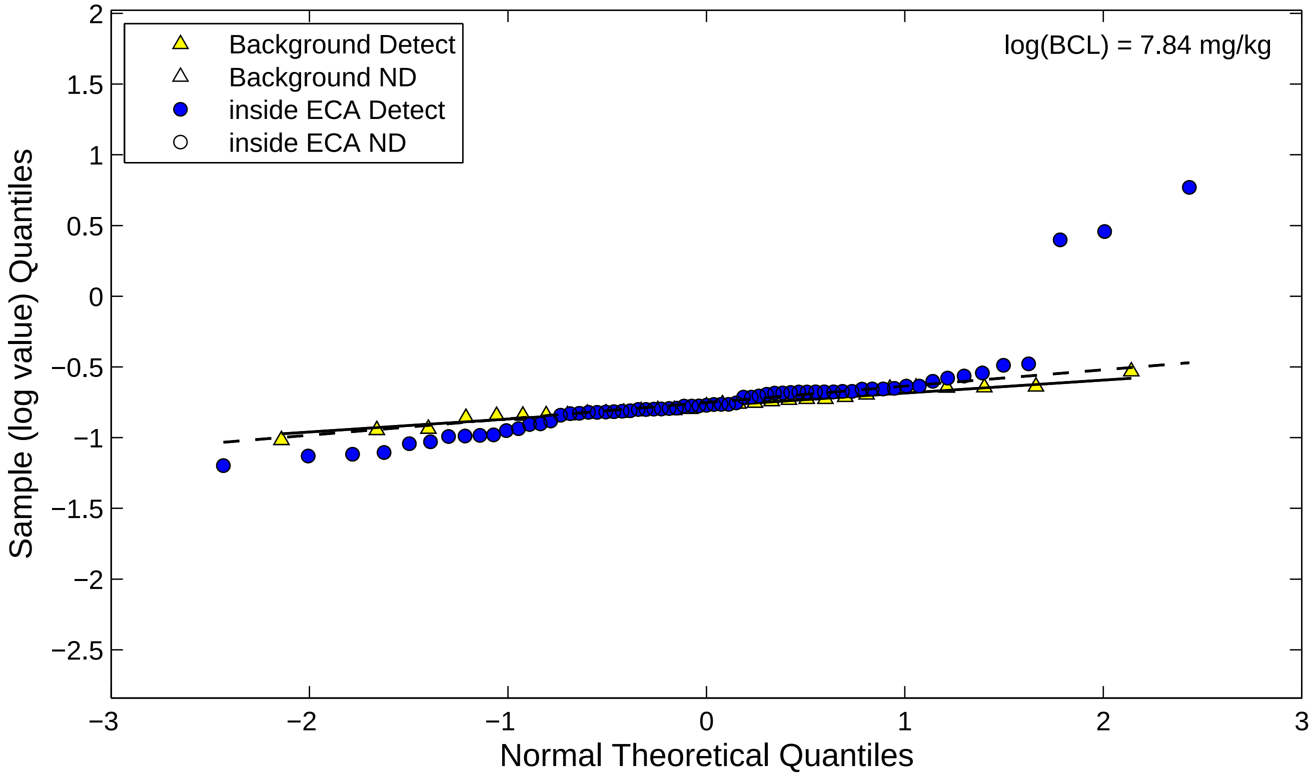


Figure C2−5B. Lognormal Q−Q Plots
Beryllium



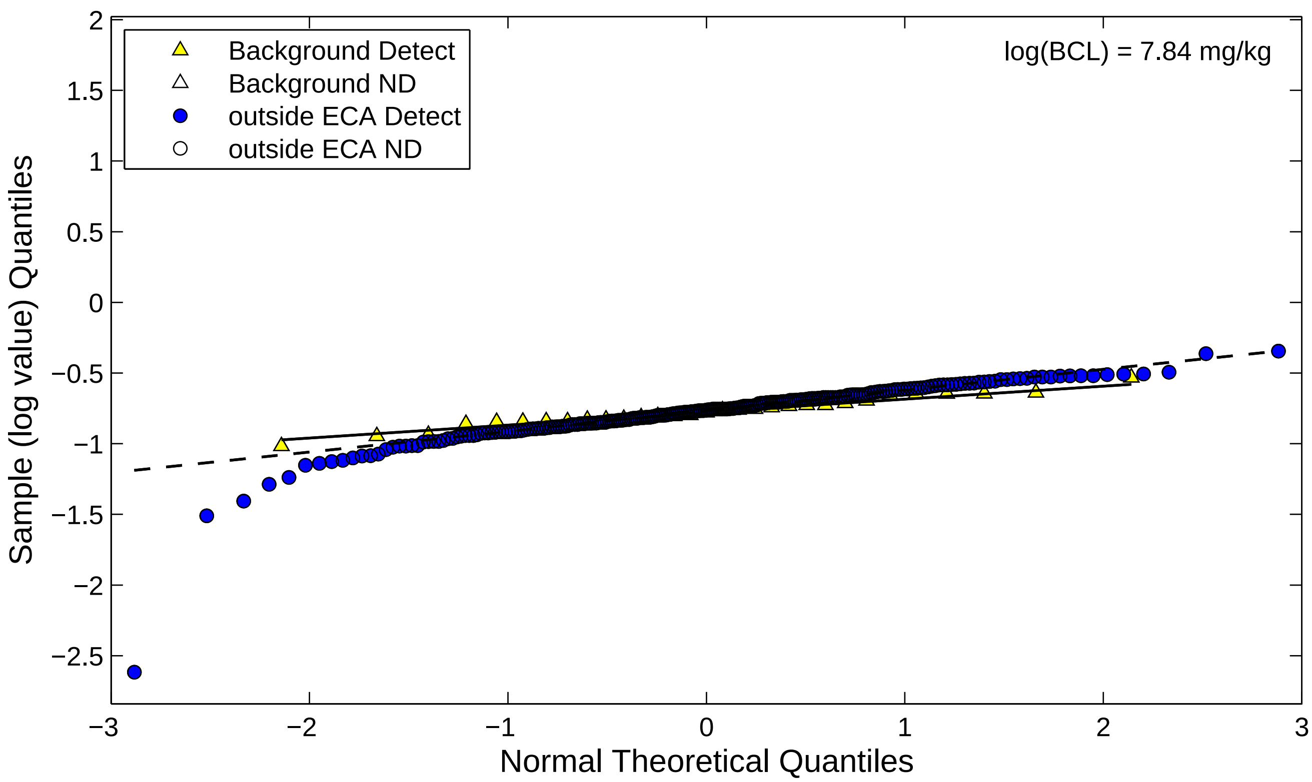
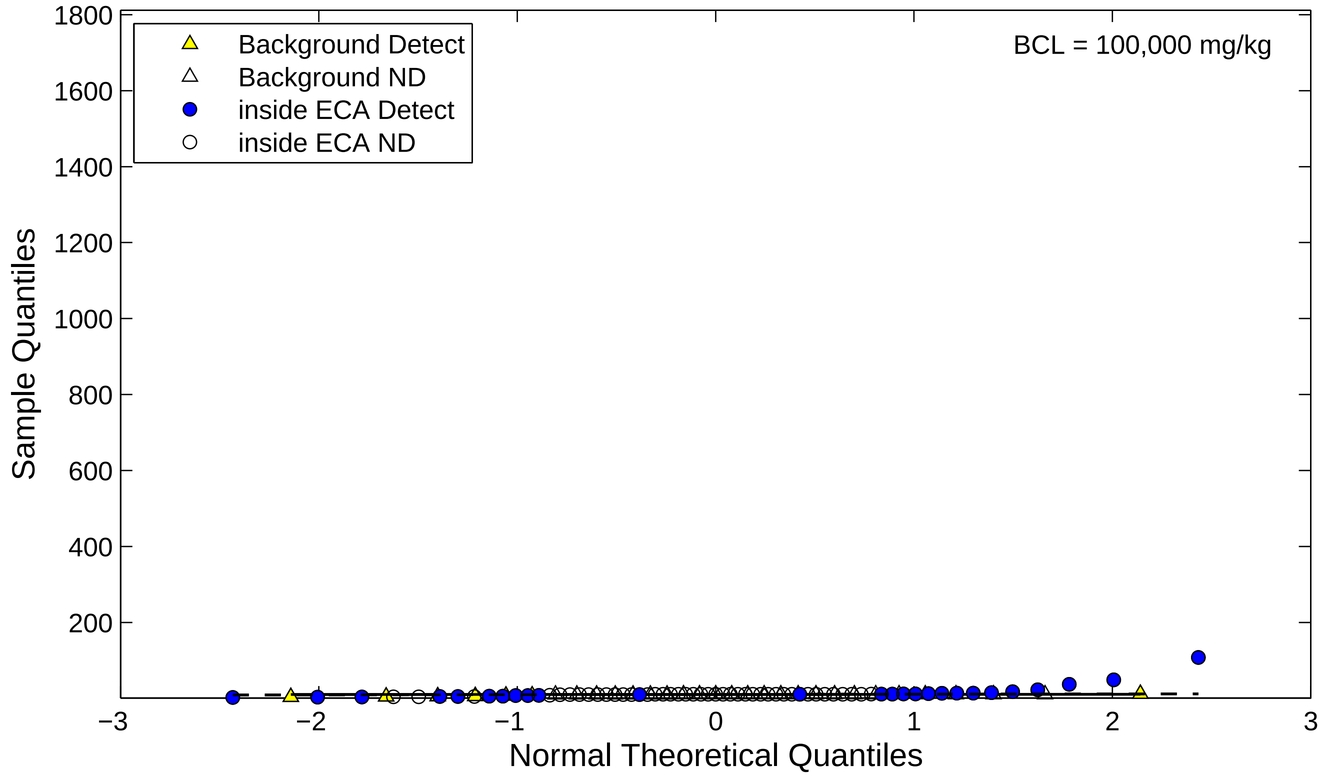


Figure C2−6A. Normal Q−Q Plots
Boron



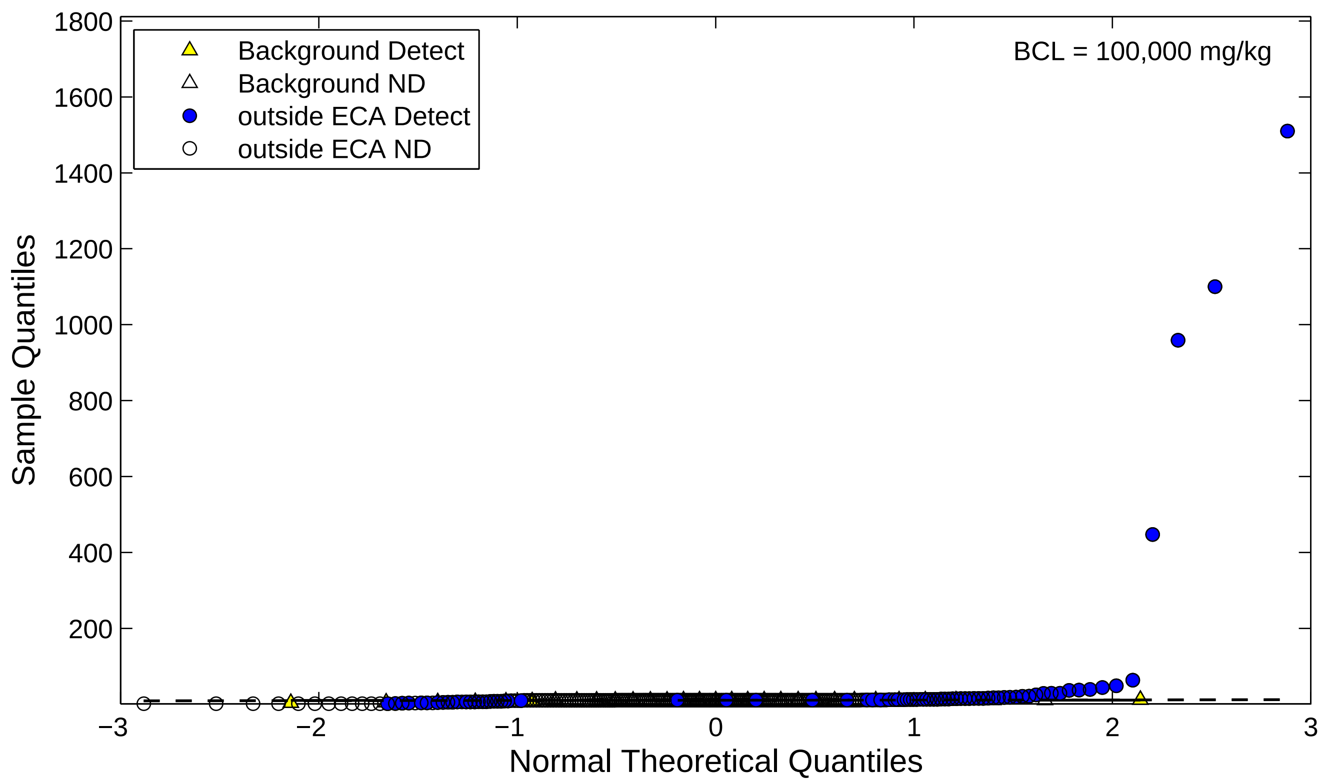
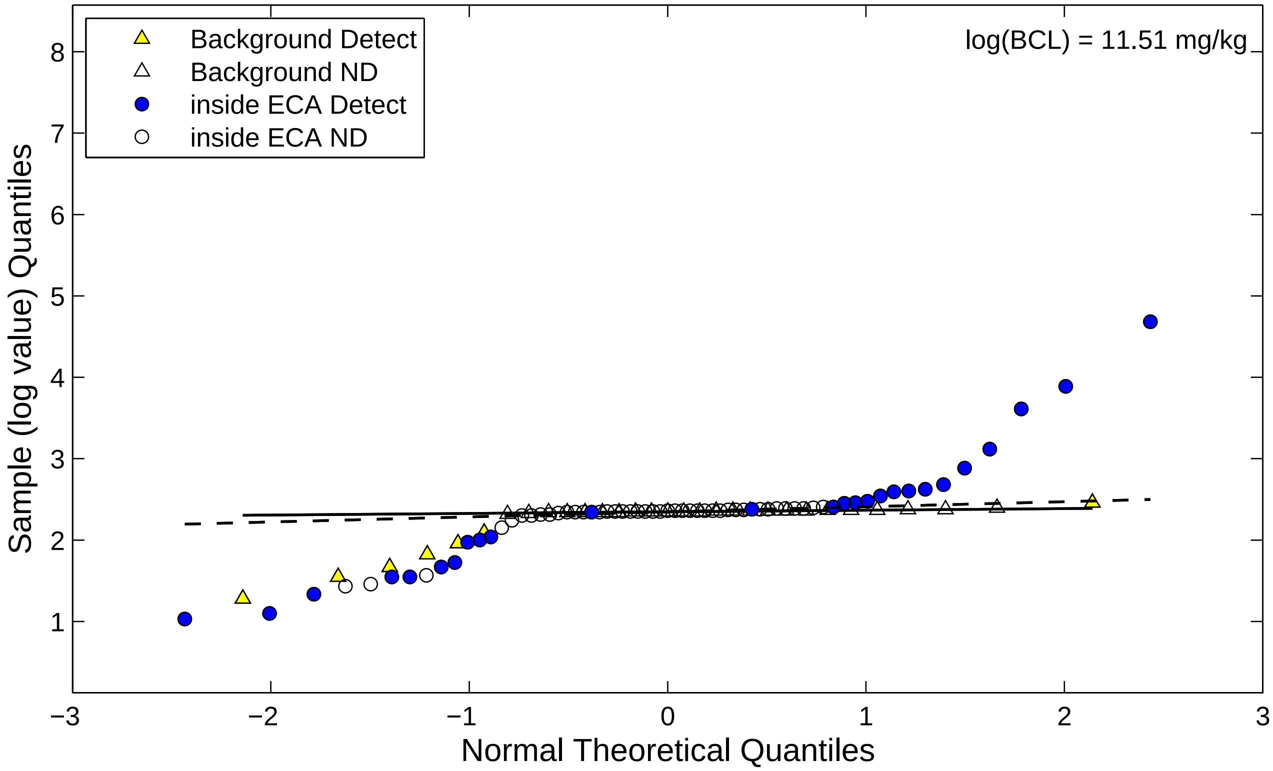


Figure C2−6B. Lognormal Q−Q Plots
Boron



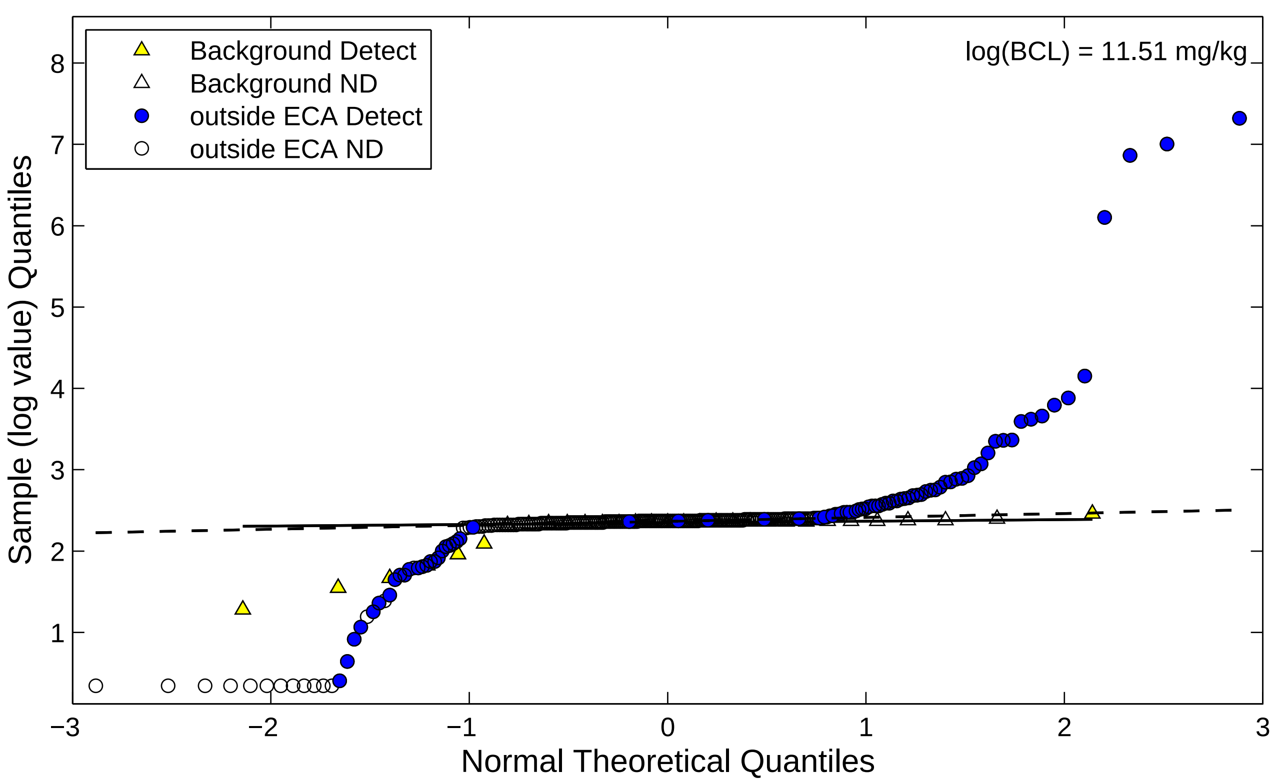


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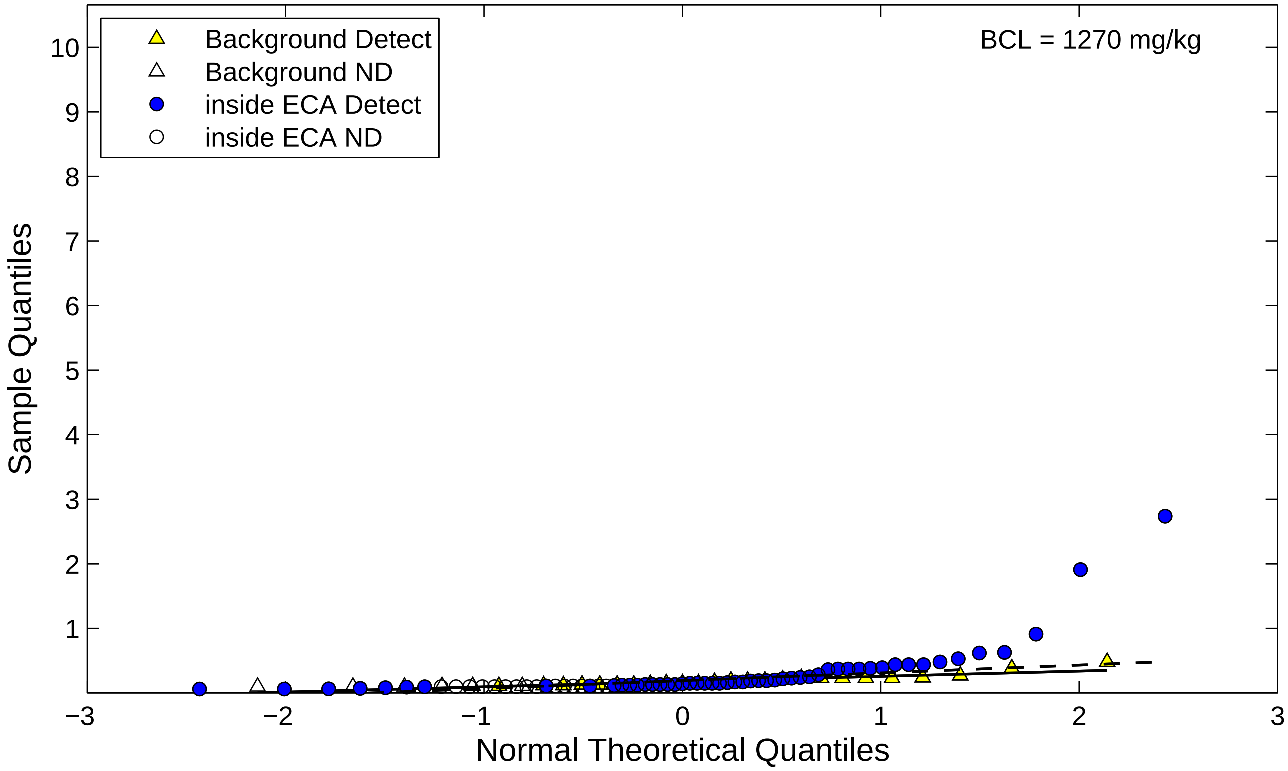
Figure C2−7A. Normal Q−Q Plots
Cadmium



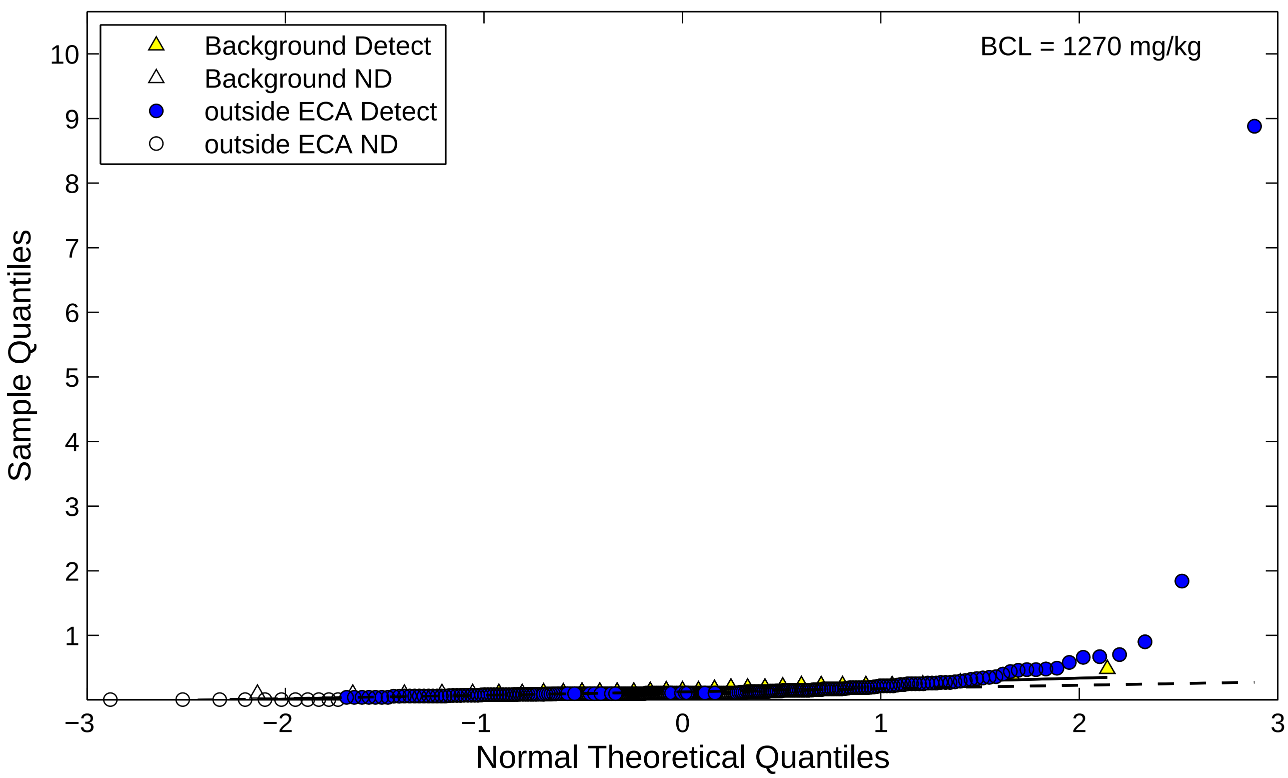
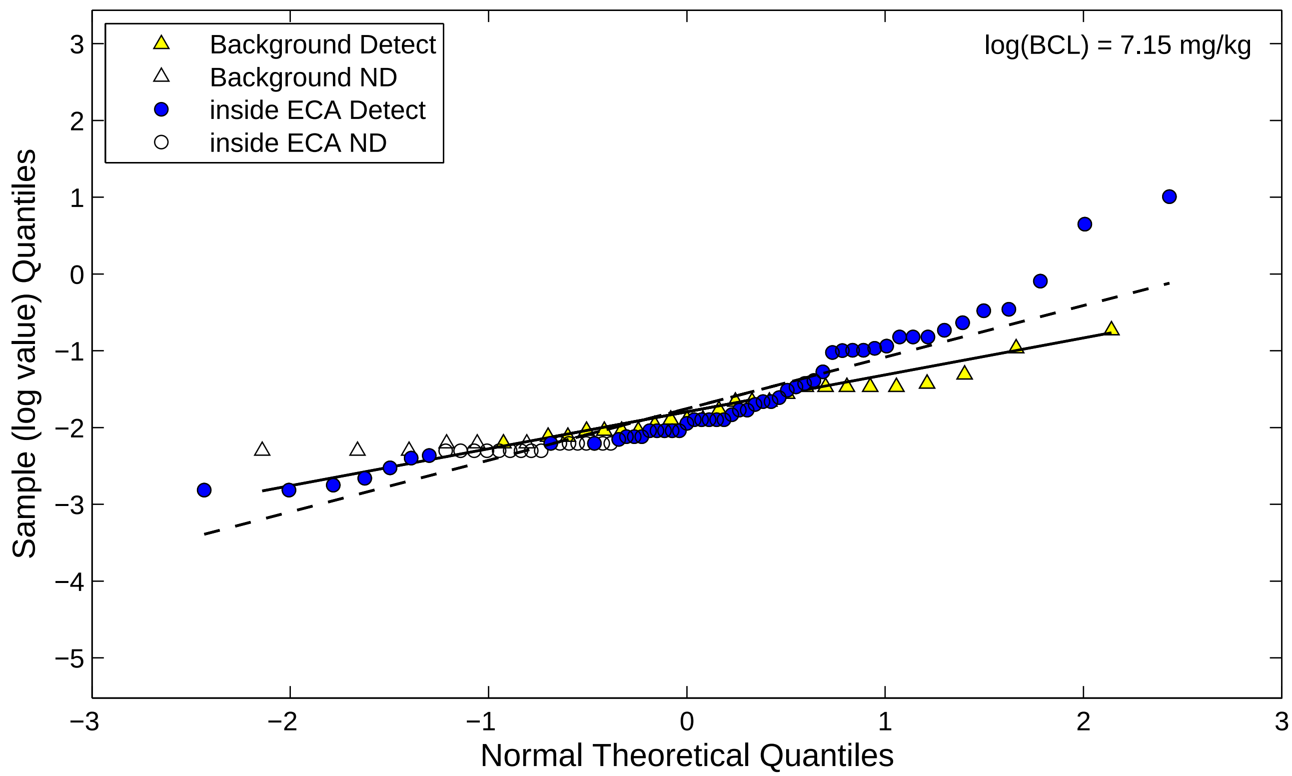


Figure C2−7B. Lognormal Q−Q Plots
Cadmium



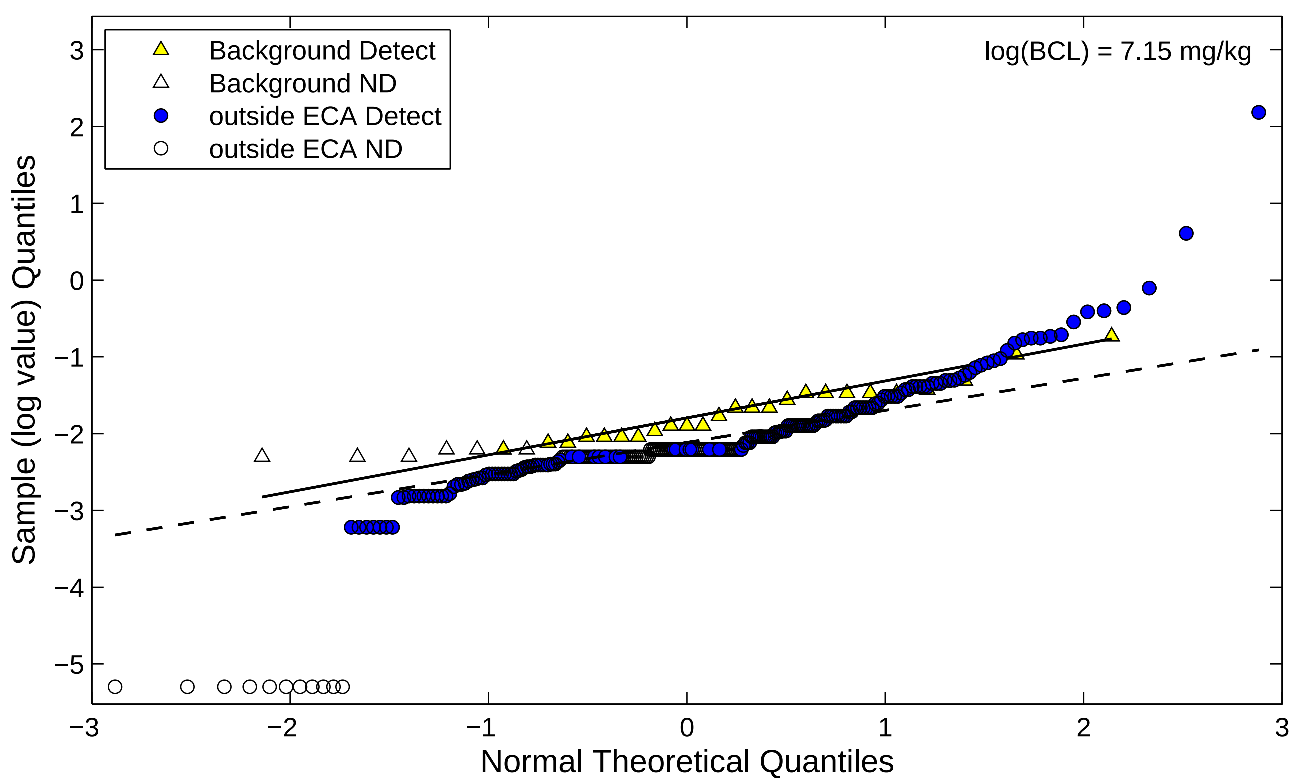
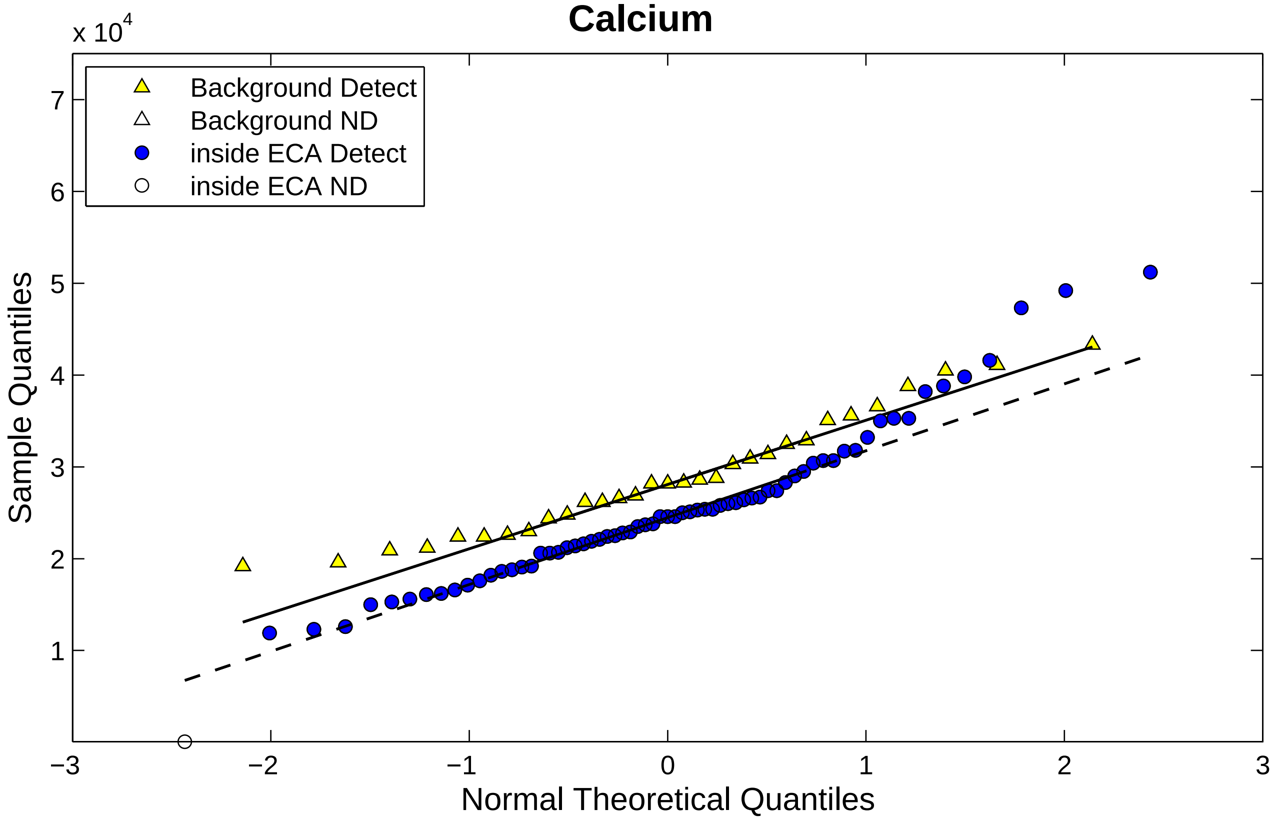


Figure C2−8A. Normal Q−Q Plots
Calcium



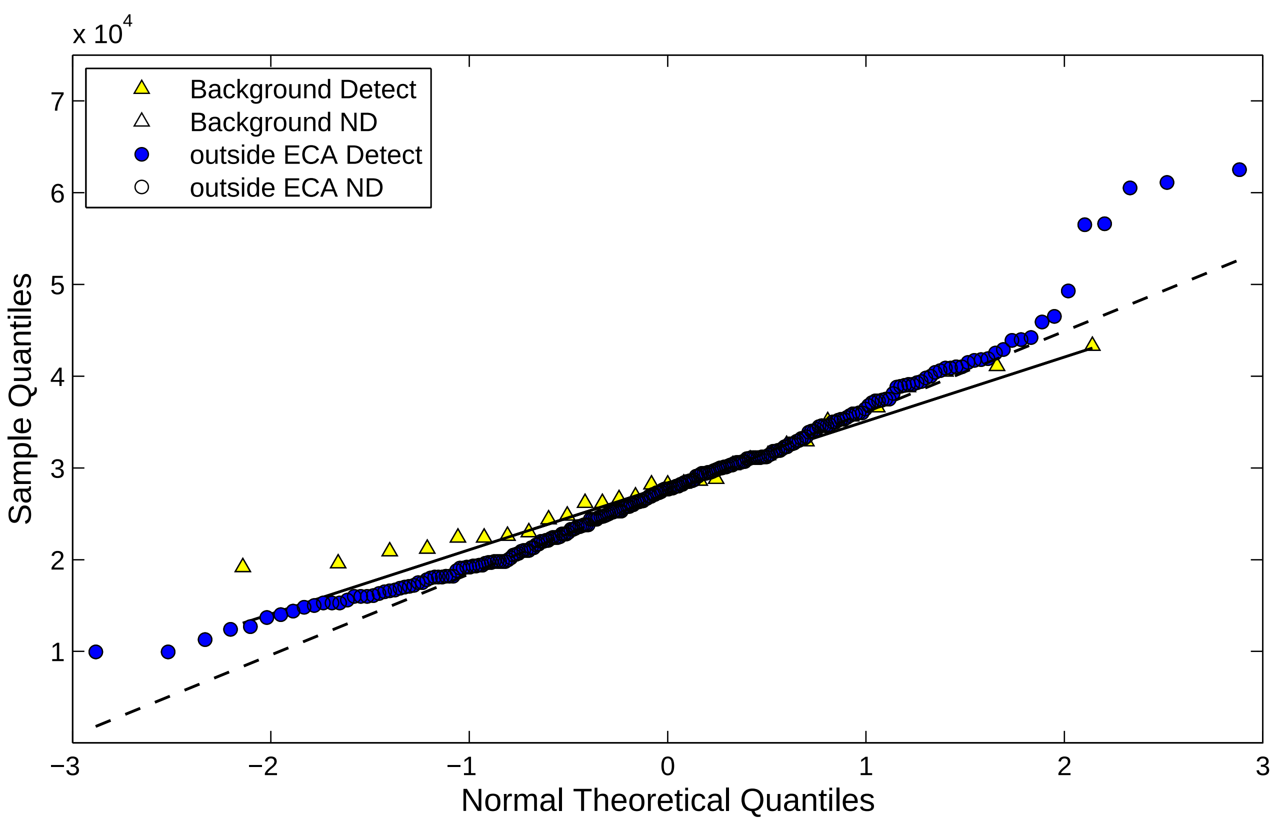
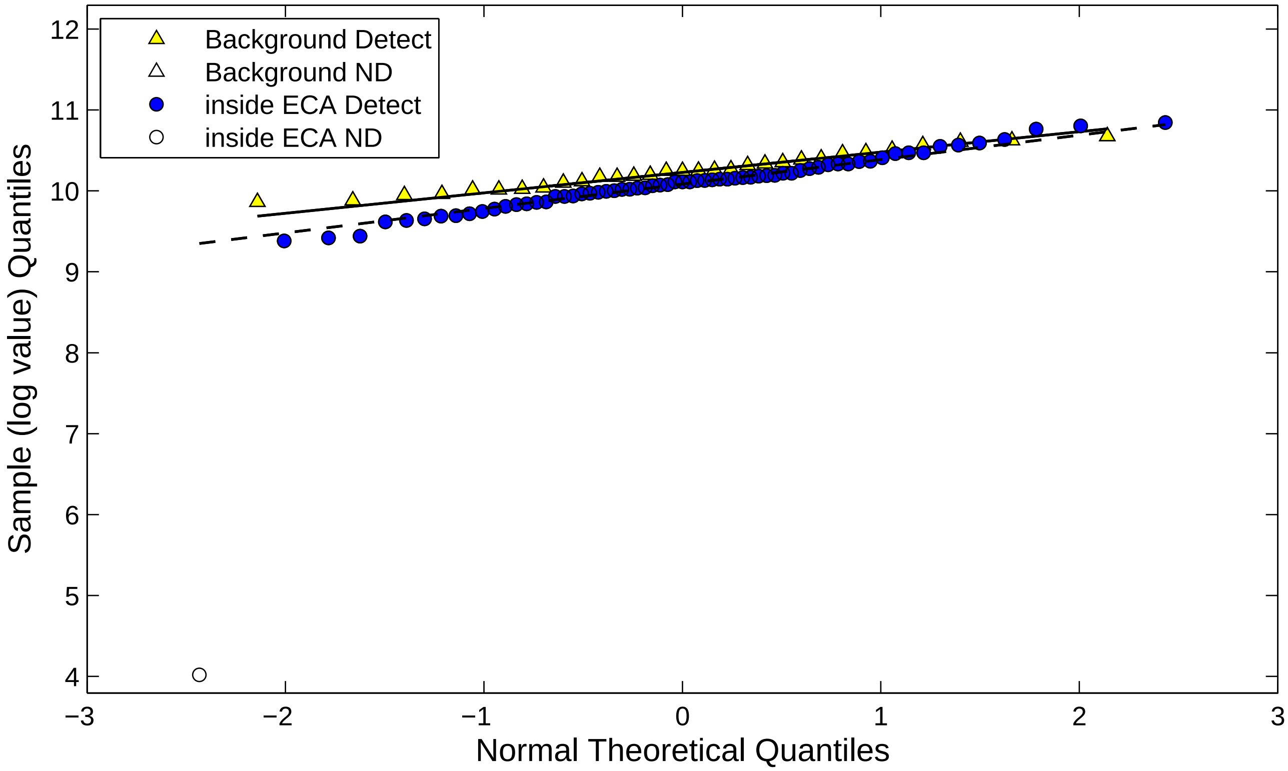
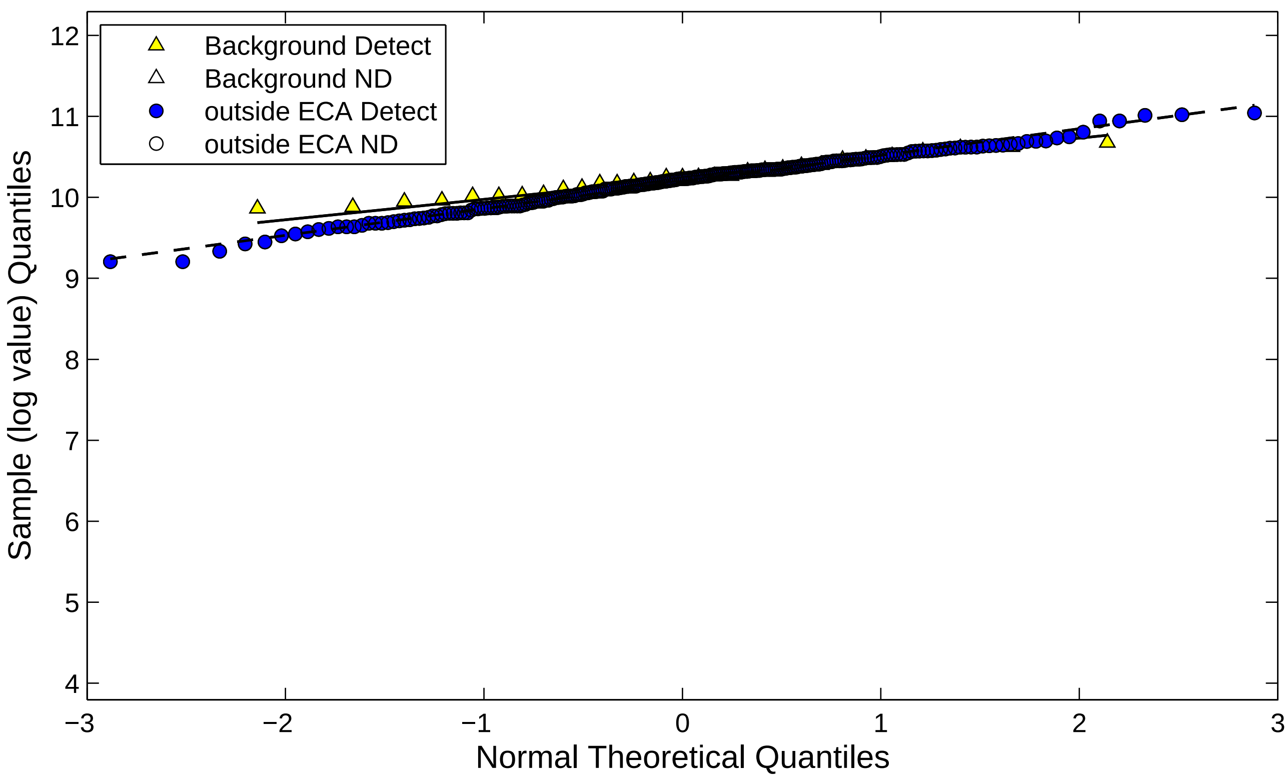


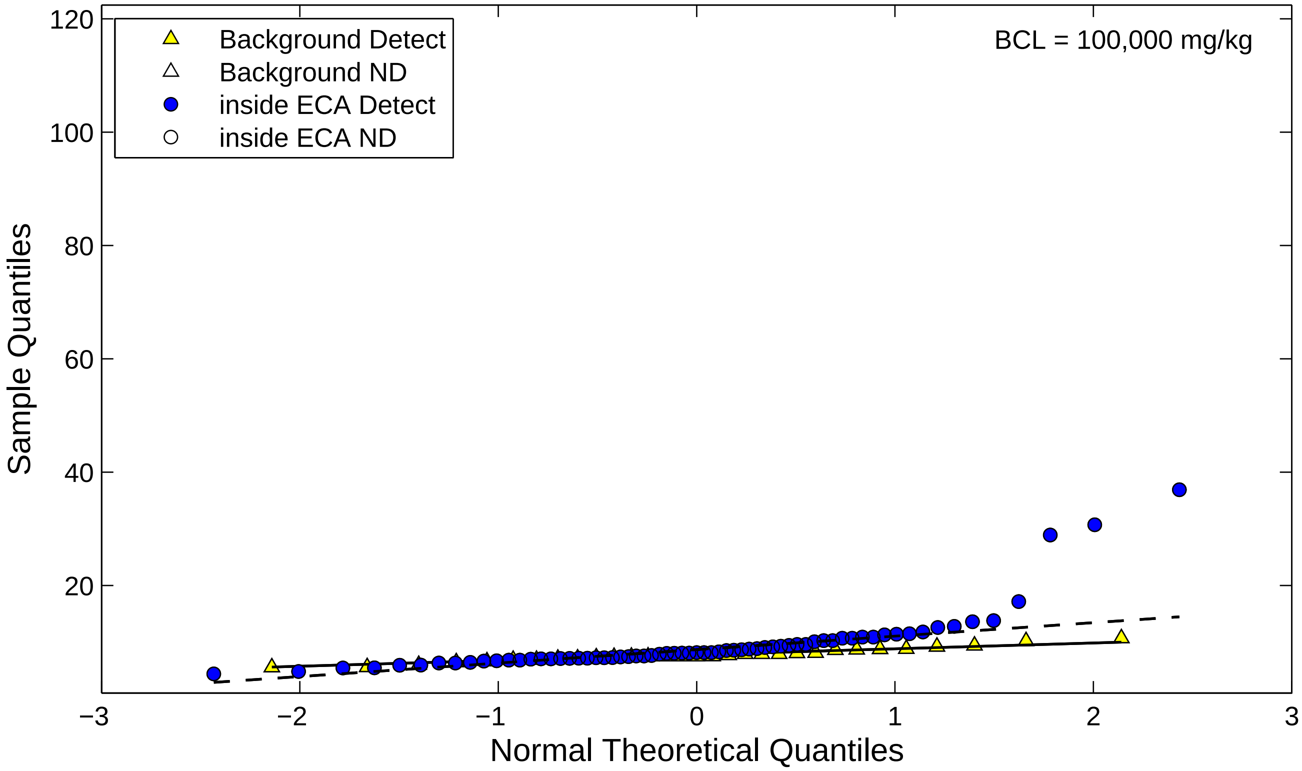
Figure C2−8B. Lognormal Q−Q Plots
Calcium

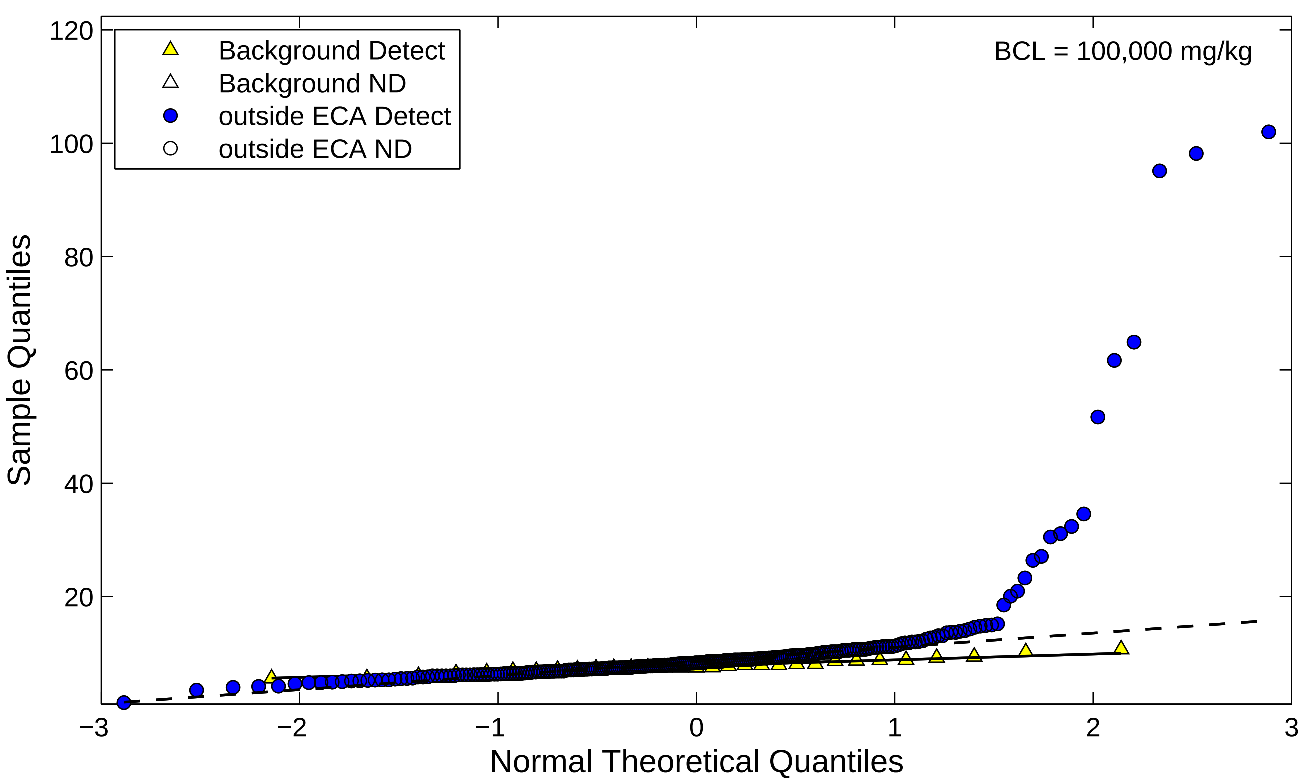




Ramboll Environ

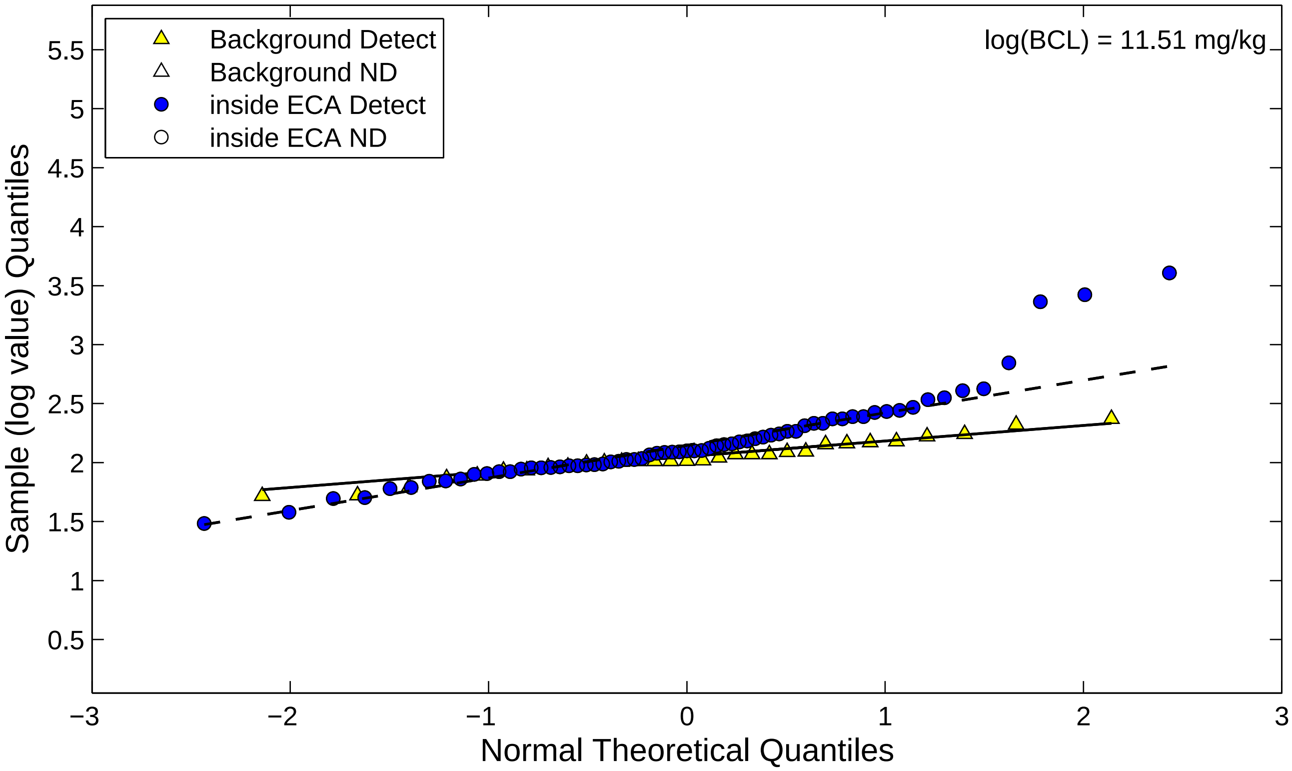
Figure C2−9A. Normal Q−Q Plots
Chromium (Total)





Ramboll Environ

Figure C2−9B. Lognormal Q−Q Plots
Chromium (Total)



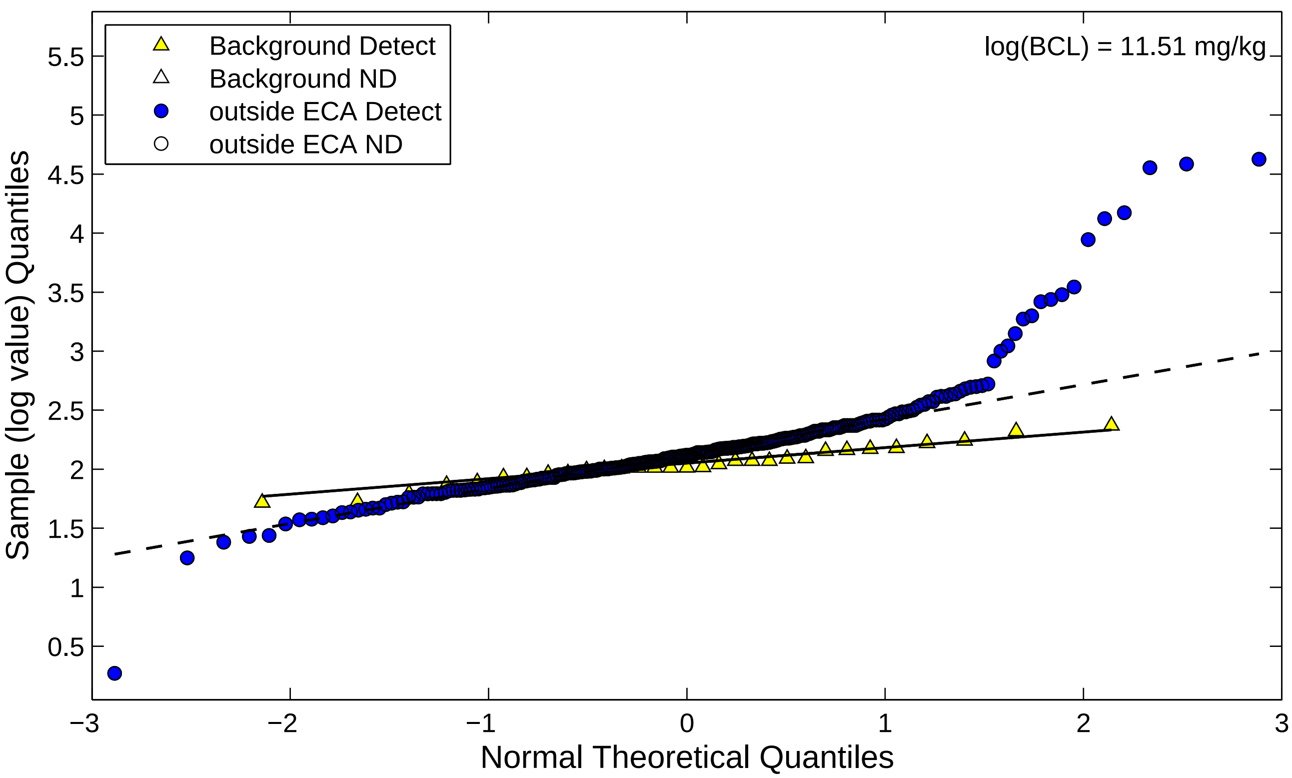
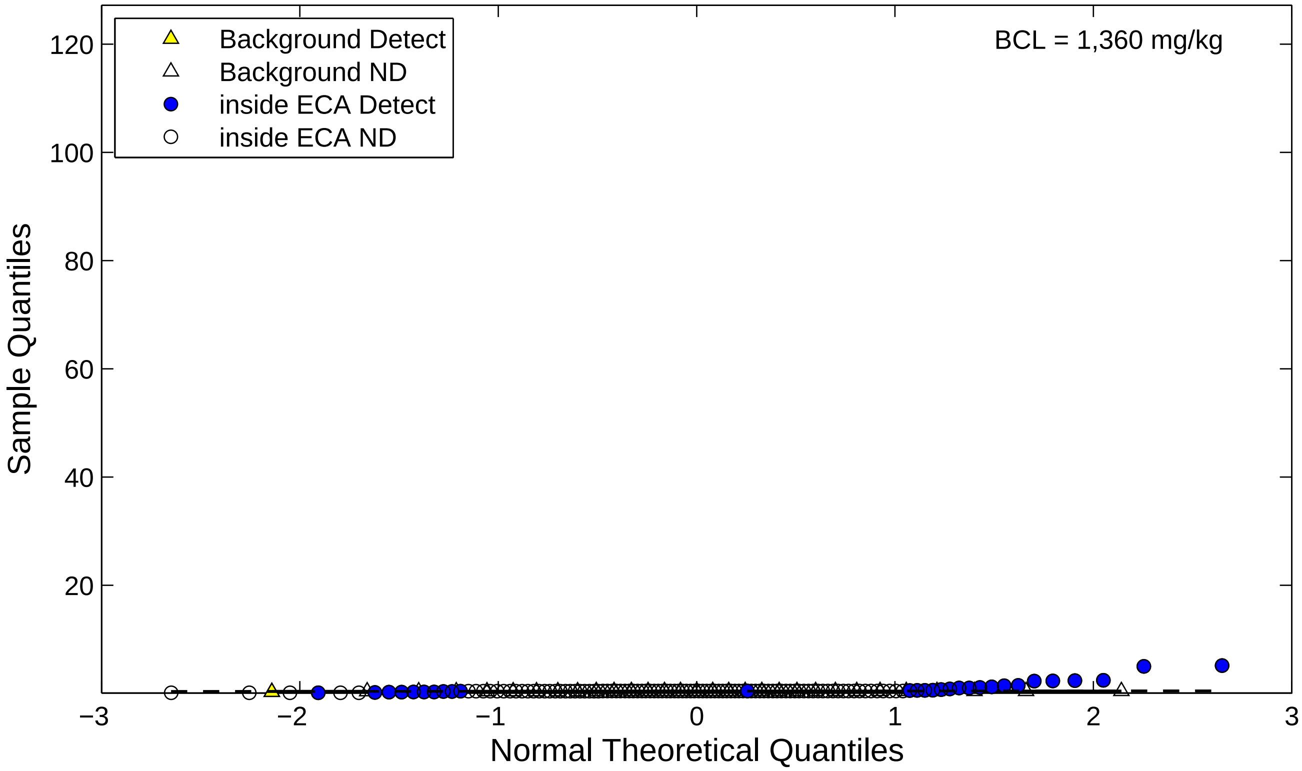


Figure C2−10A. Normal Q−Q Plots
Chromium (VI)



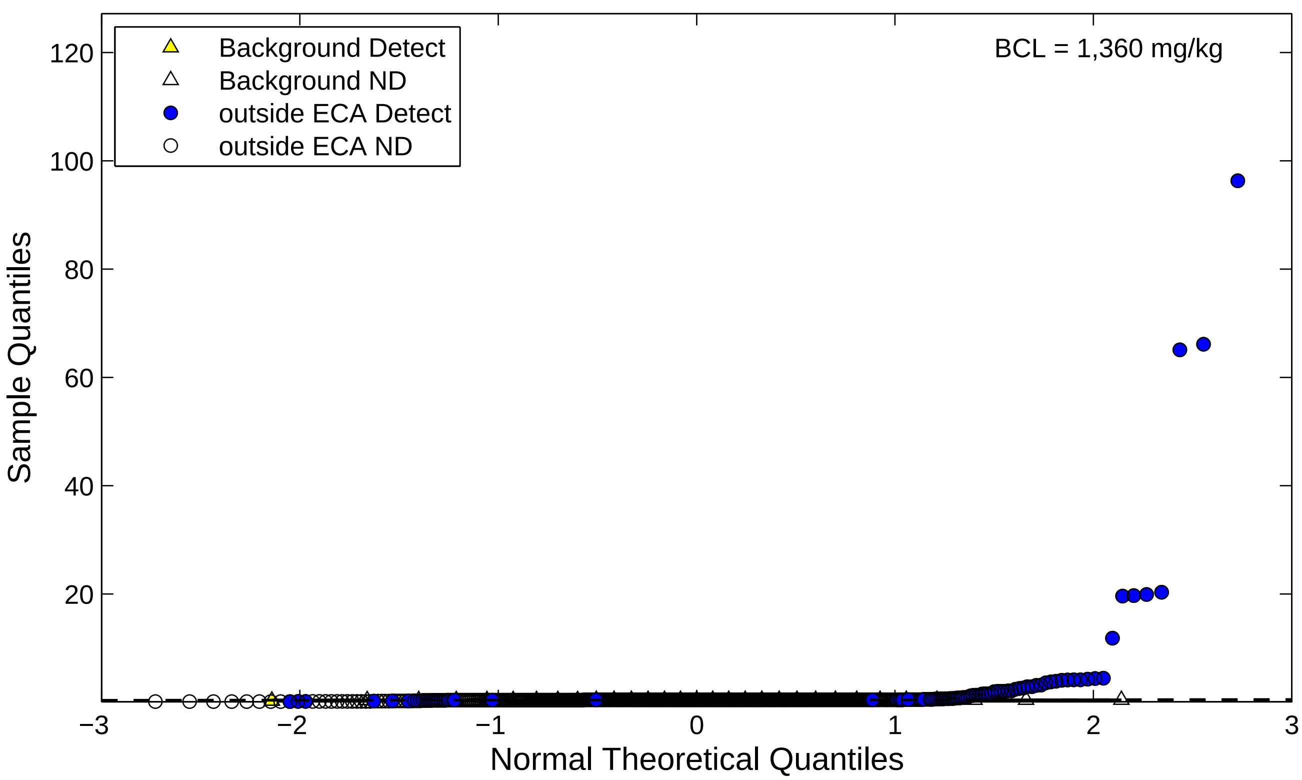


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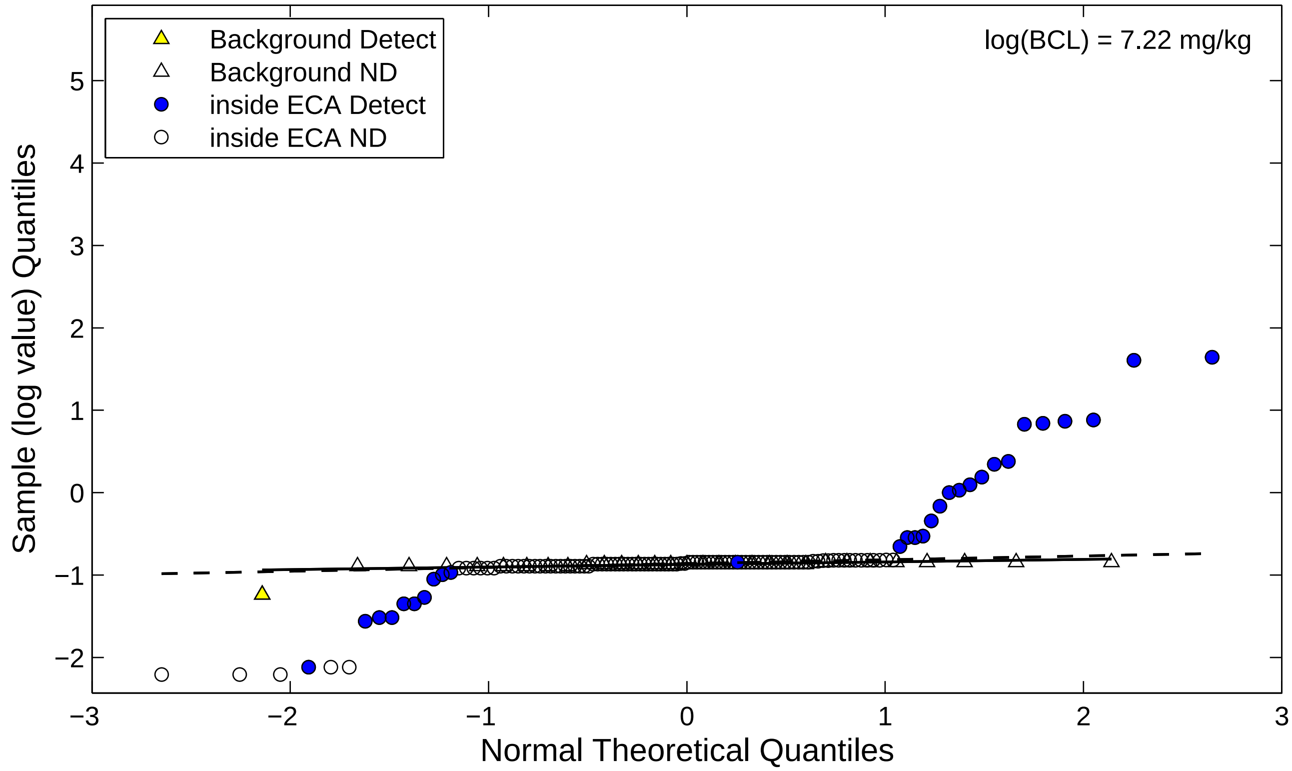
Figure C2−10B. Lognormal Q−Q Plots
Chromium (VI)



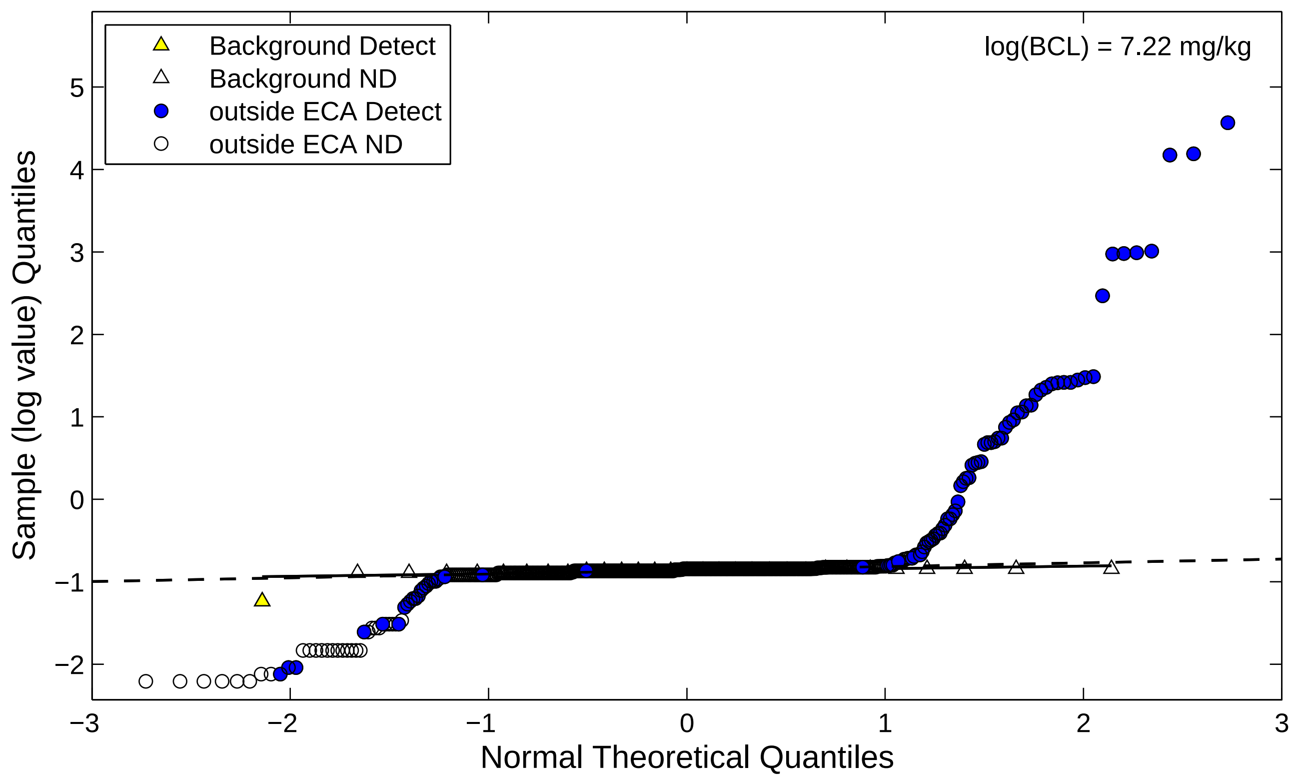


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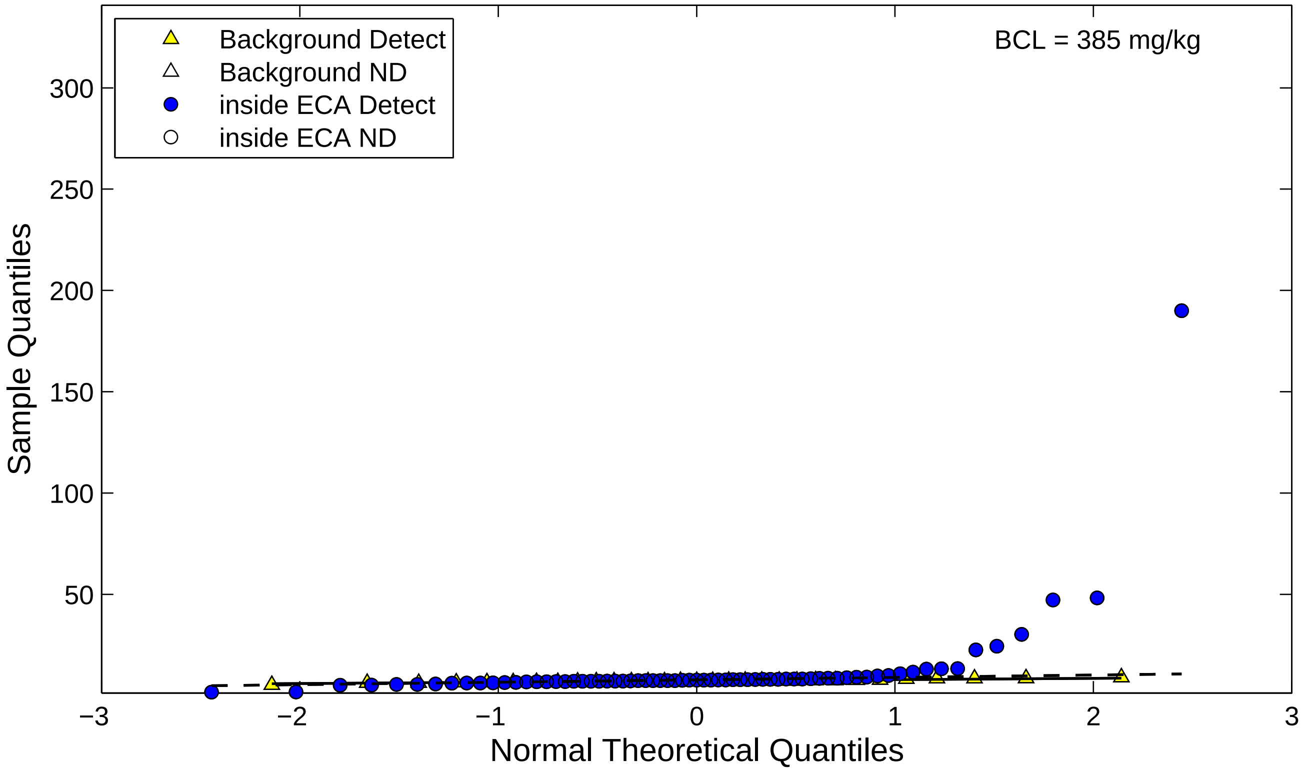
Figure C2−11A. Normal Q−Q Plots
Cobalt



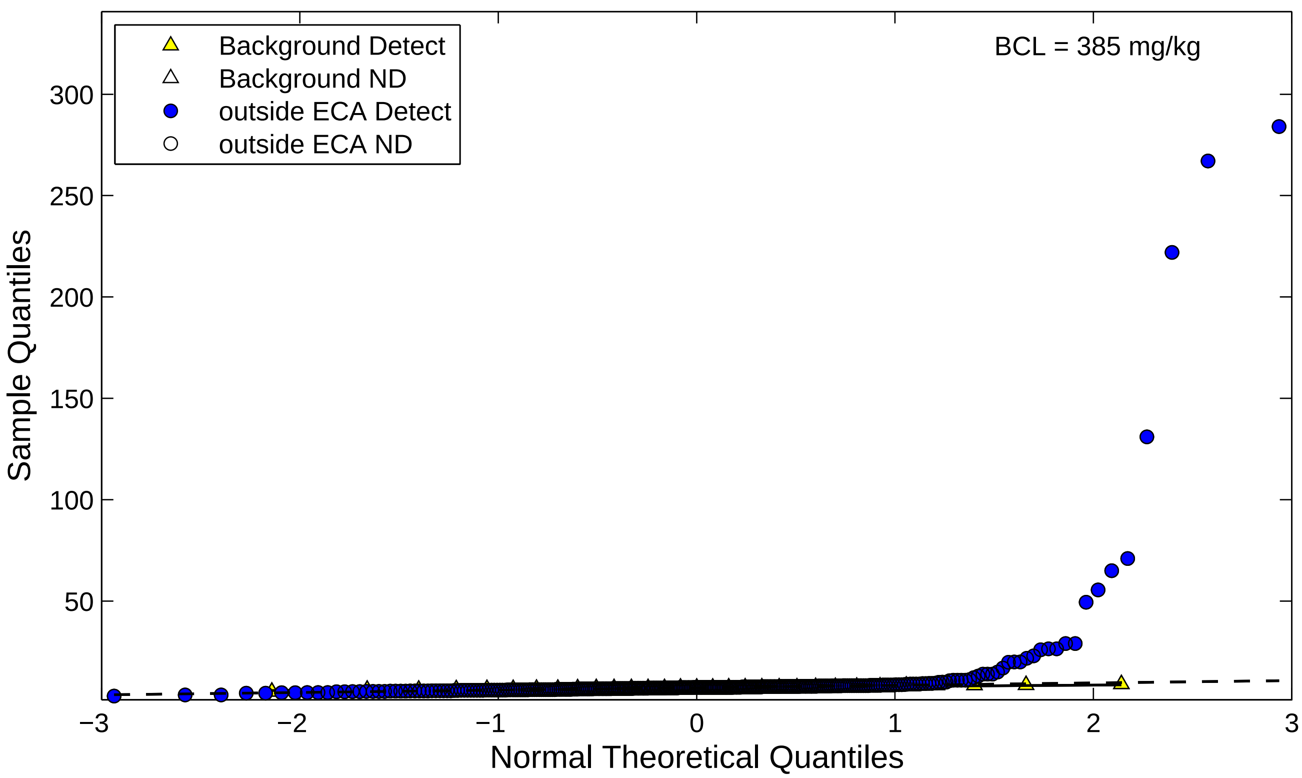
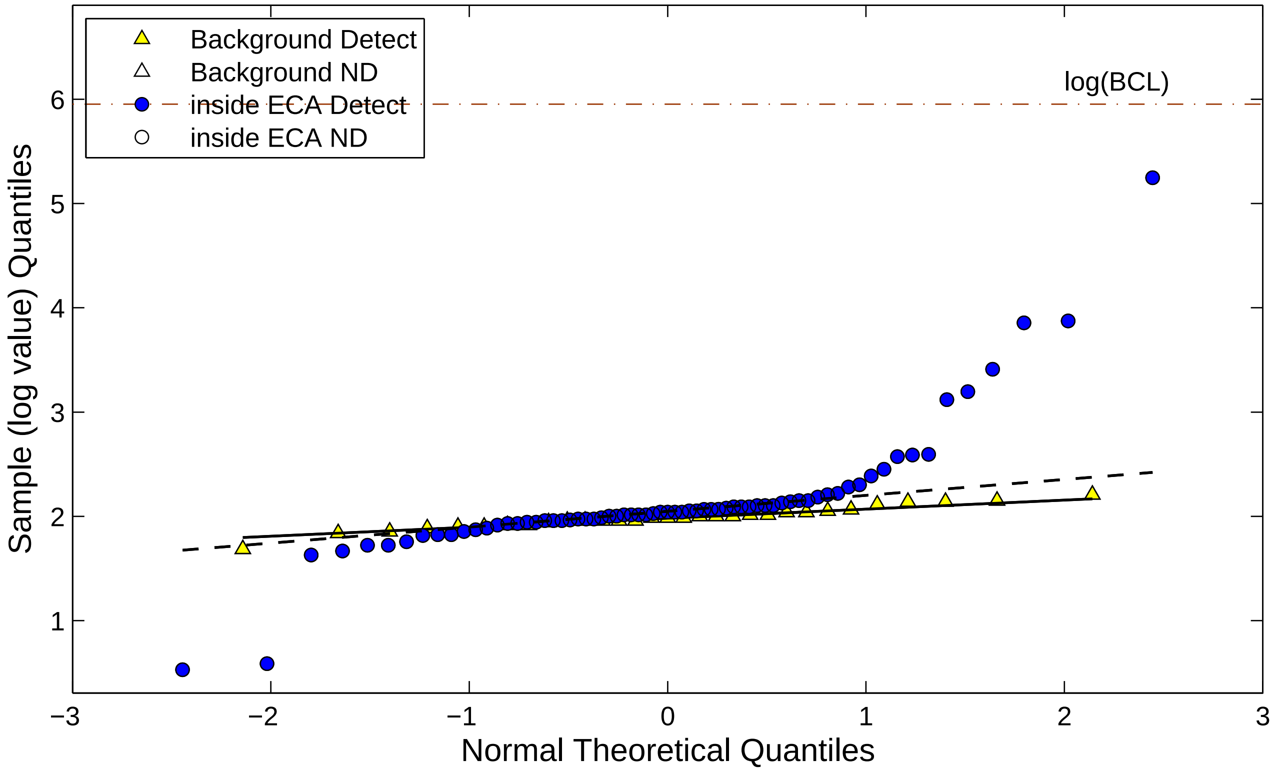


Figure C2−11B. Lognormal Q−Q Plots
Cobalt



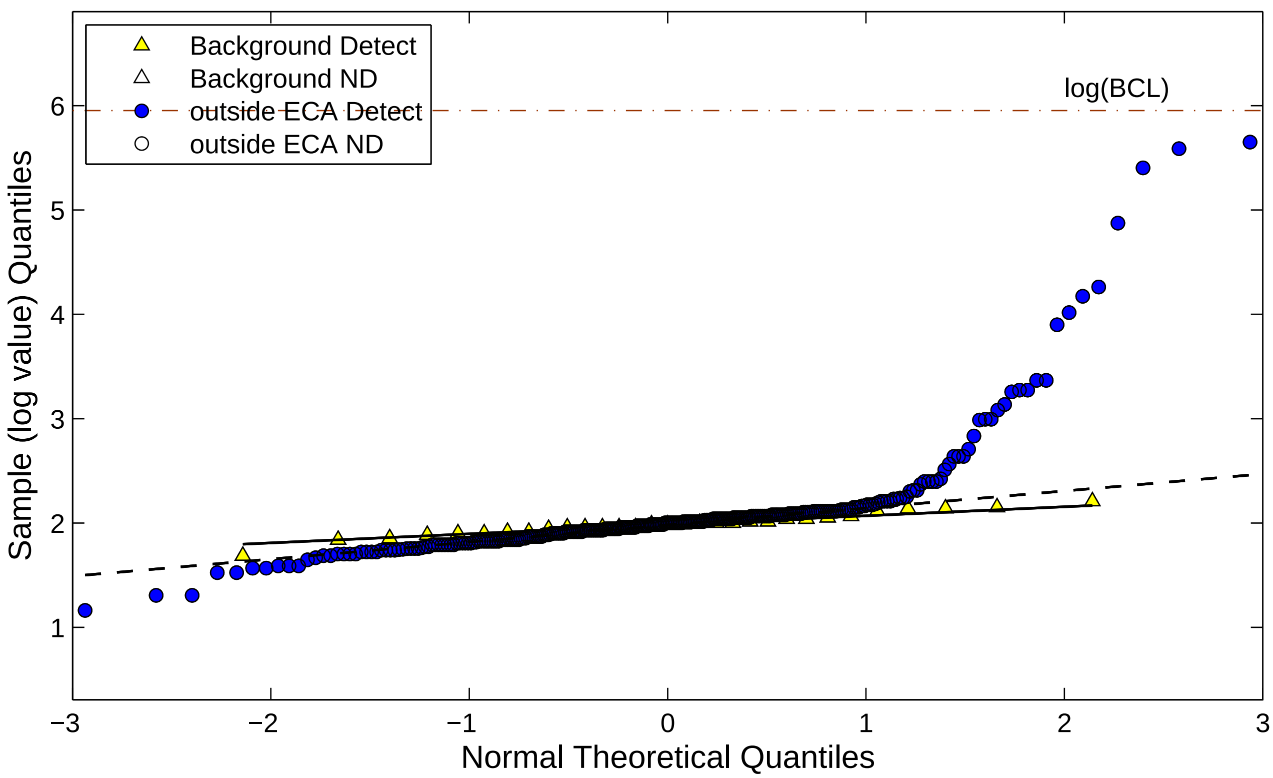
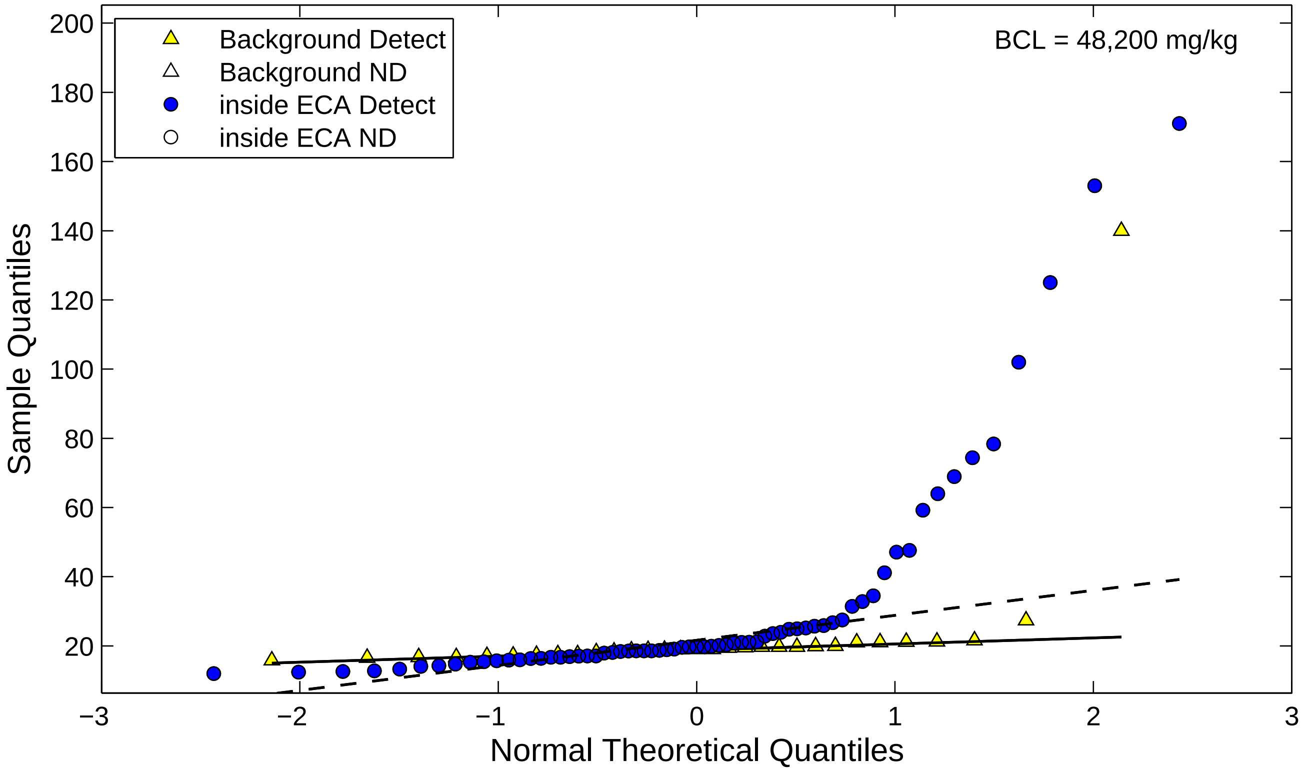


Figure C2−12A. Normal Q−Q Plots
Copper



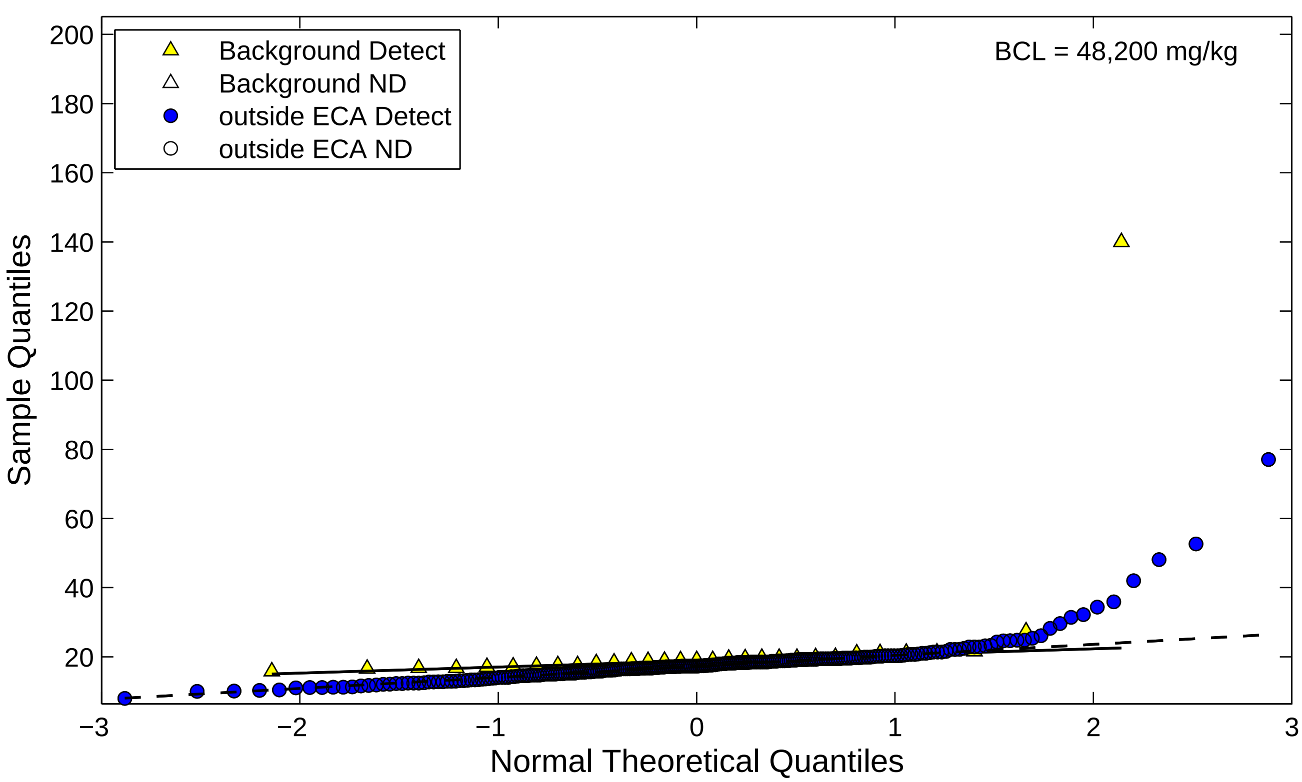
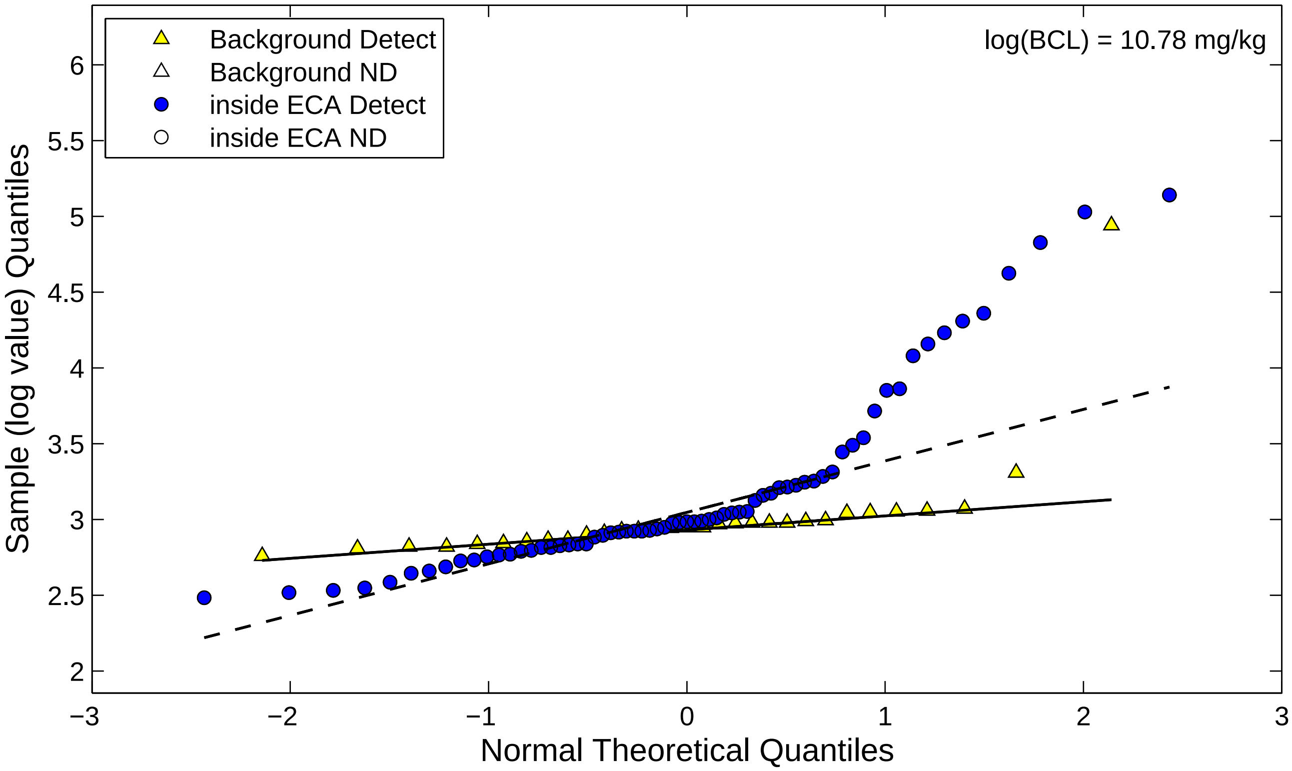


Figure C2−12B. Lognormal Q−Q Plots
Copper



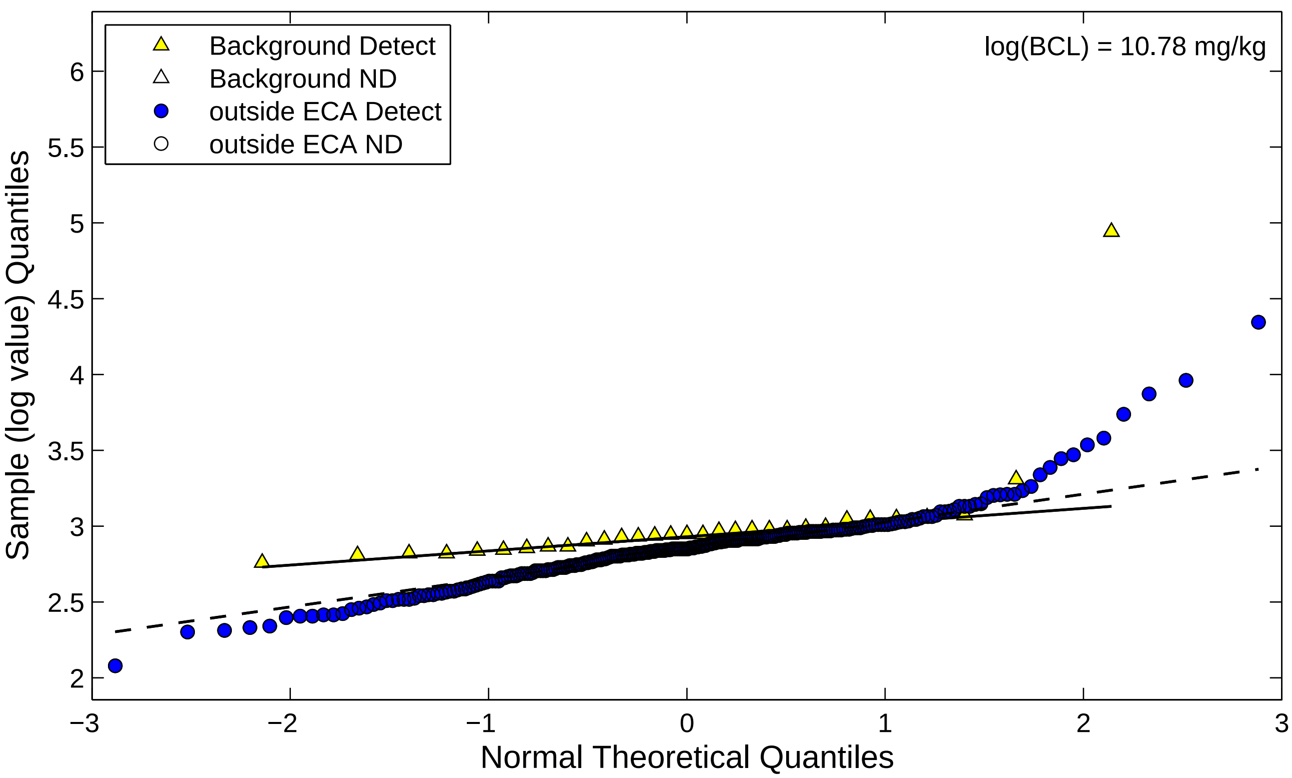
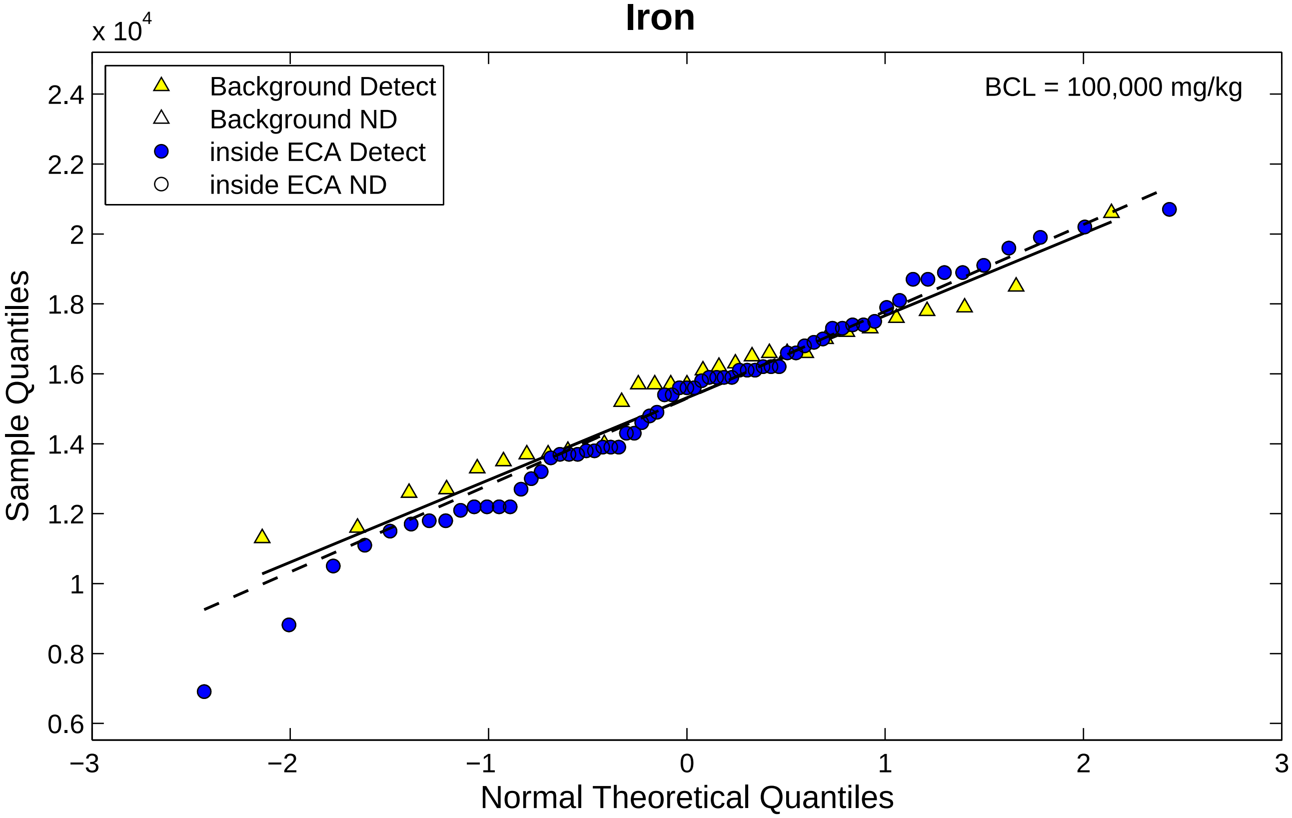


Figure C2−13A. Normal Q−Q Plots
Iron



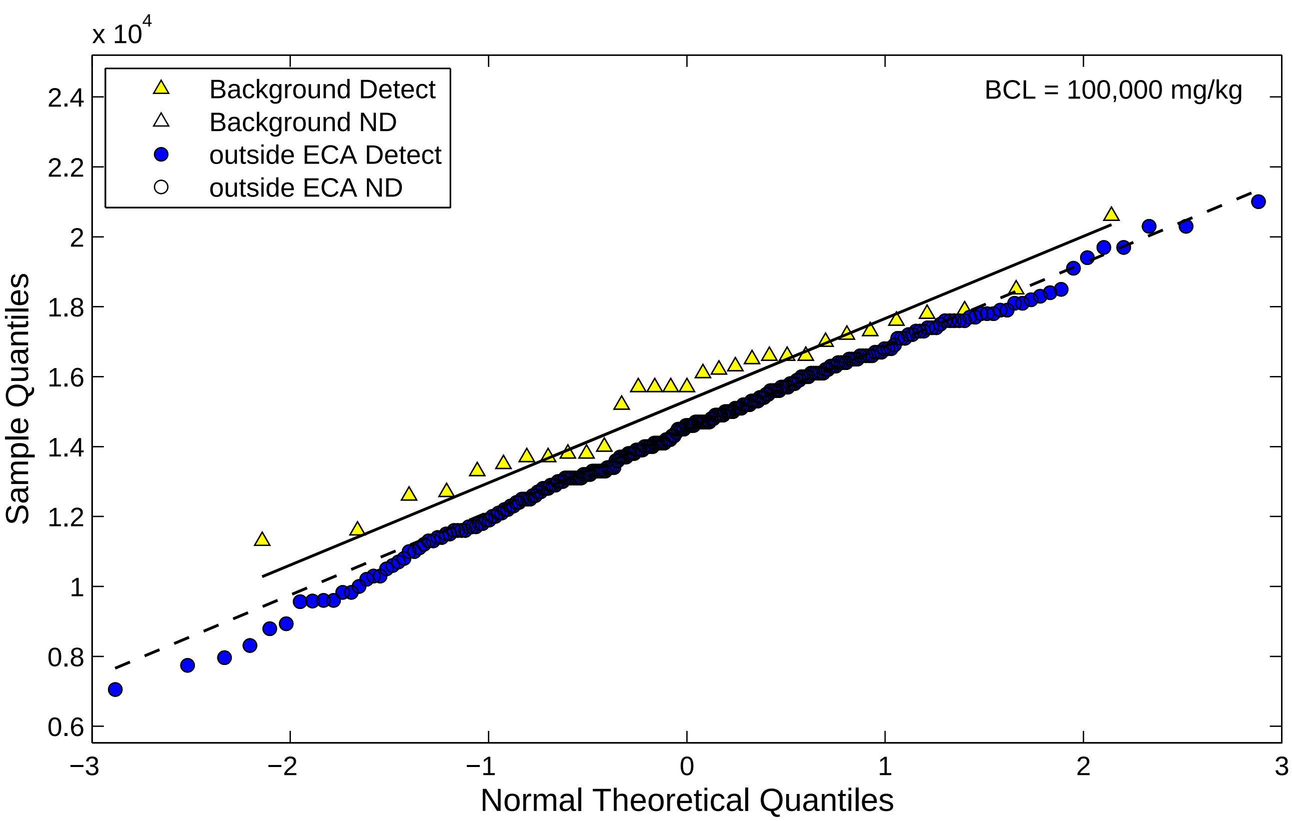
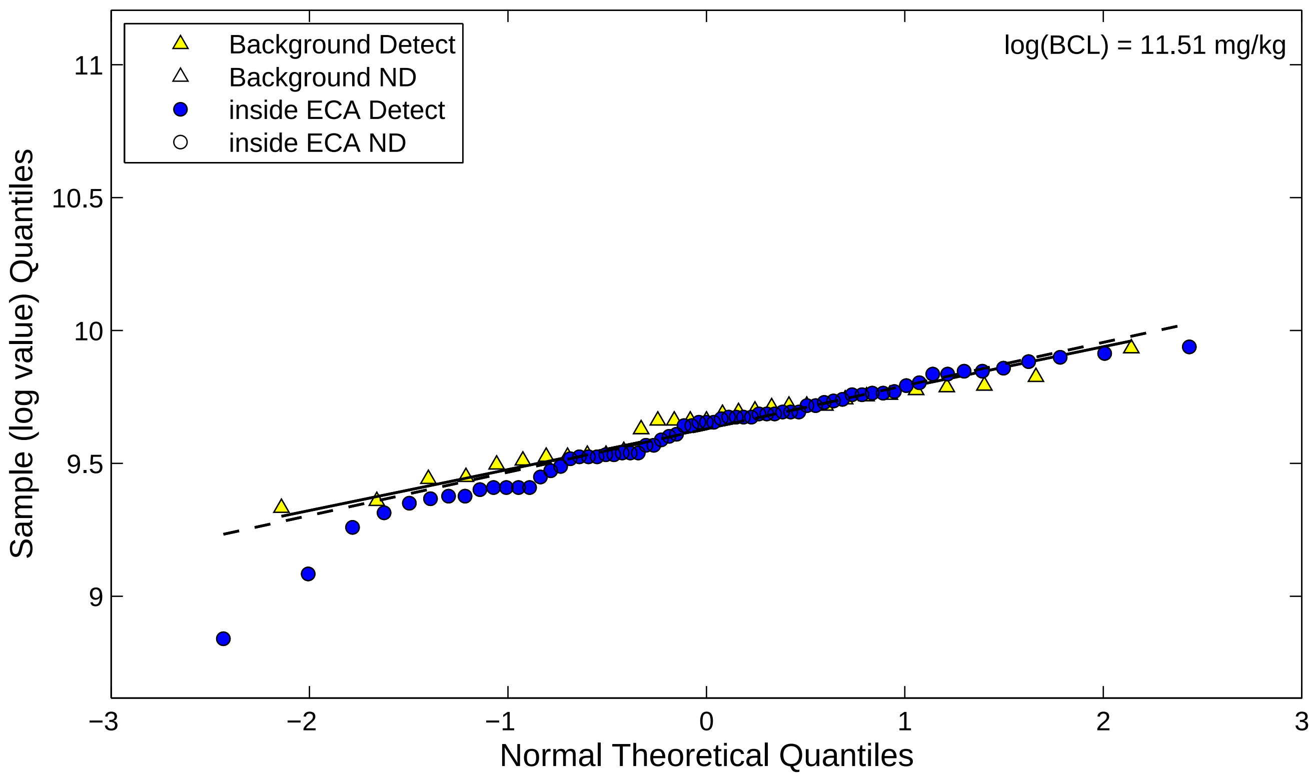


Figure C2−13B. Lognormal Q−Q Plots
Iron



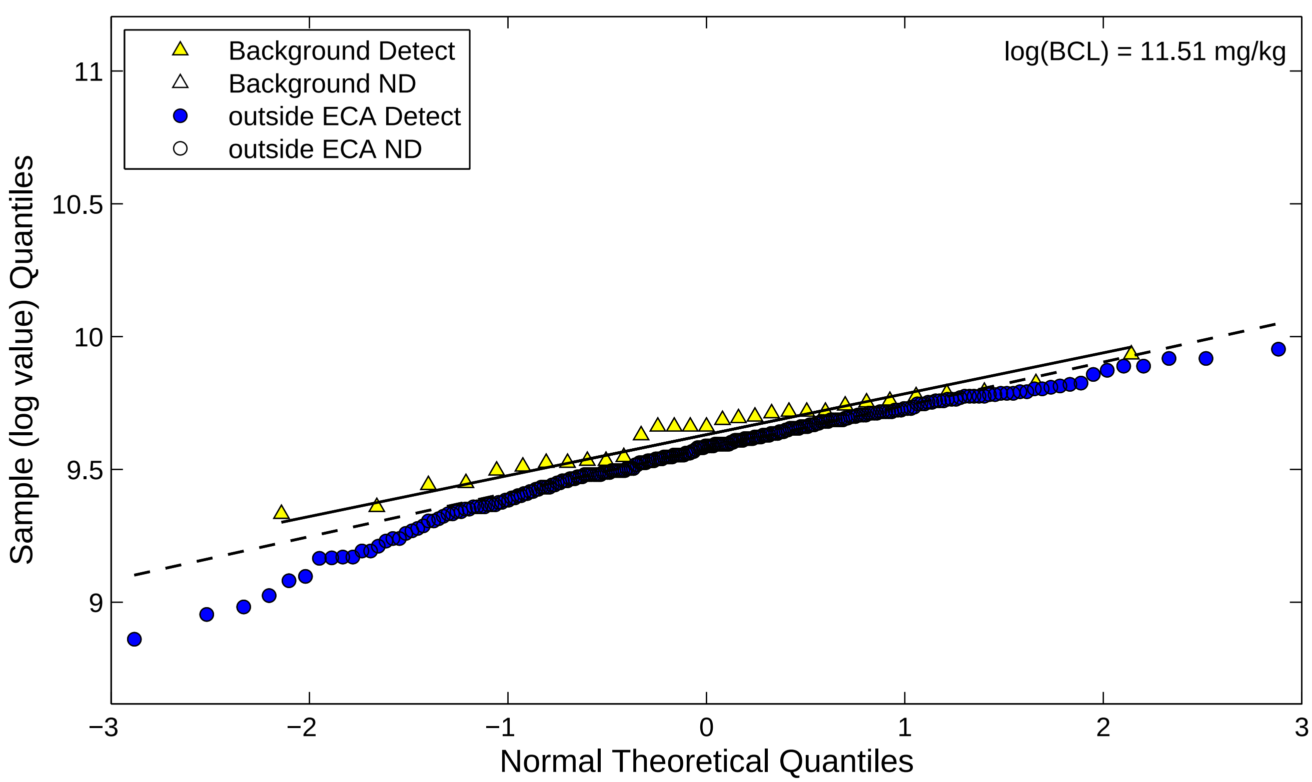


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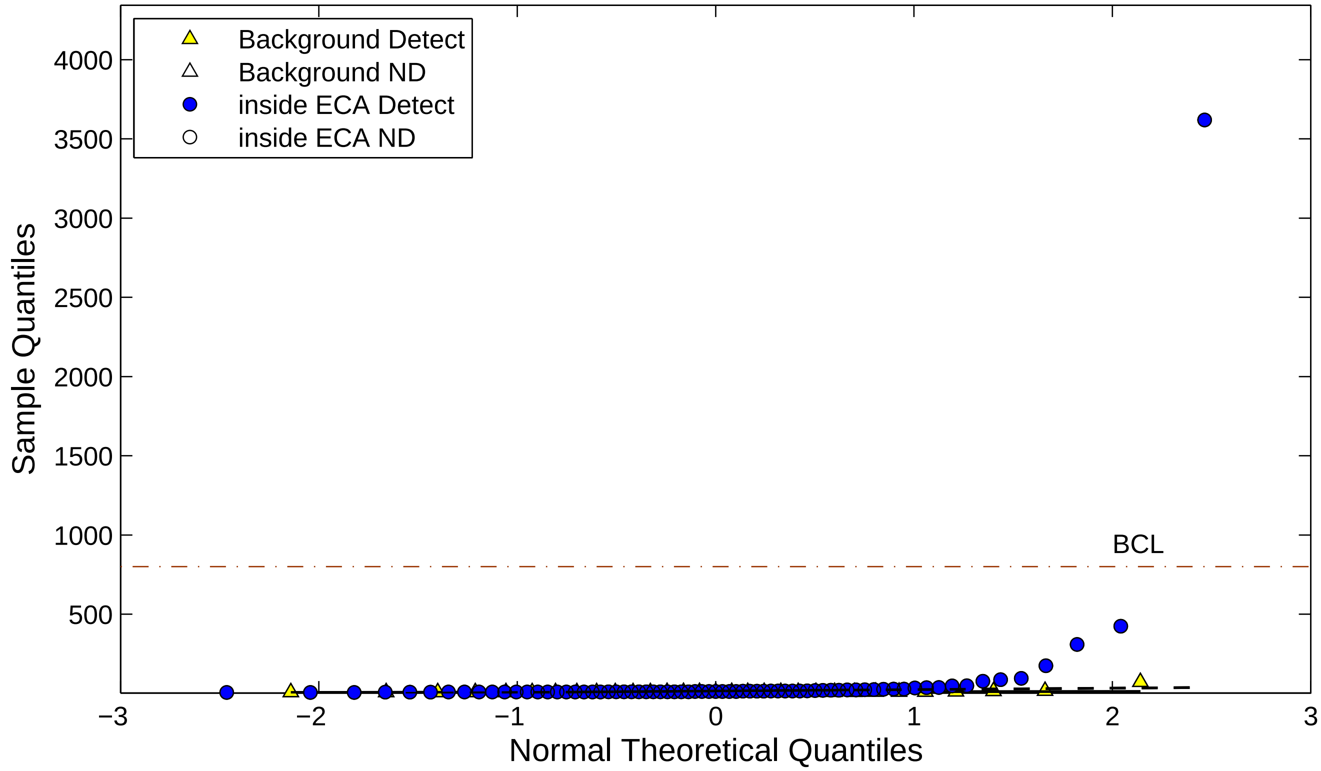
Figure C2−14A. Normal Q−Q Plots
Lead



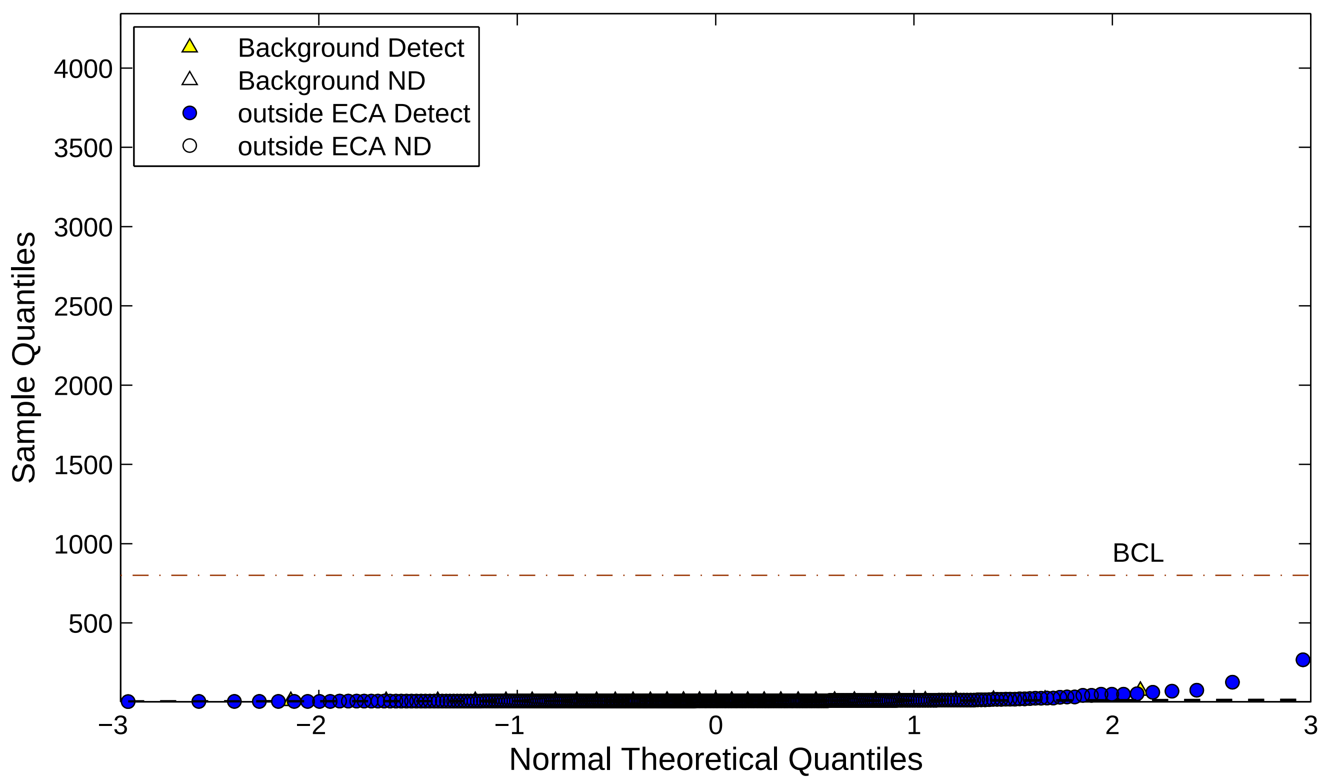
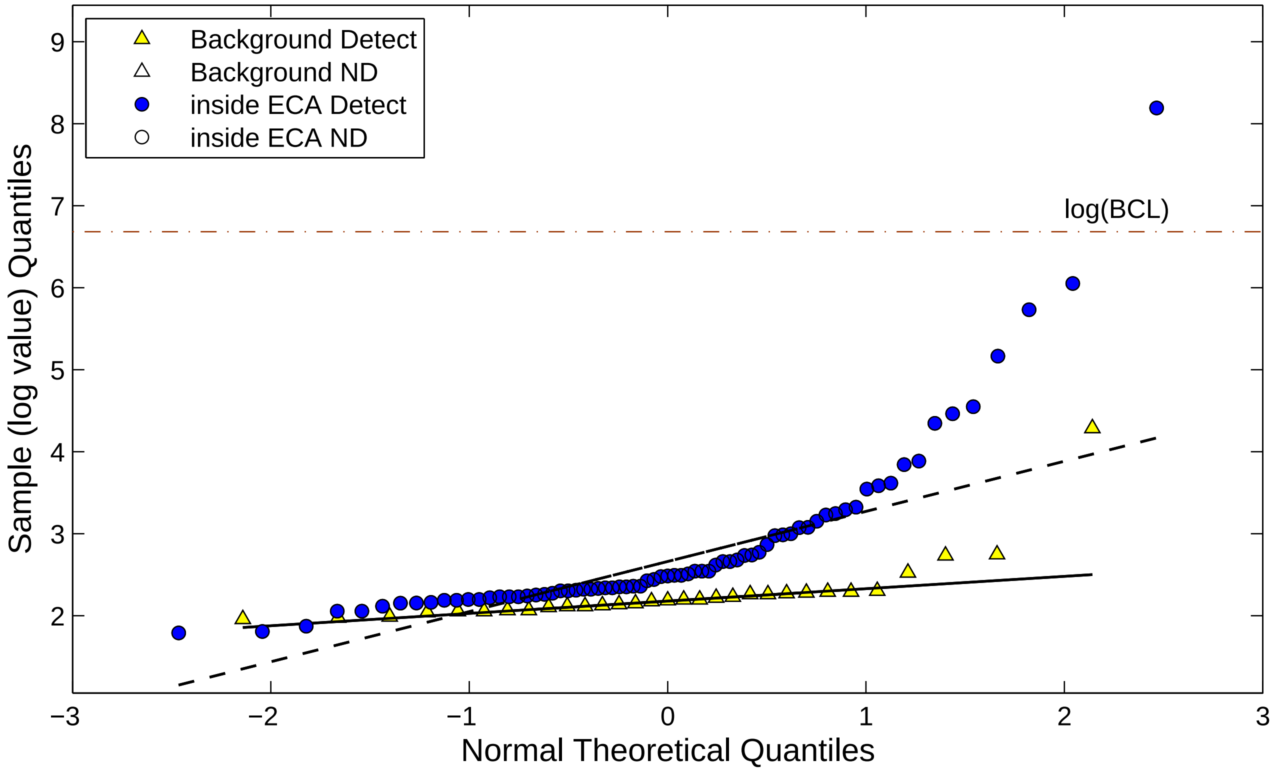


Figure C2−14B. Lognormal Q−Q Plots
Lead



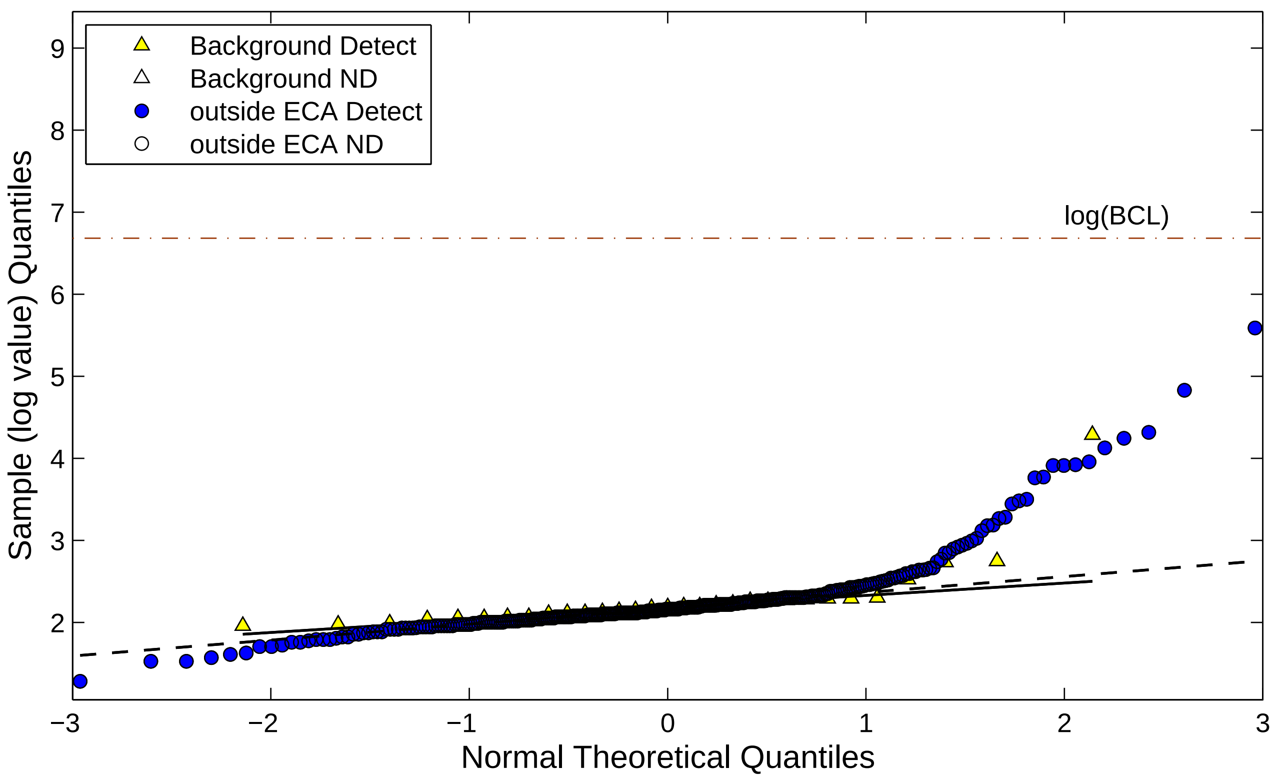
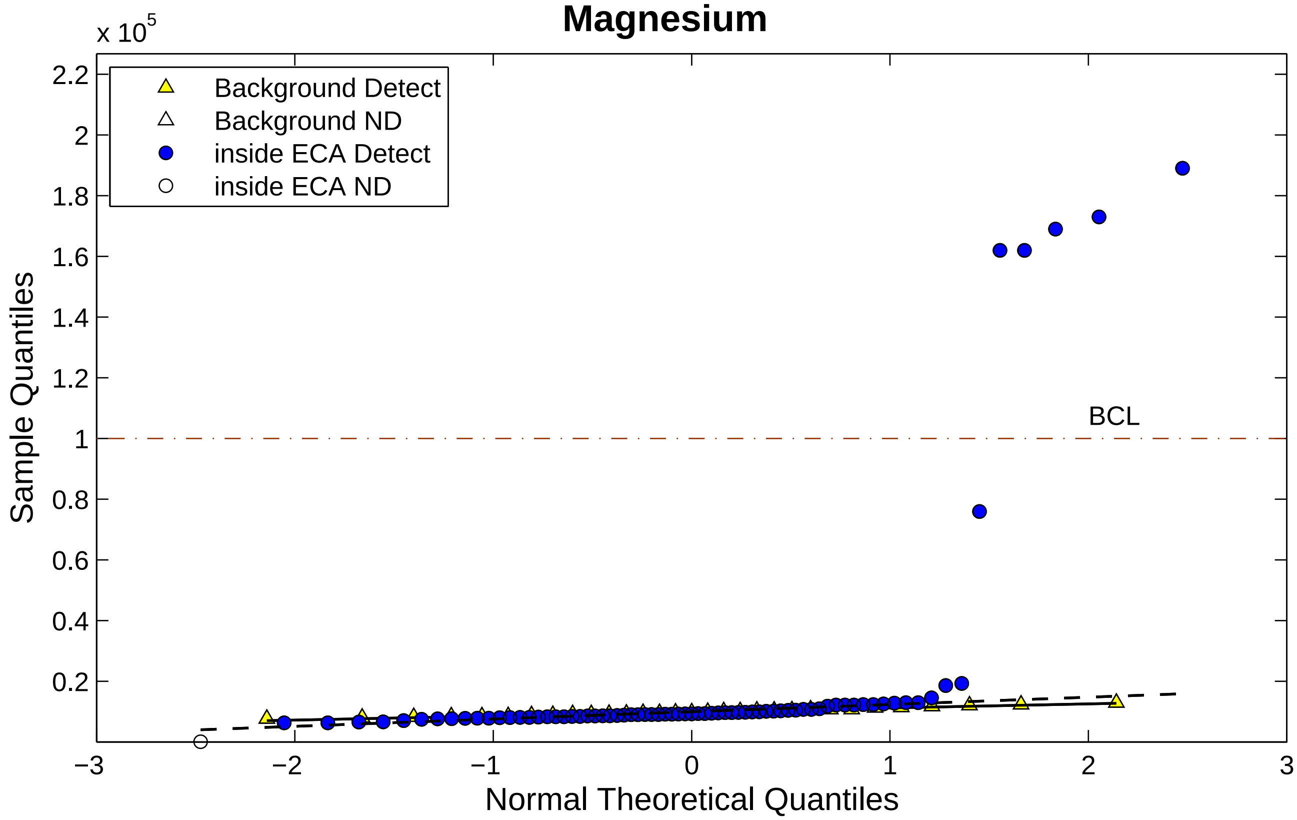


Figure C2−15A. Normal Q−Q Plots
Magnesium



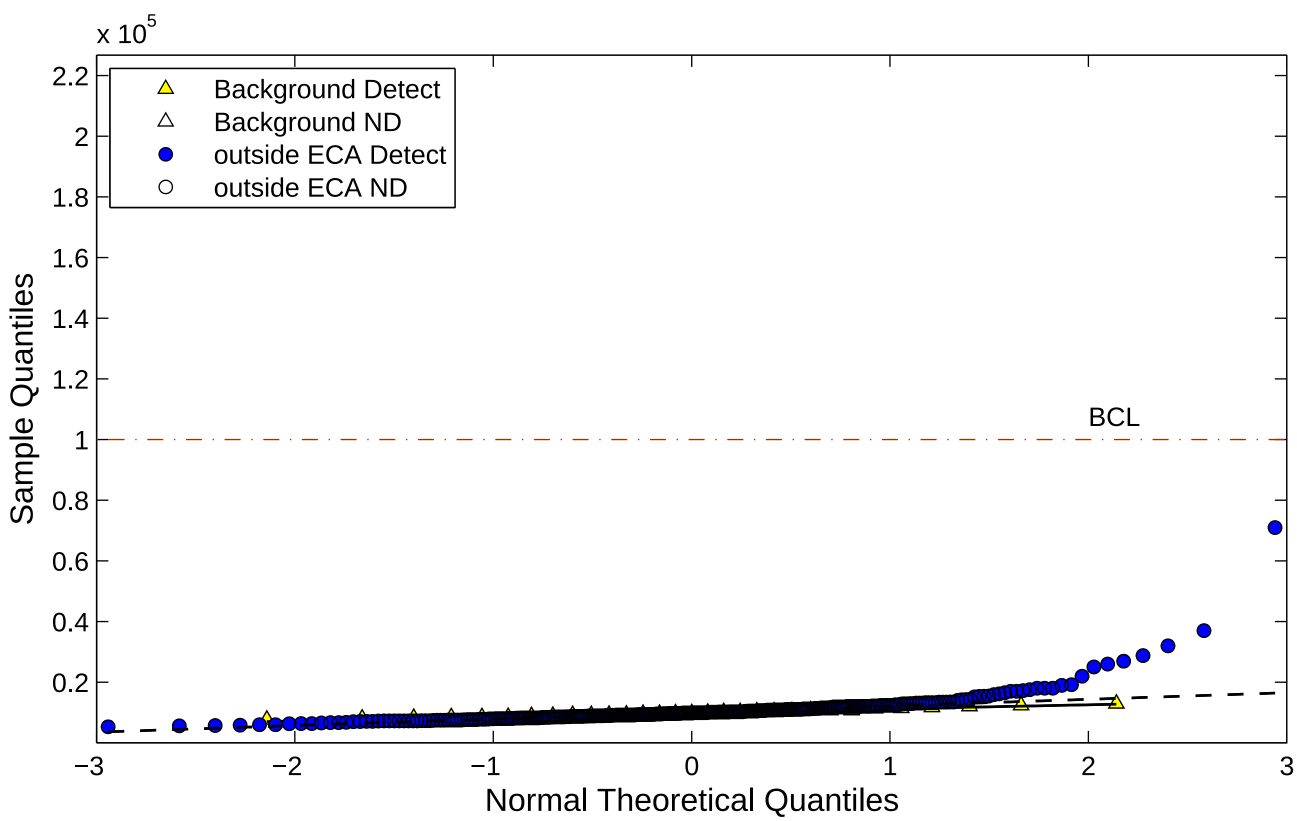
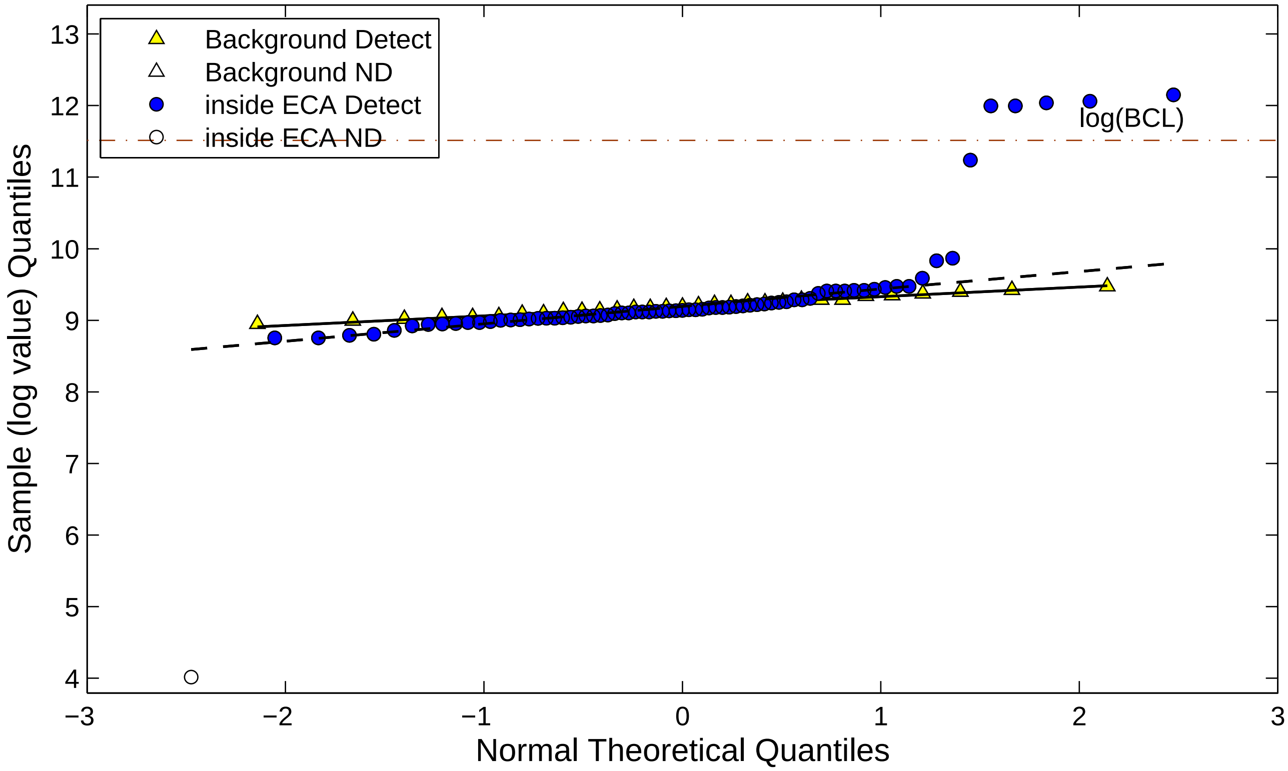


Figure C2−15B. Lognormal Q−Q Plots
Magnesium



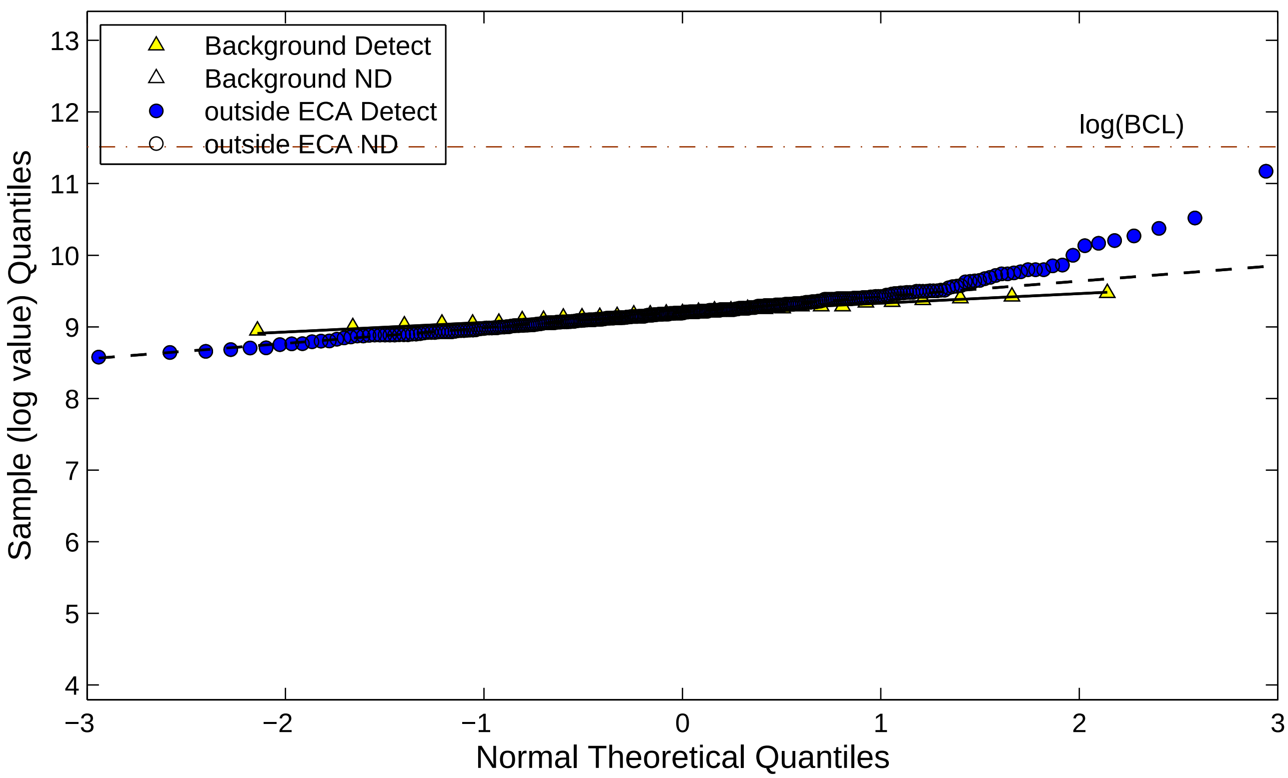
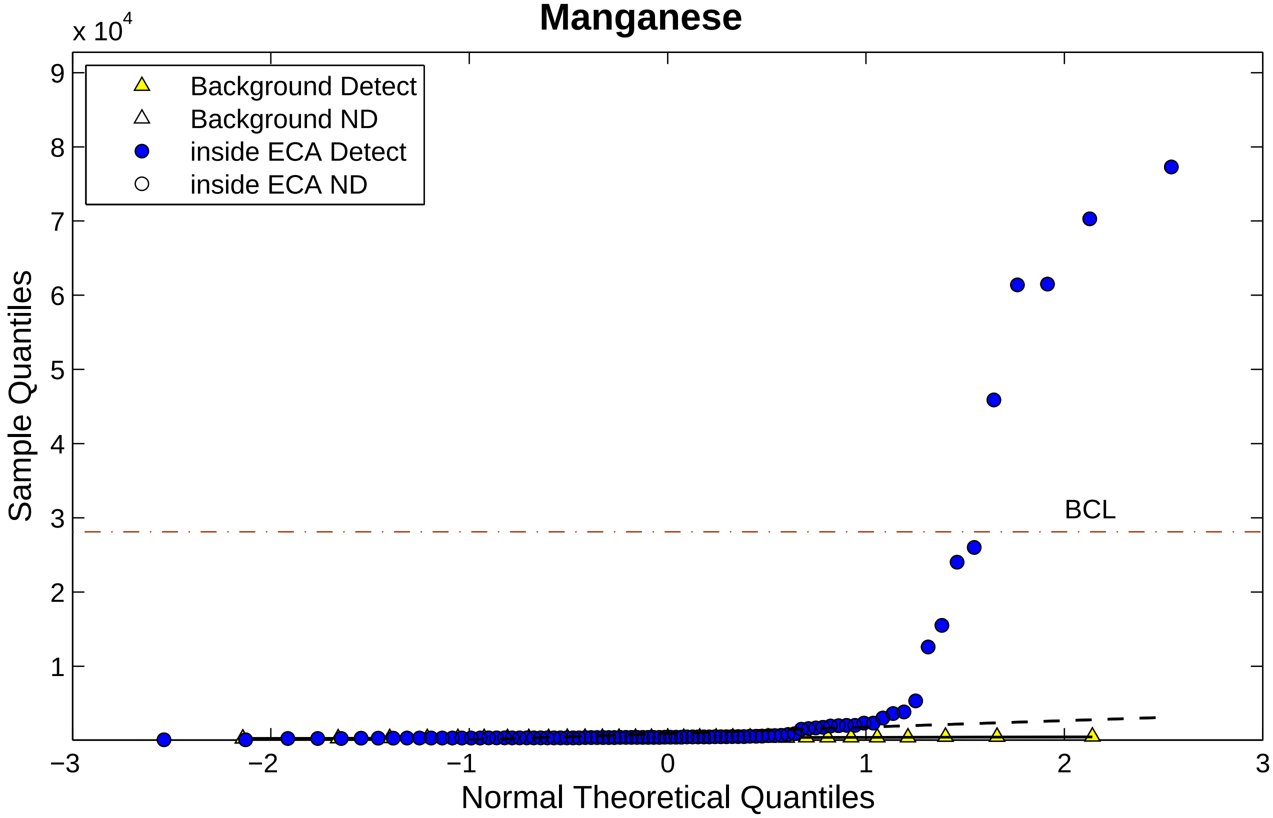


Figure C2−16A. Normal Q−Q Plots
Manganese



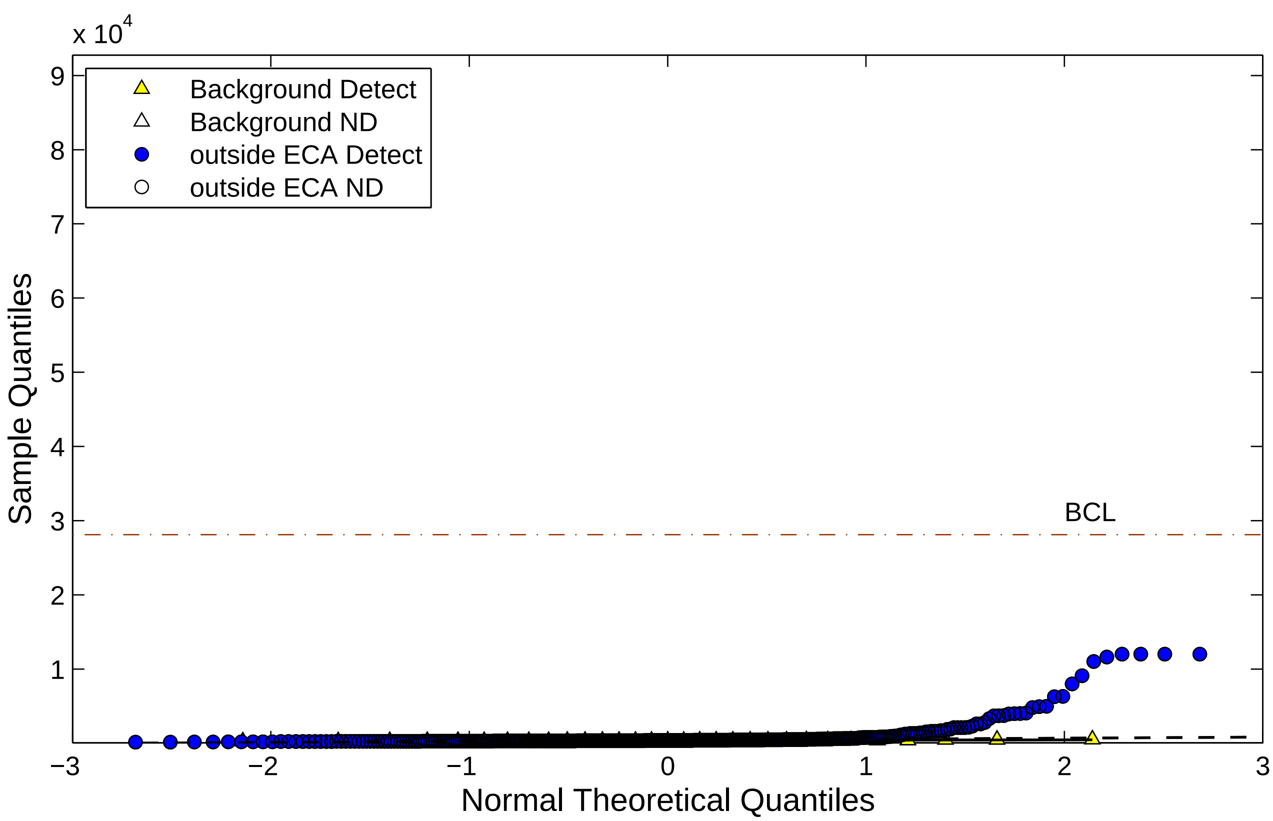
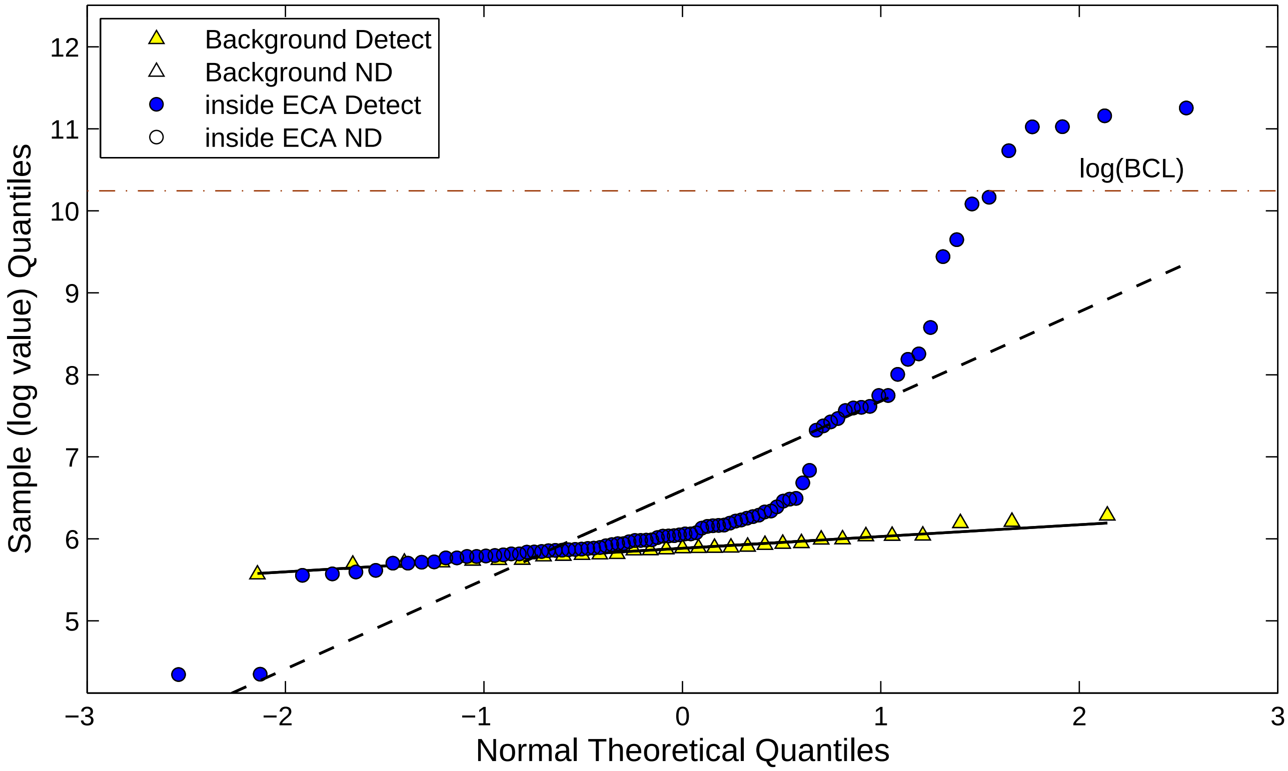


Figure C2−16B. Lognormal Q−Q Plots
Manganese



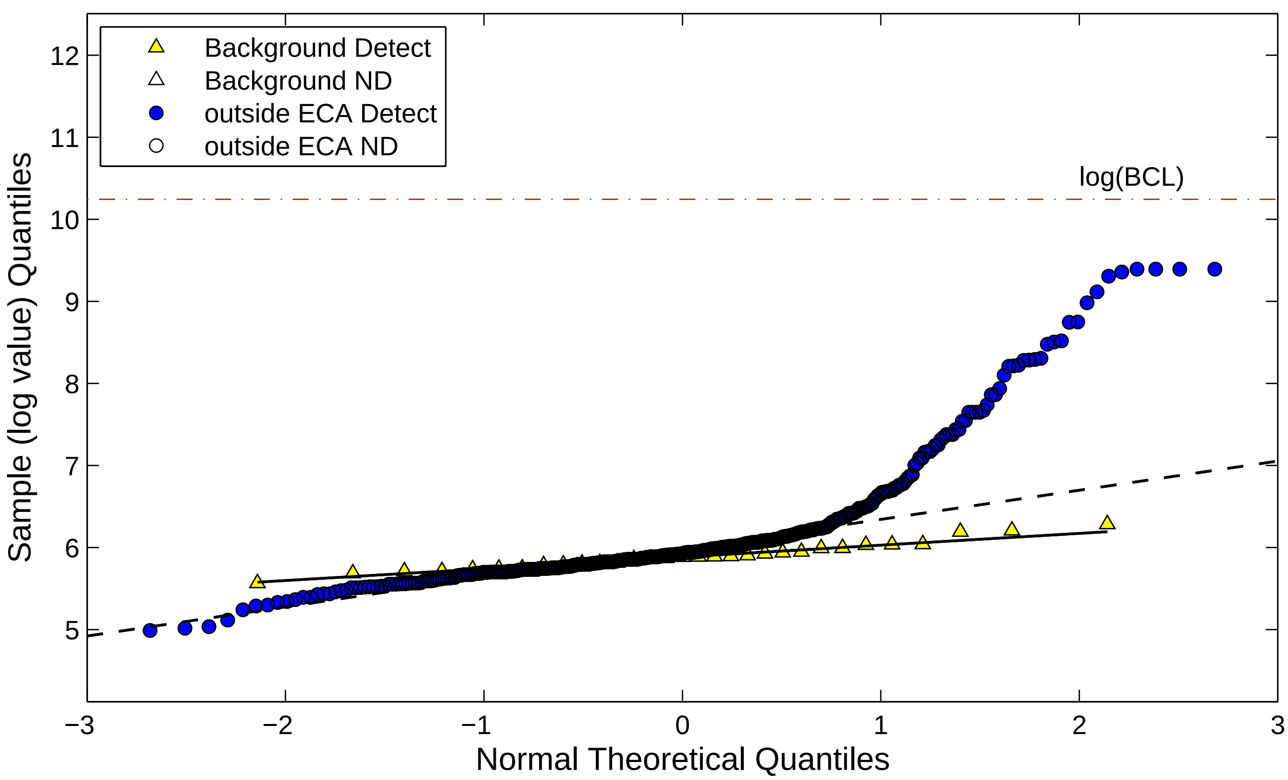


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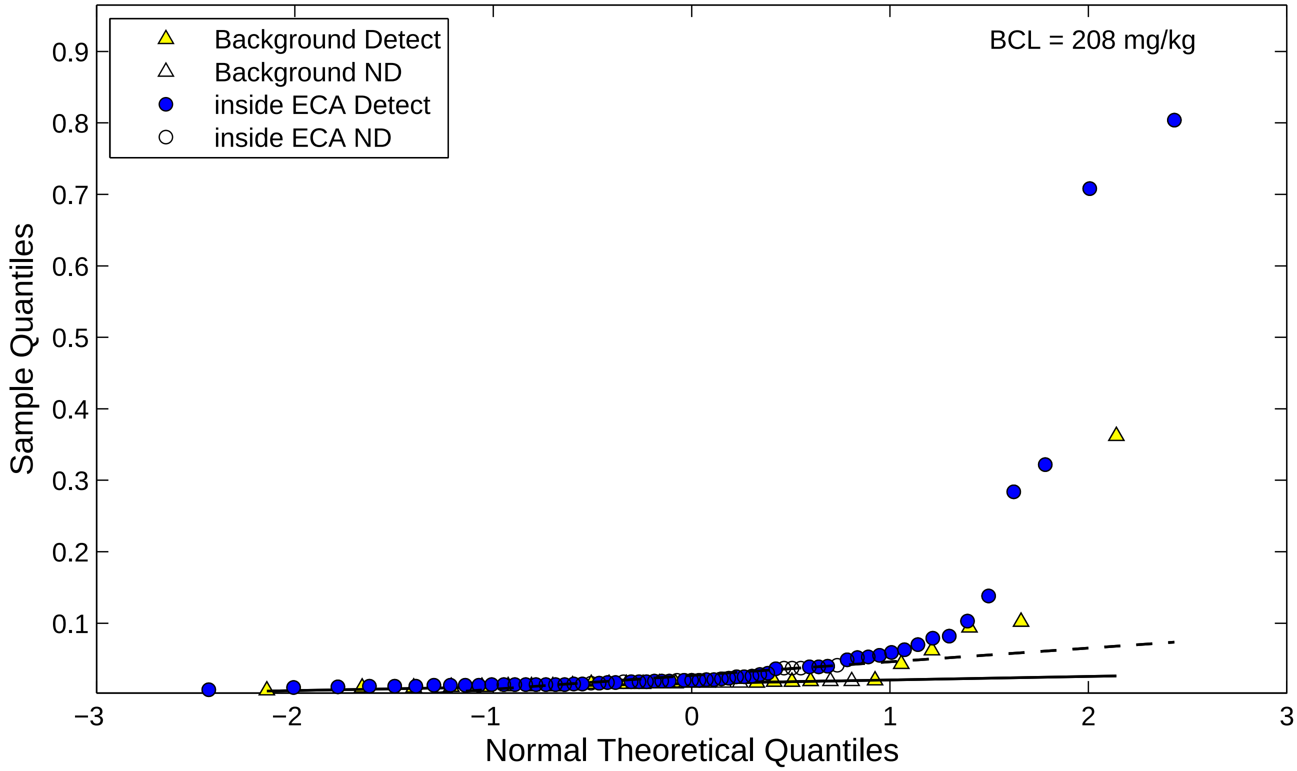
Figure C2−17A. Normal Q−Q Plots
Mercury



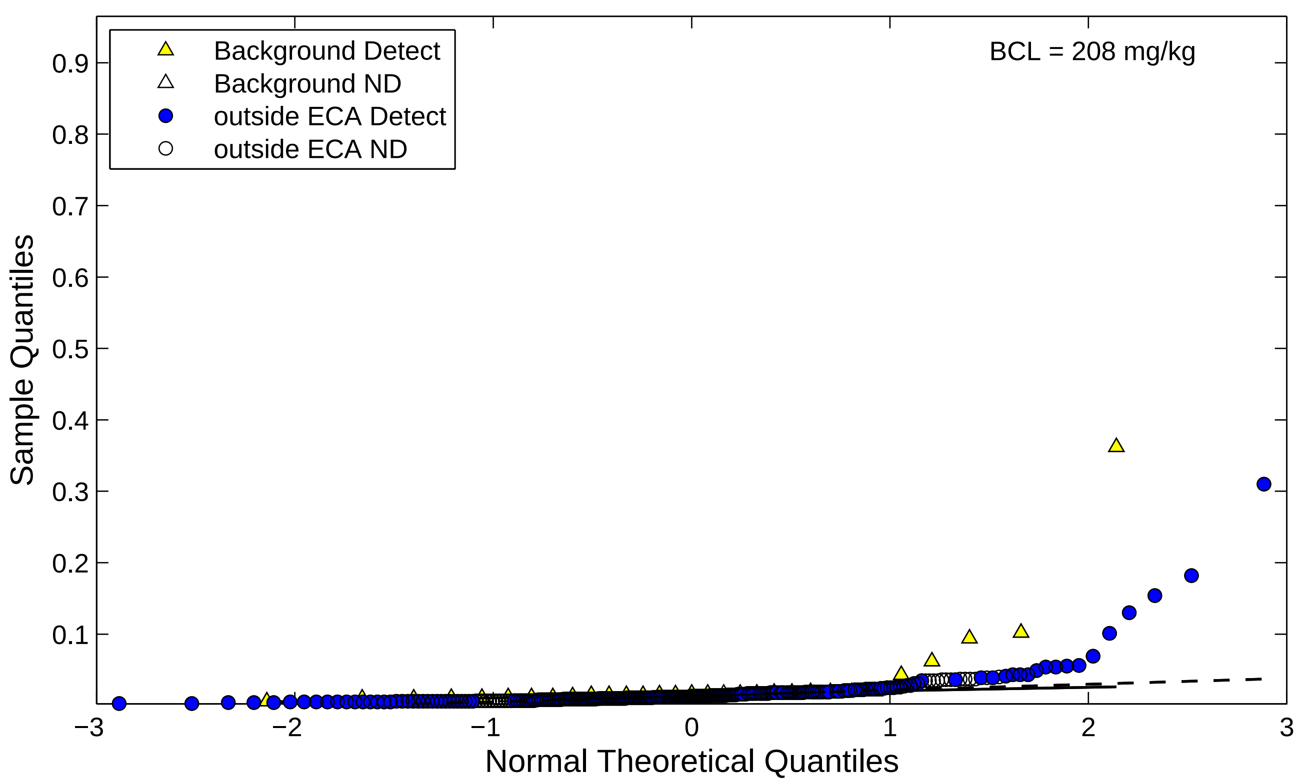
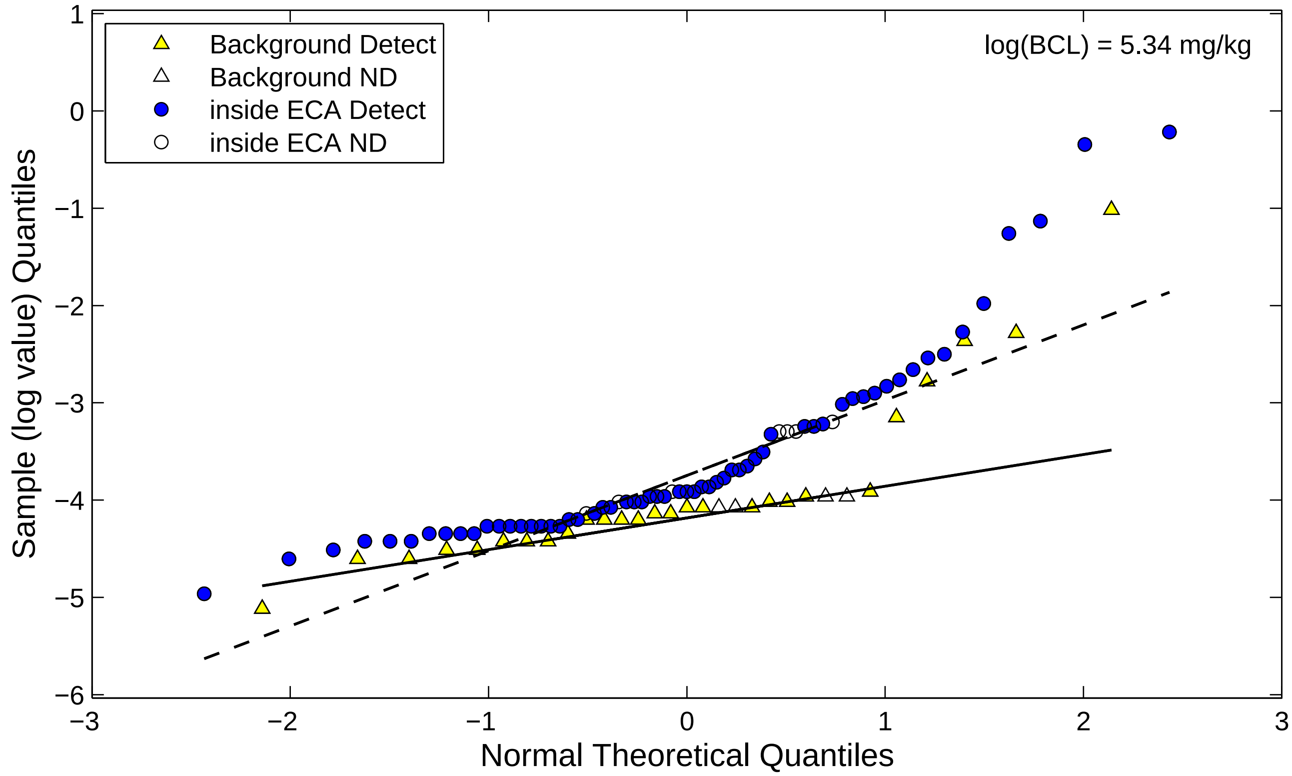


Figure C2−17B. Lognormal Q−Q Plots
Mercury



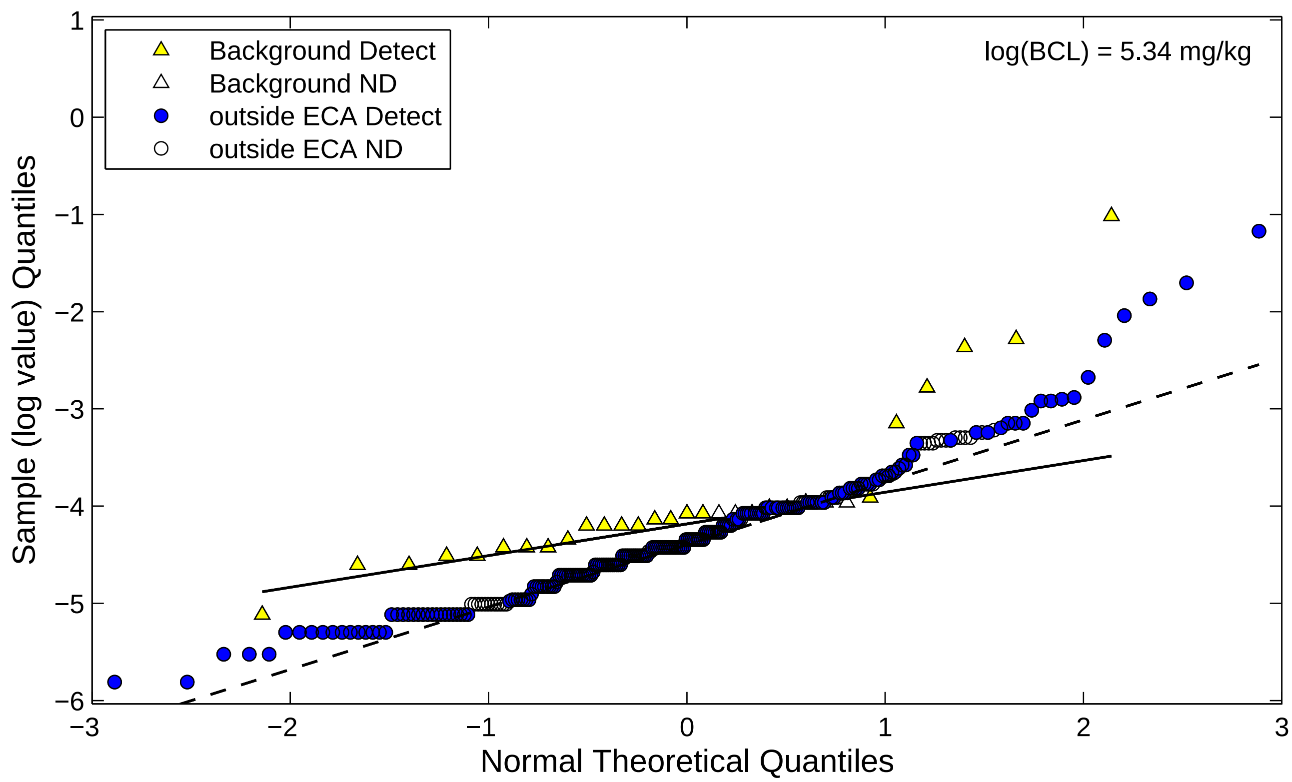
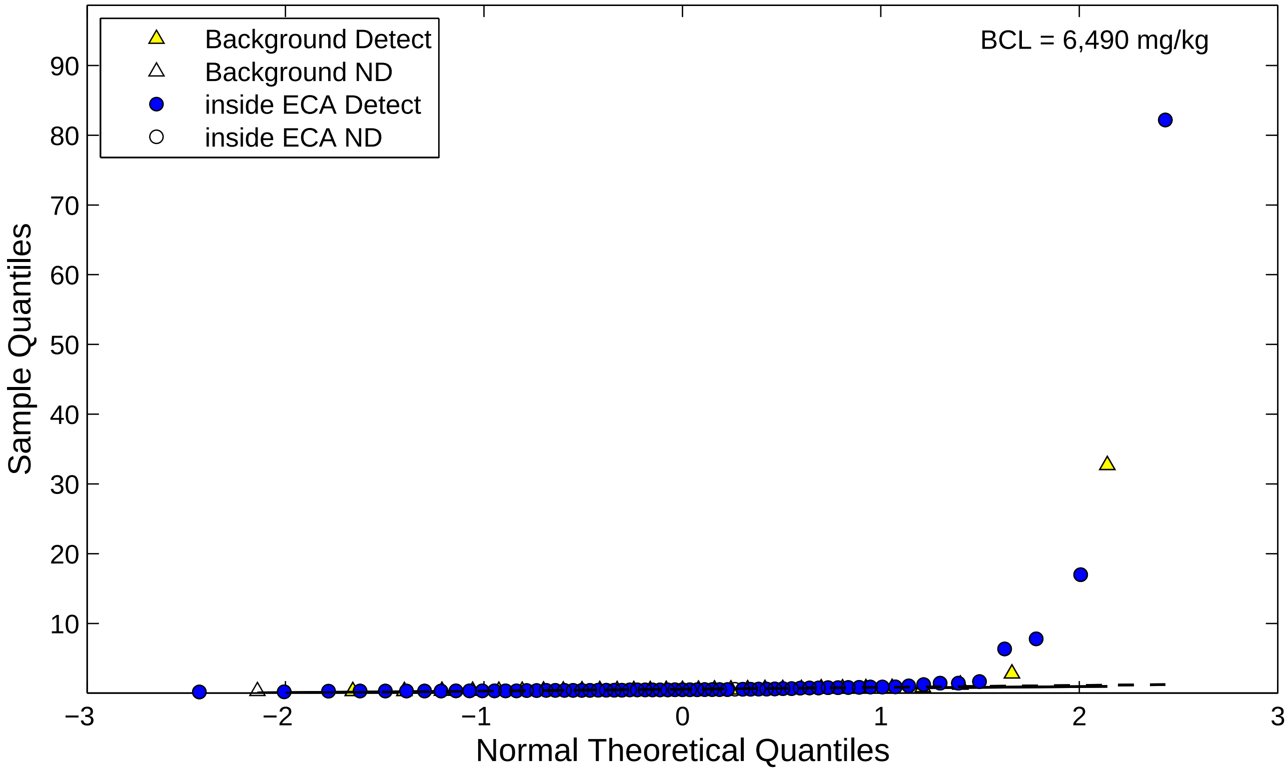


Figure C2−18A. Normal Q−Q Plots
Molybdenum



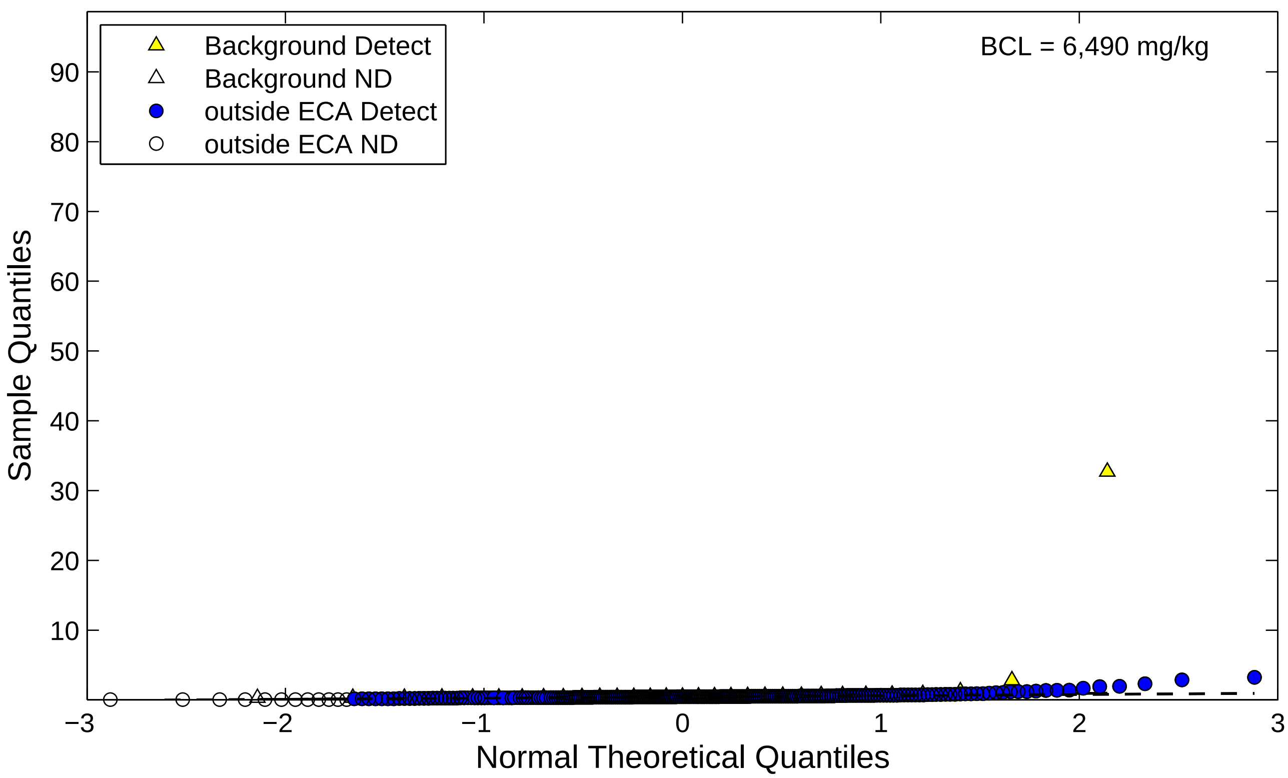
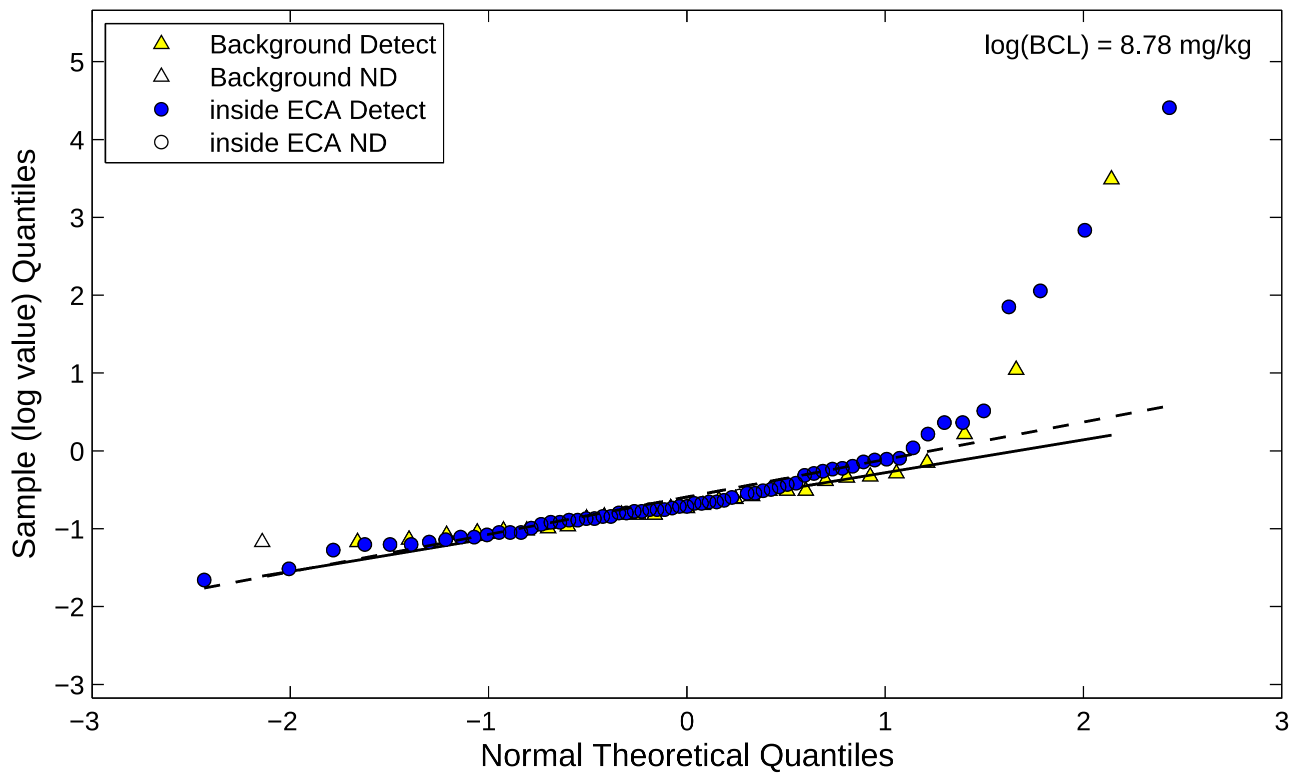


Figure C2−18B. Lognormal Q−Q Plots
Molybdenum



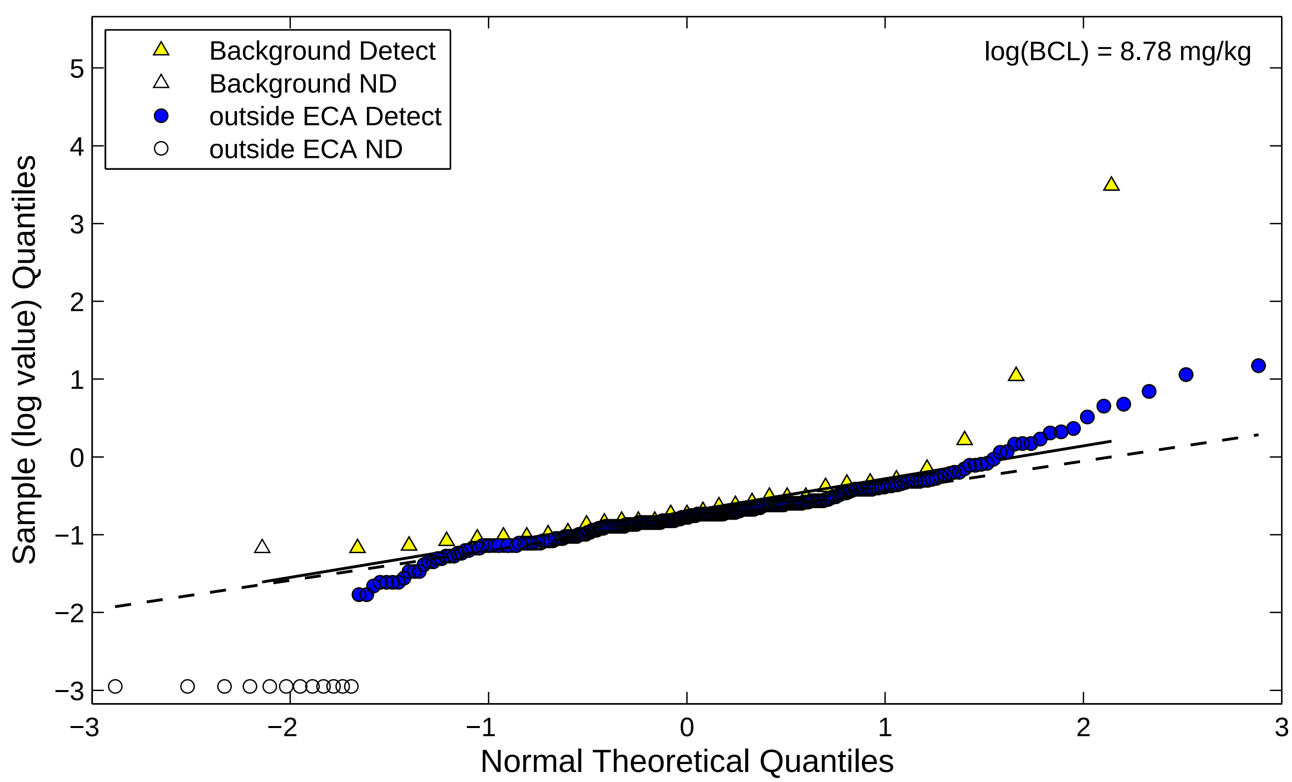


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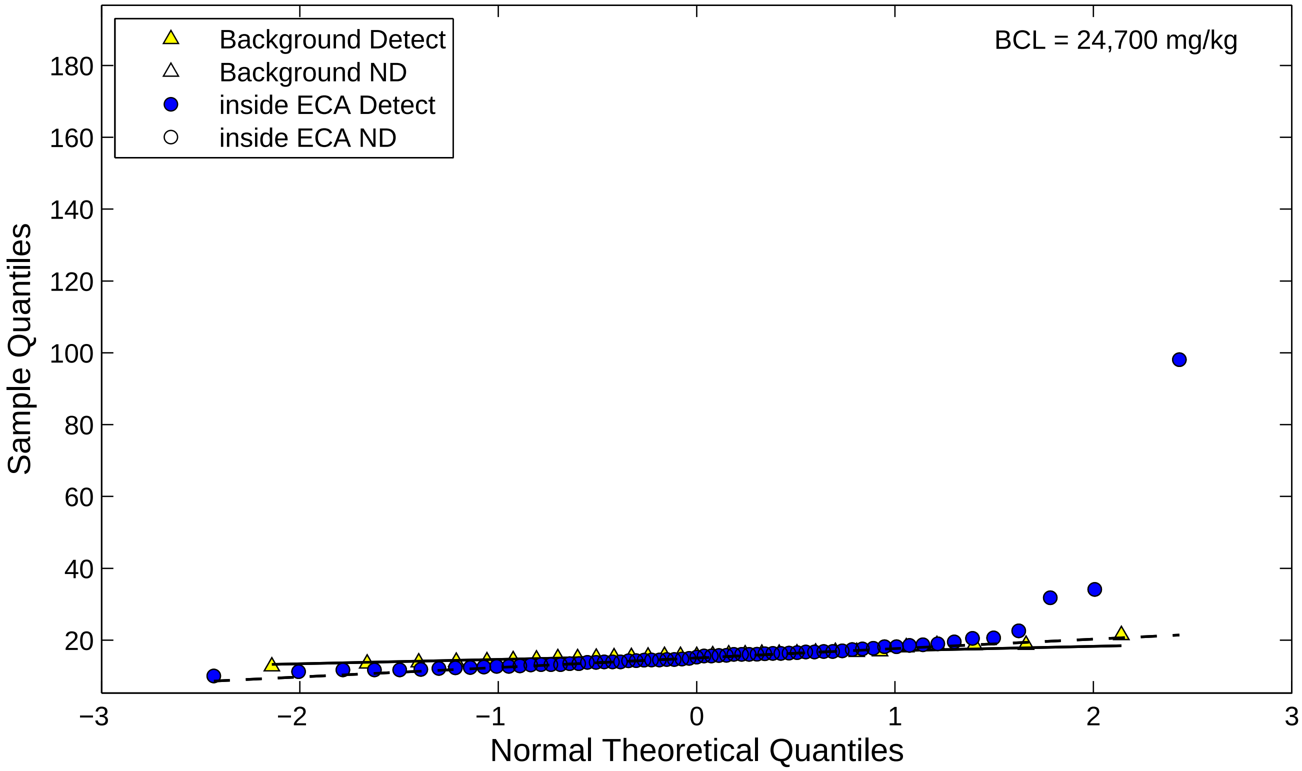
Figure C2−19A. Normal Q−Q Plots
Nickel



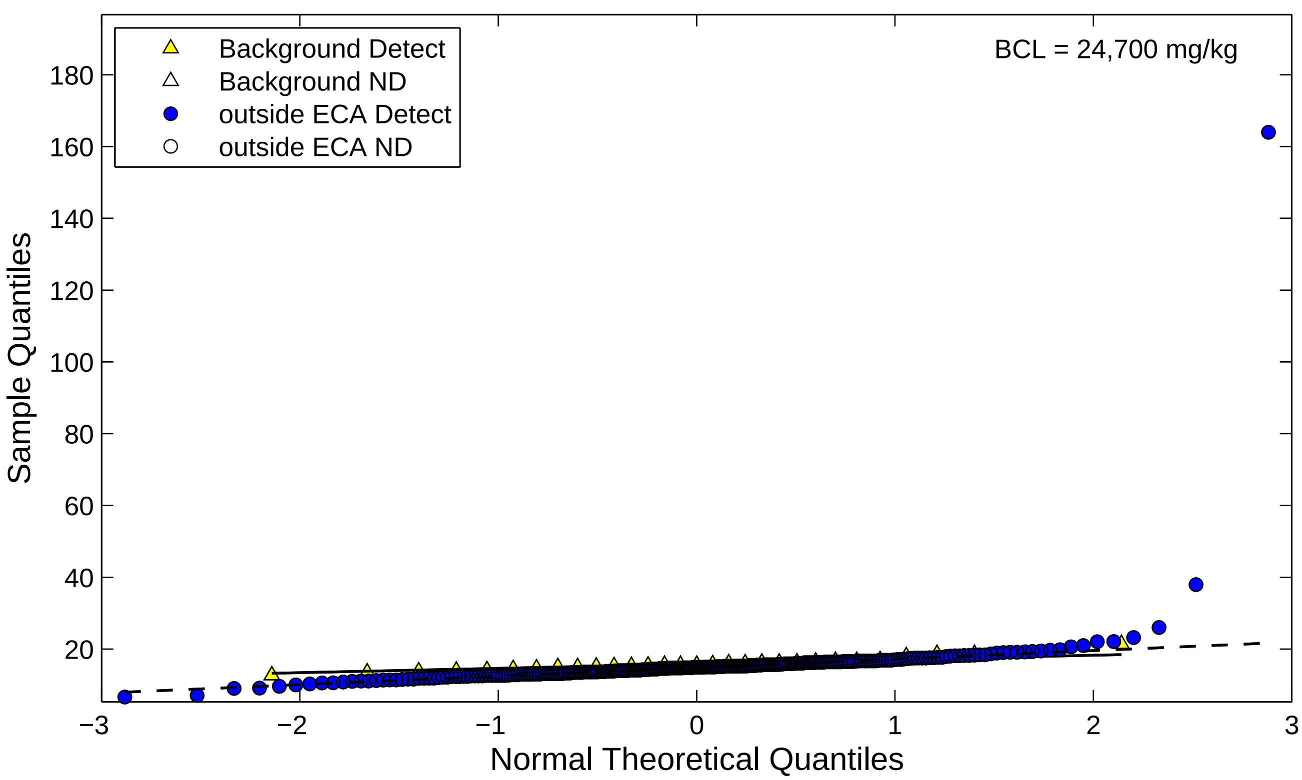
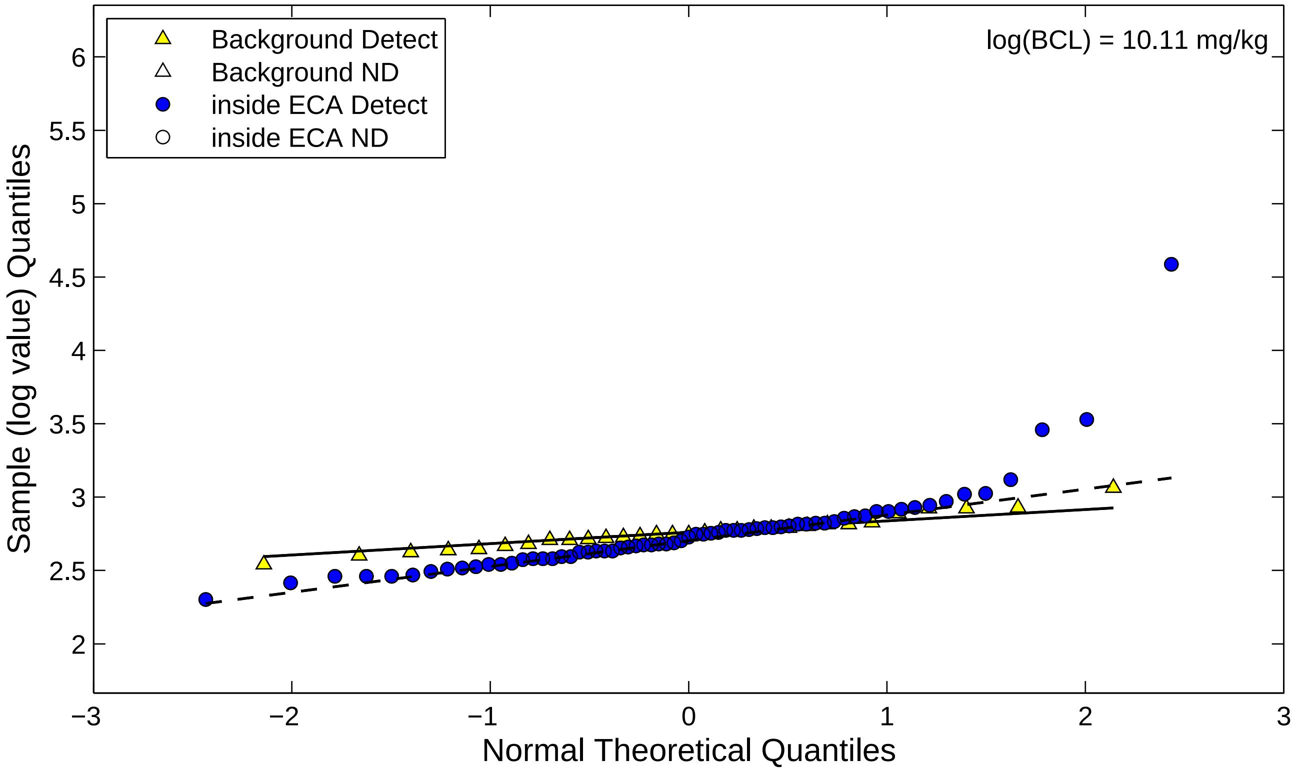


Figure C2−19B. Lognormal Q−Q Plots
Nickel



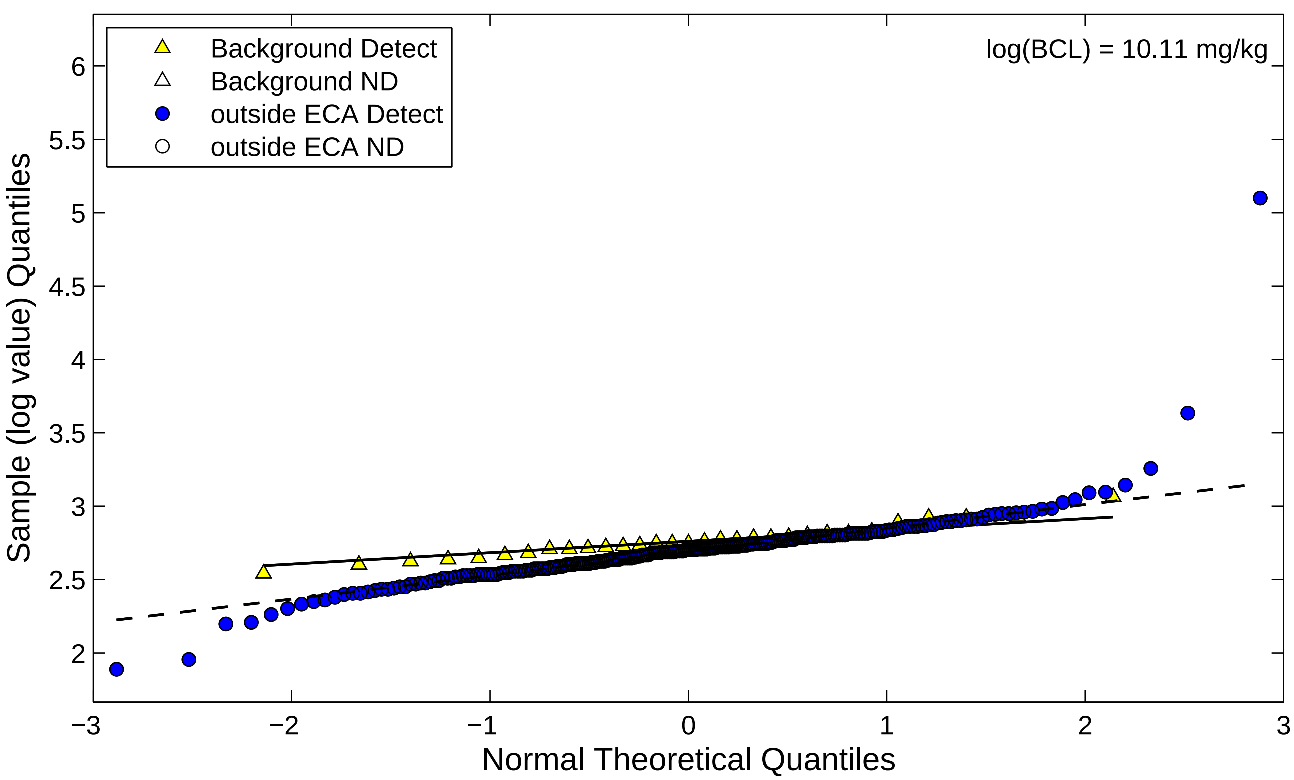
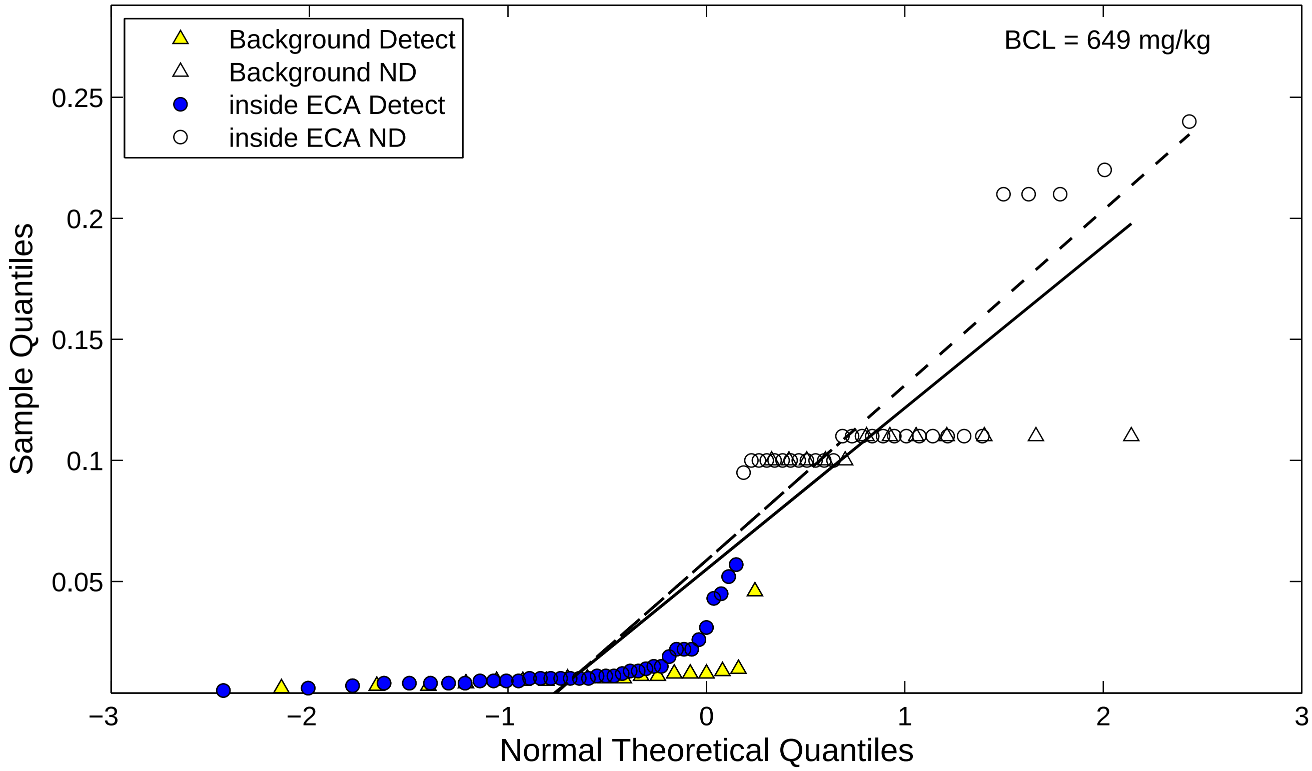


Figure C2−20A. Normal Q−Q Plots
Platinum



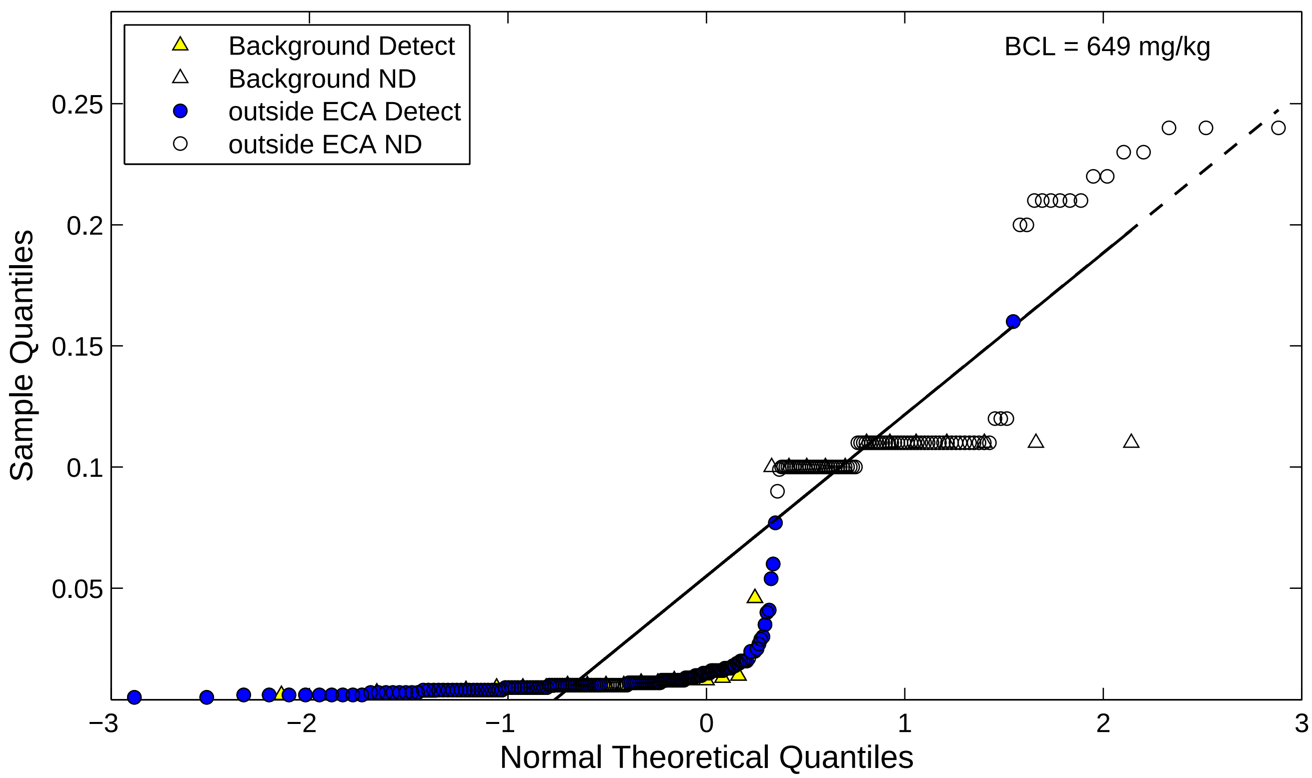
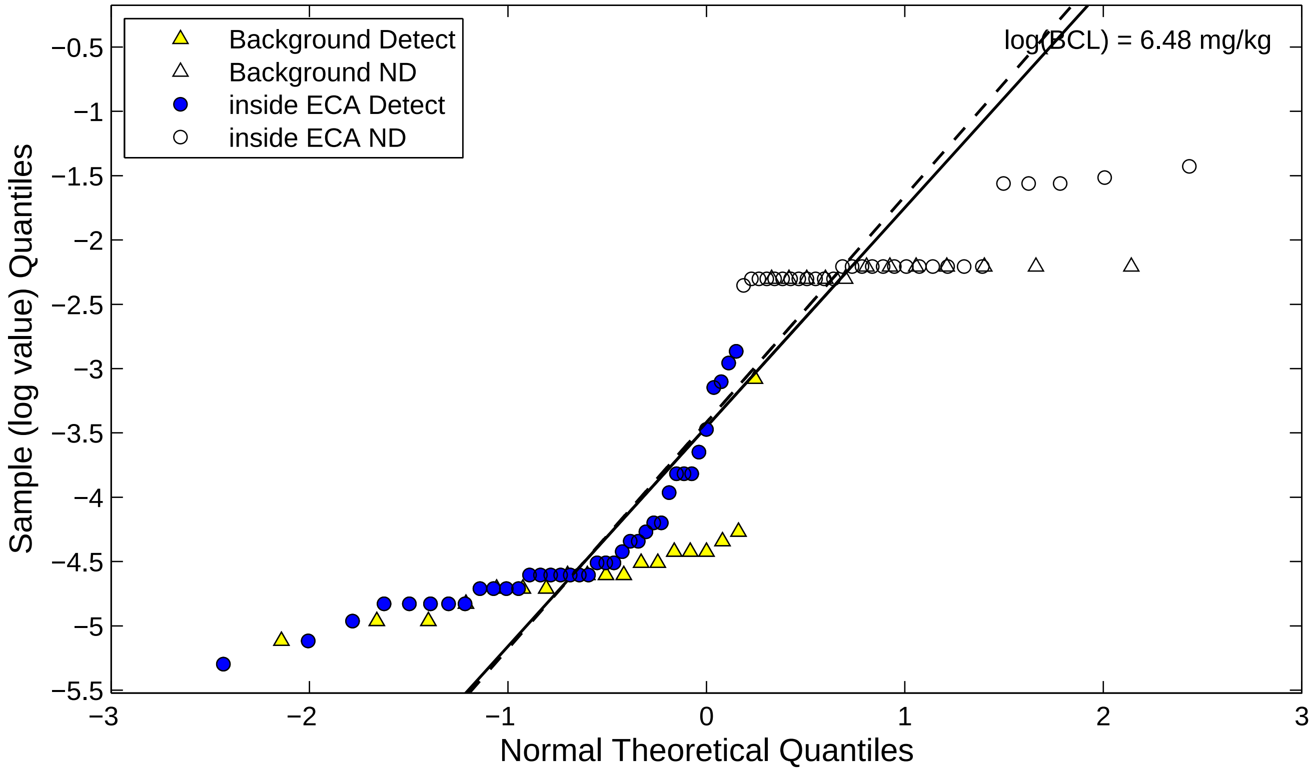


Figure C2−20B. Lognormal Q−Q Plots
Platinum



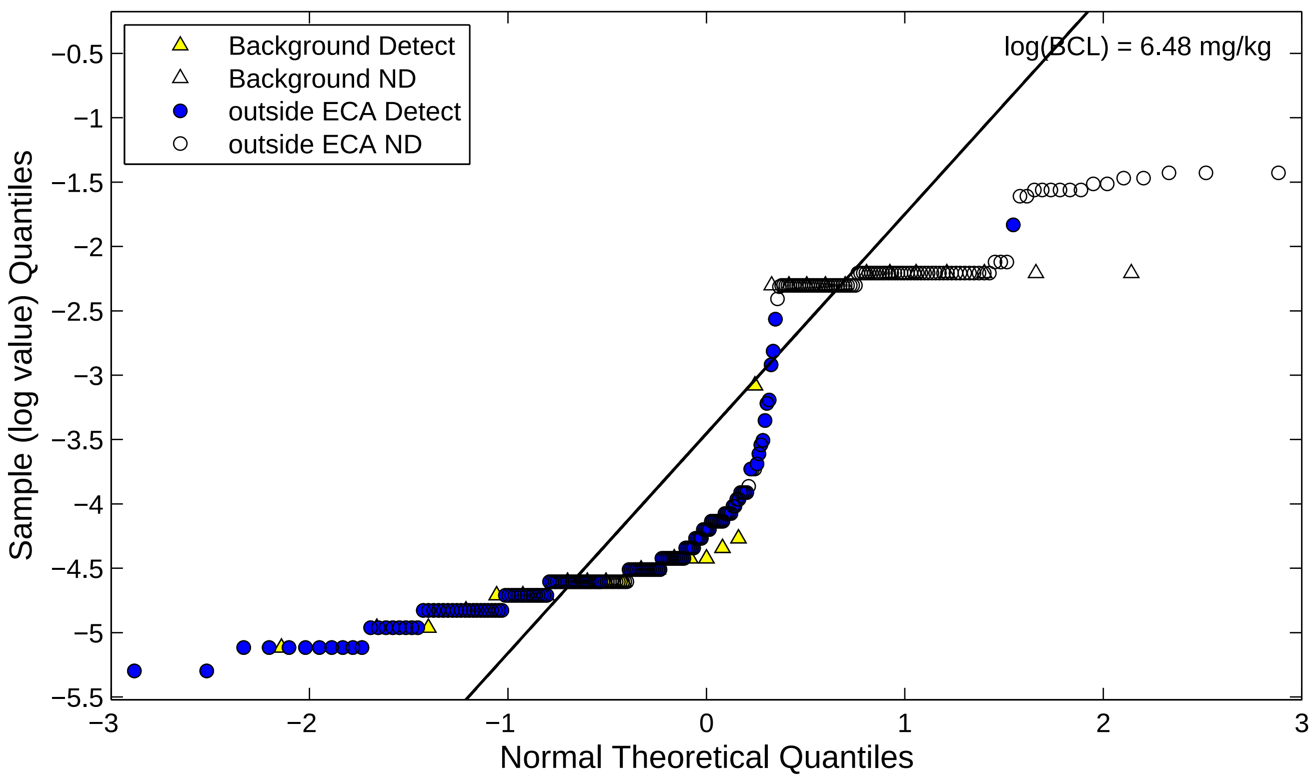


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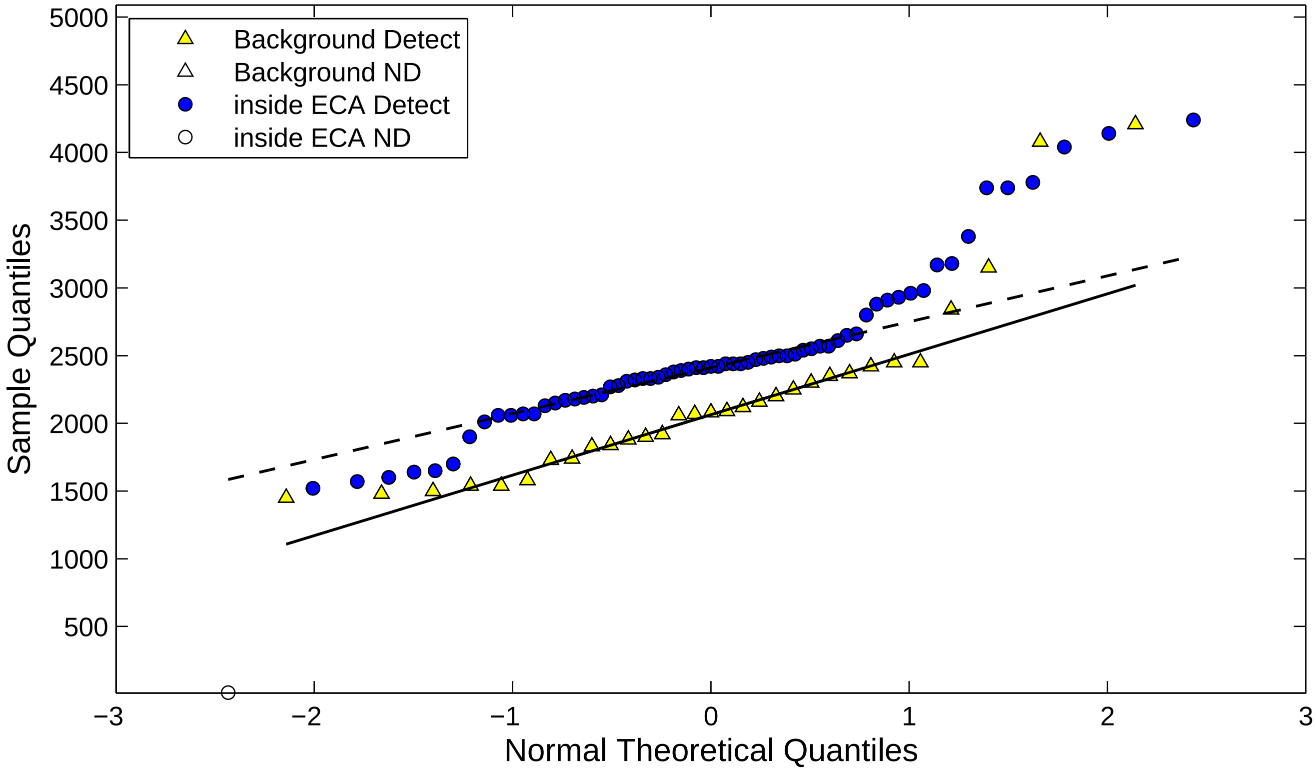
Figure C2−21A. Normal Q−Q Plots
Potassium



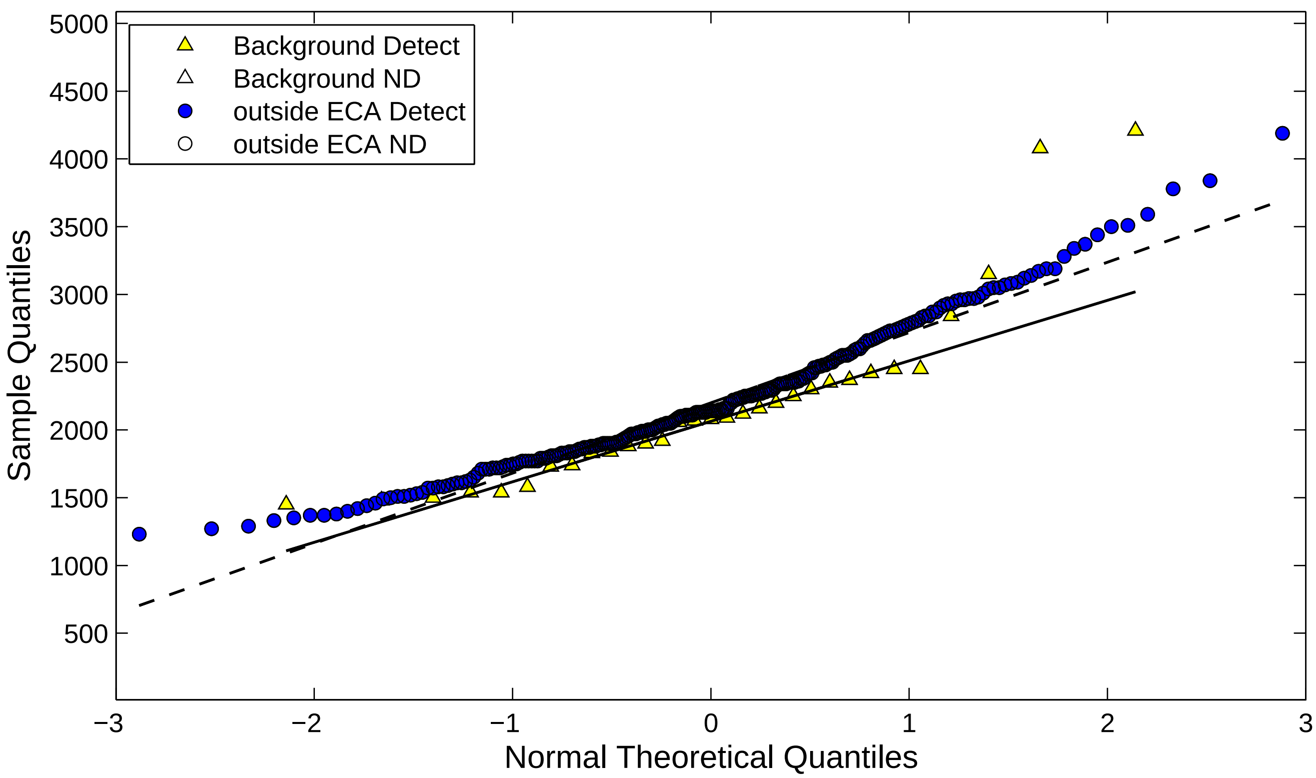
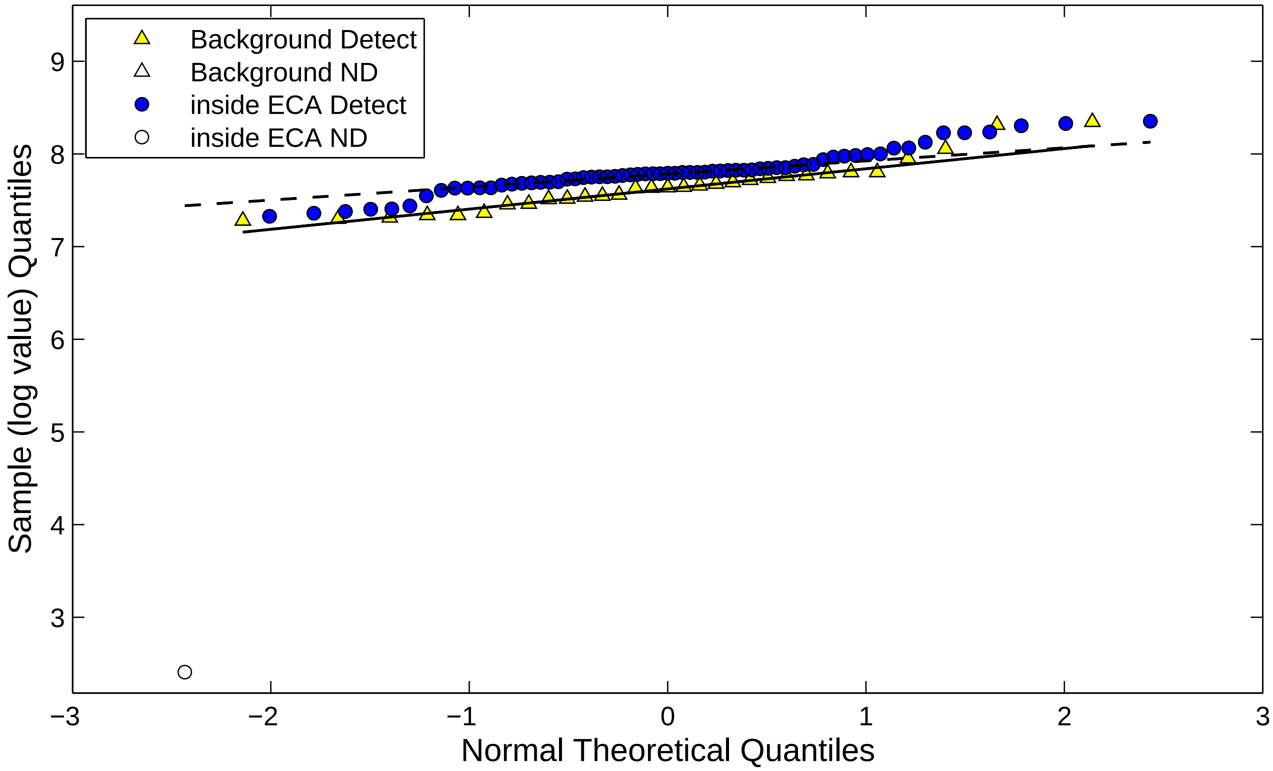


Figure C2−21B. Lognormal Q−Q Plots
Potassium



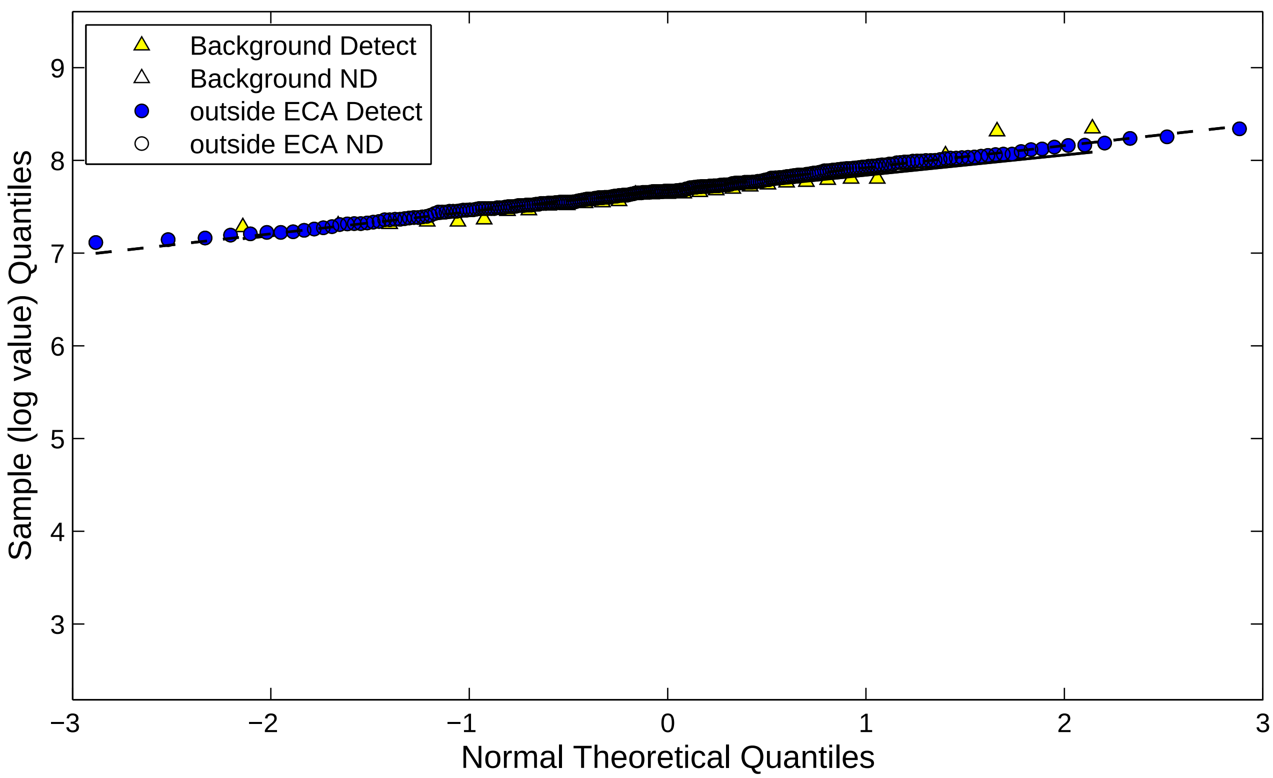
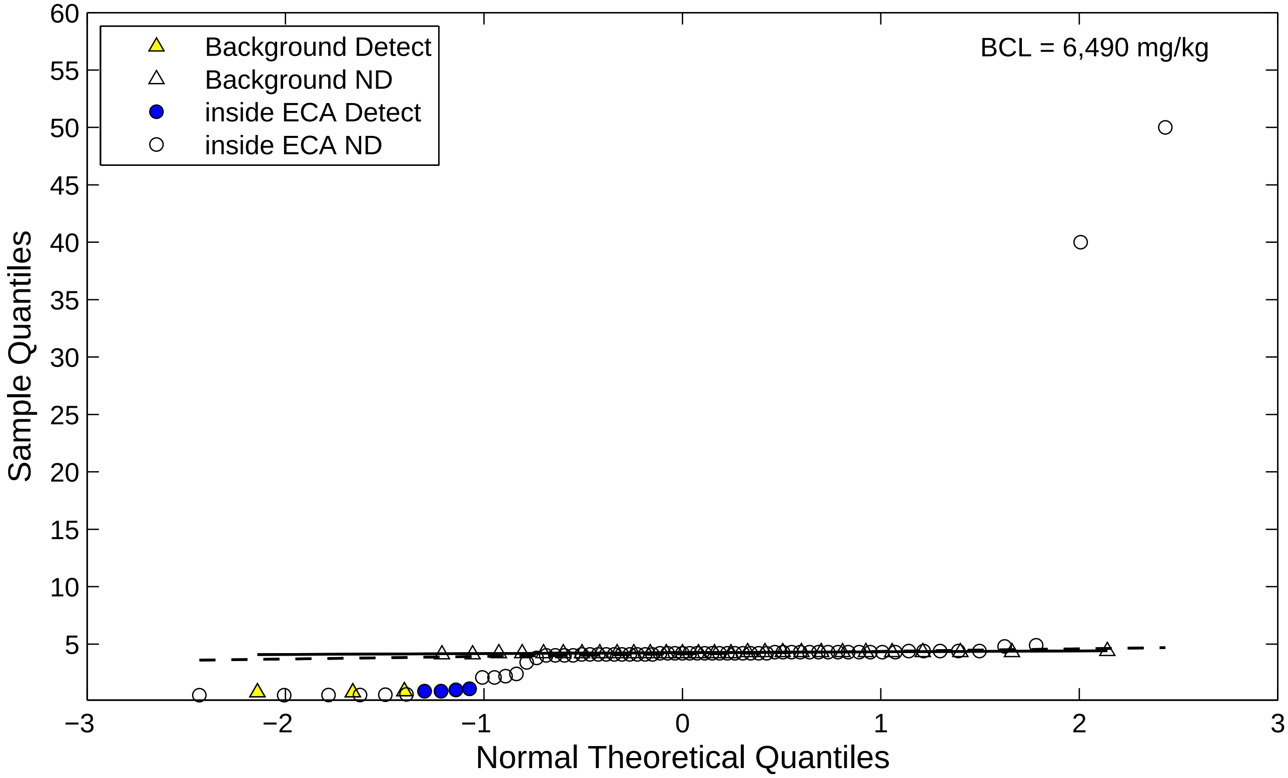


Figure C2−22A. Normal Q−Q Plots
Selenium



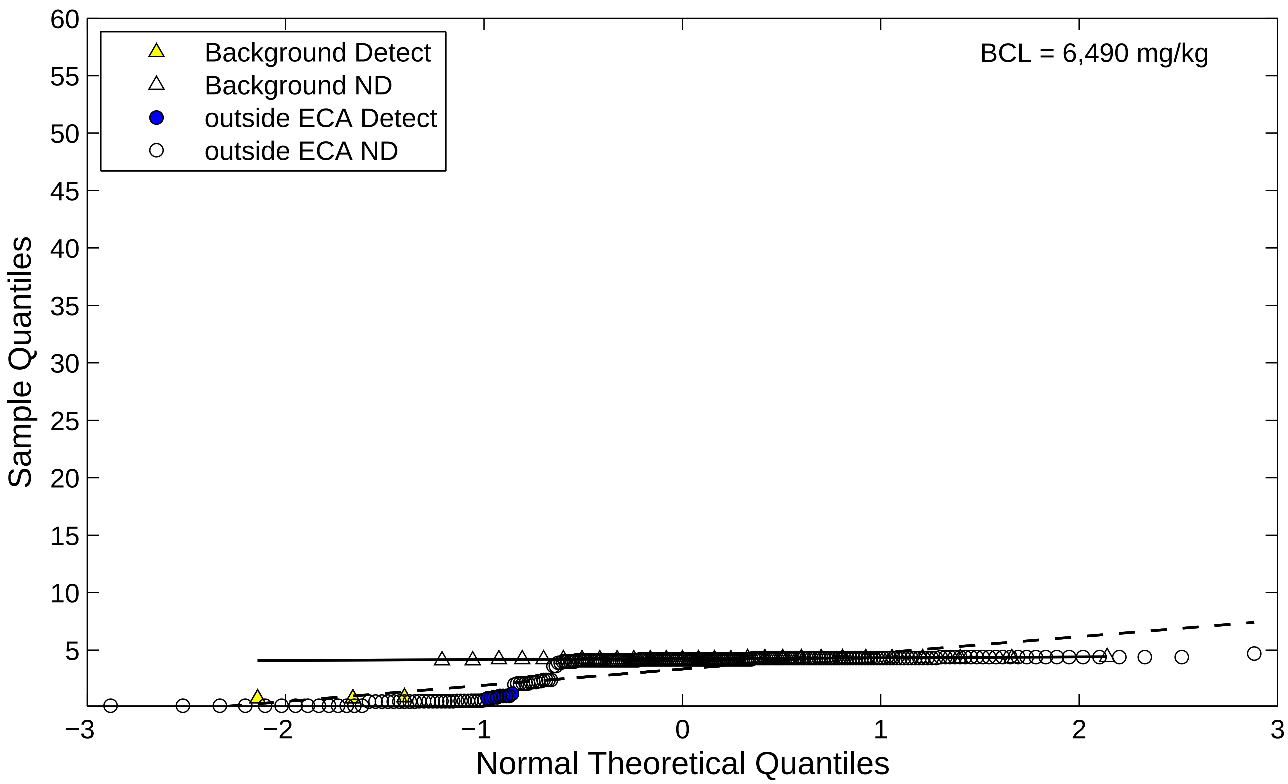
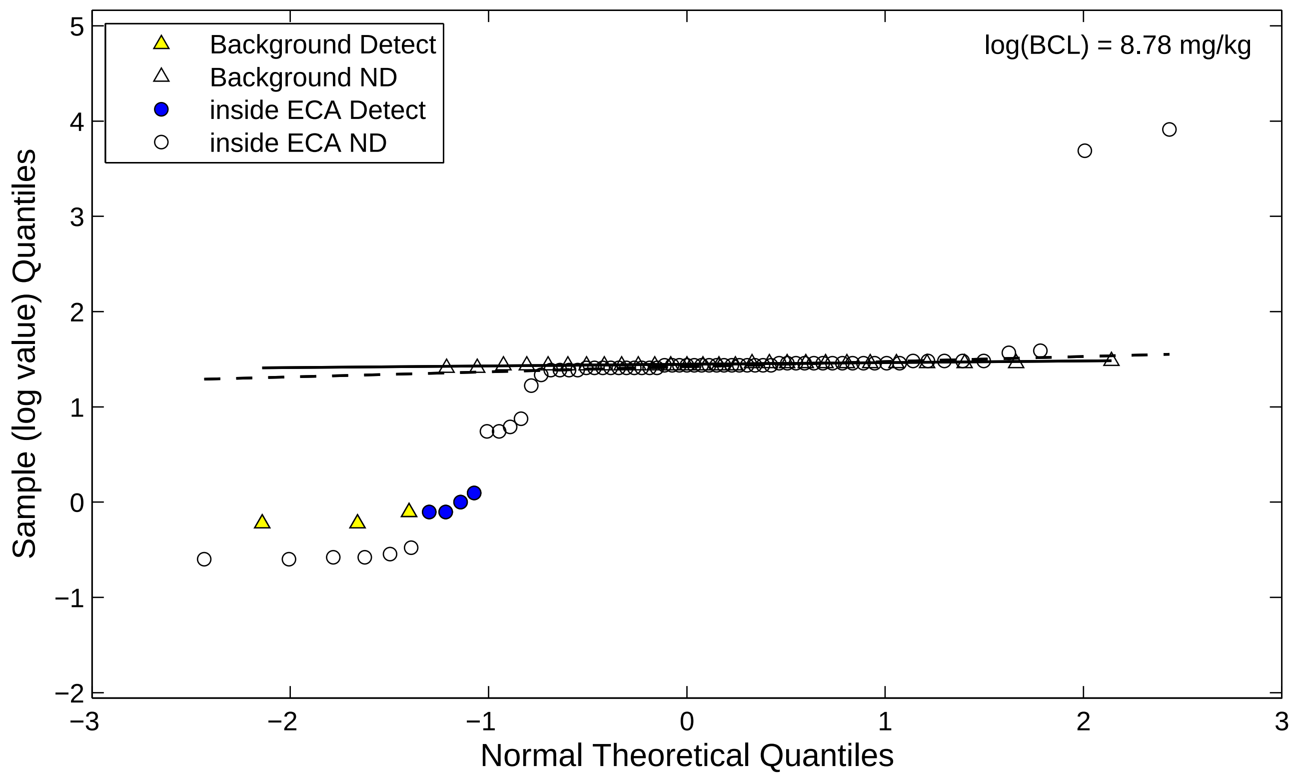


Figure C2−22B. Lognormal Q−Q Plots
Selenium



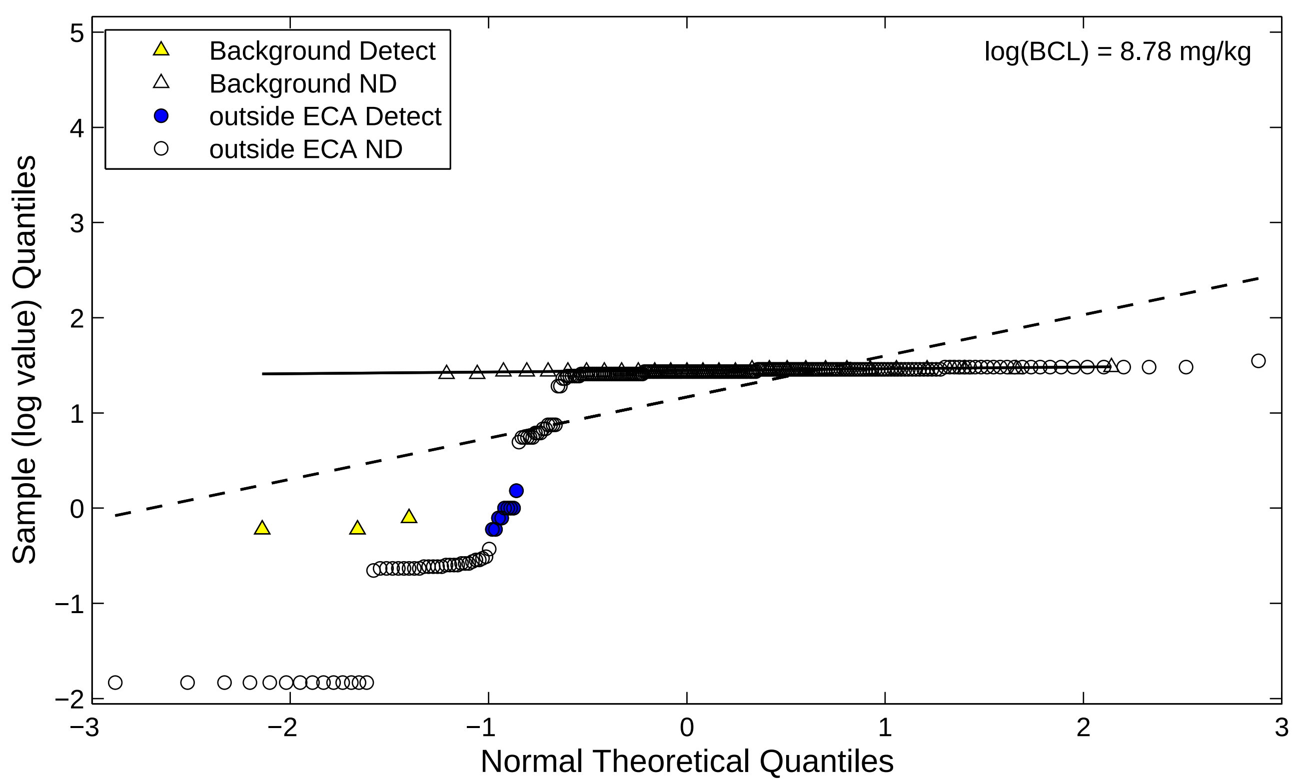
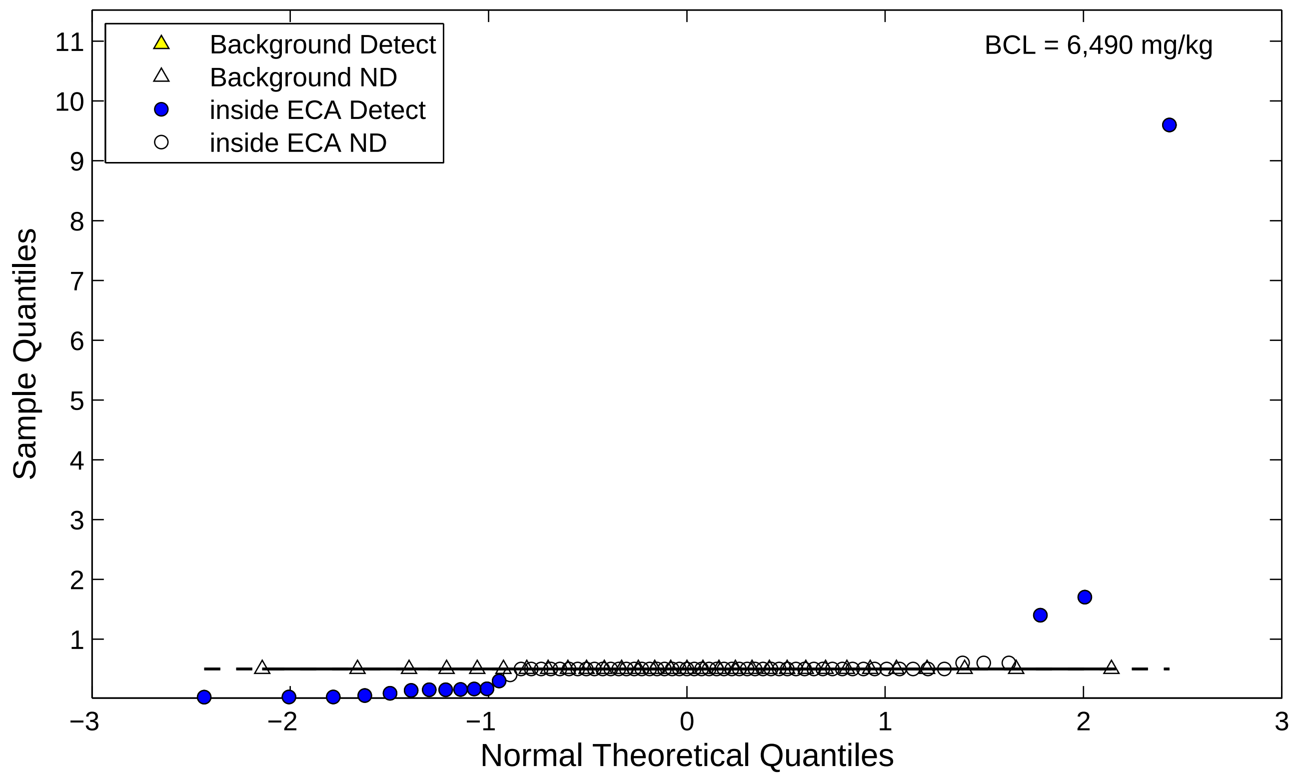


Figure C2−23A. Normal Q−Q Plots
Silver



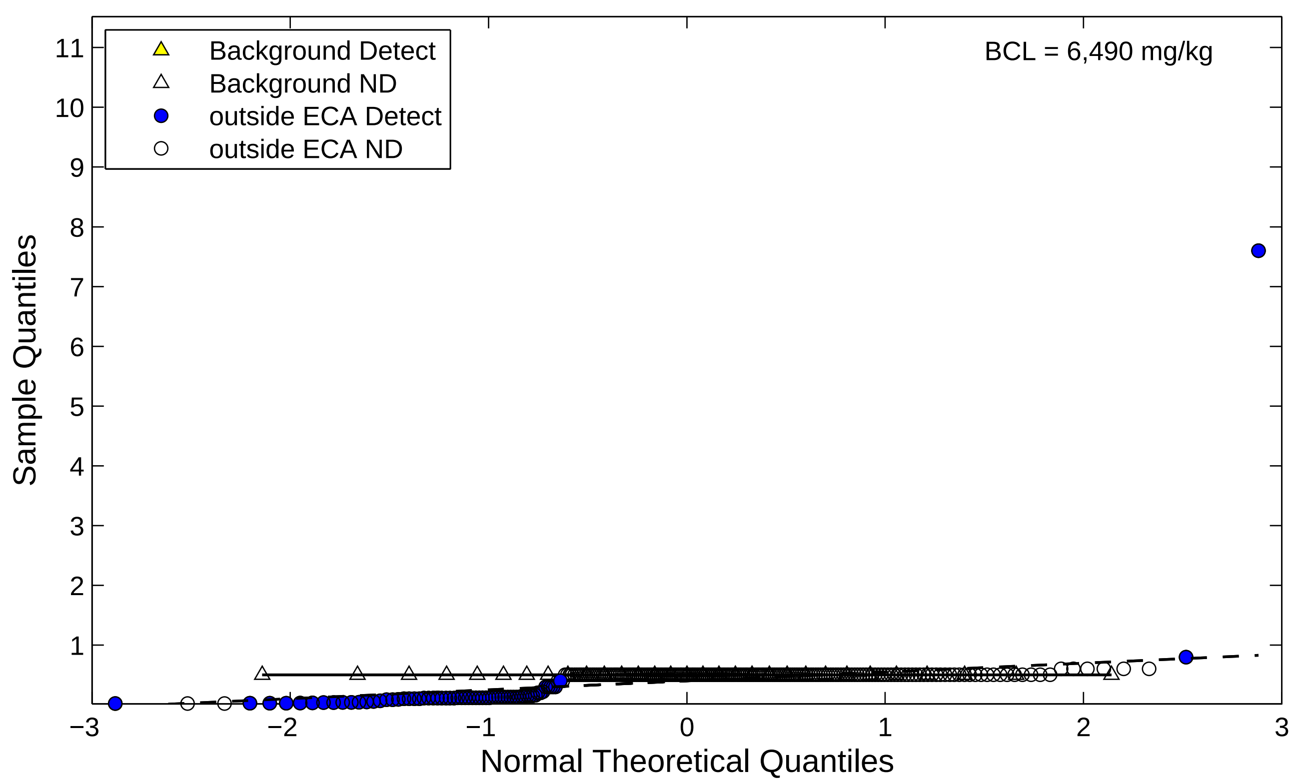


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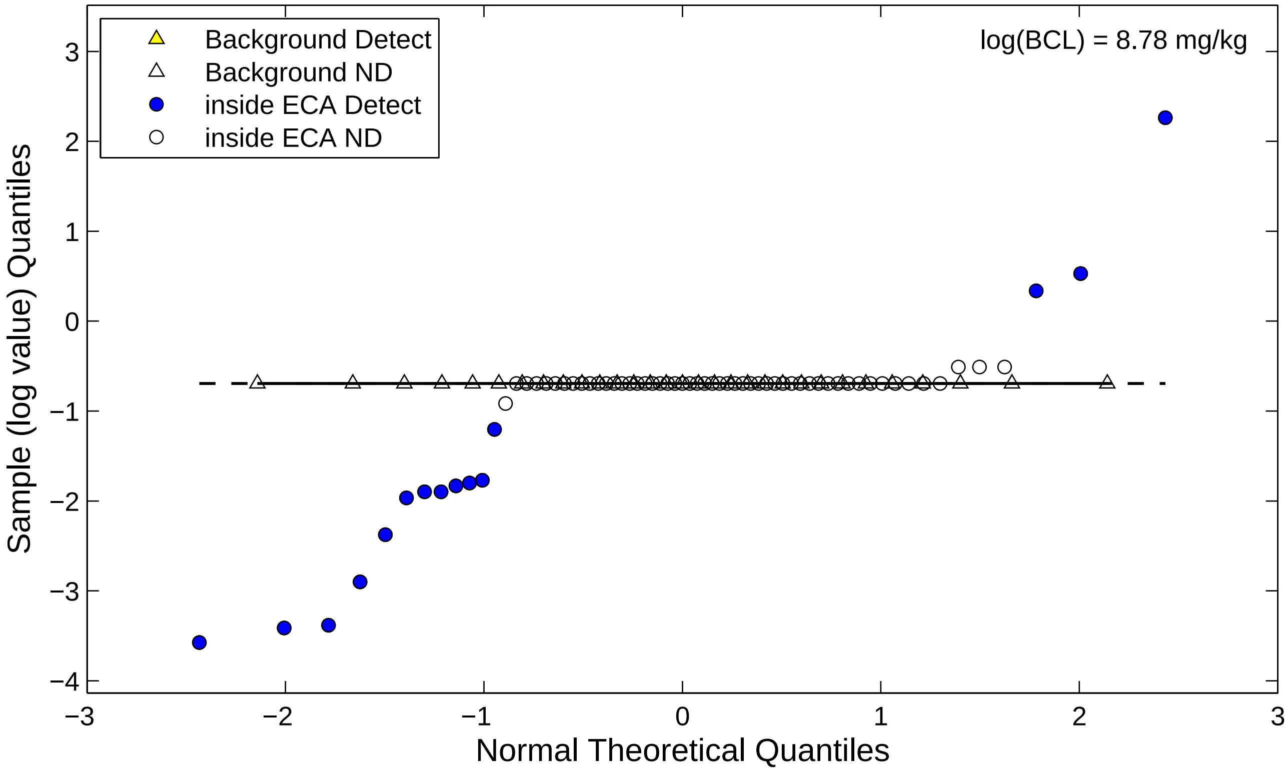
Figure C2−23B. Lognormal Q−Q Plots
Silver



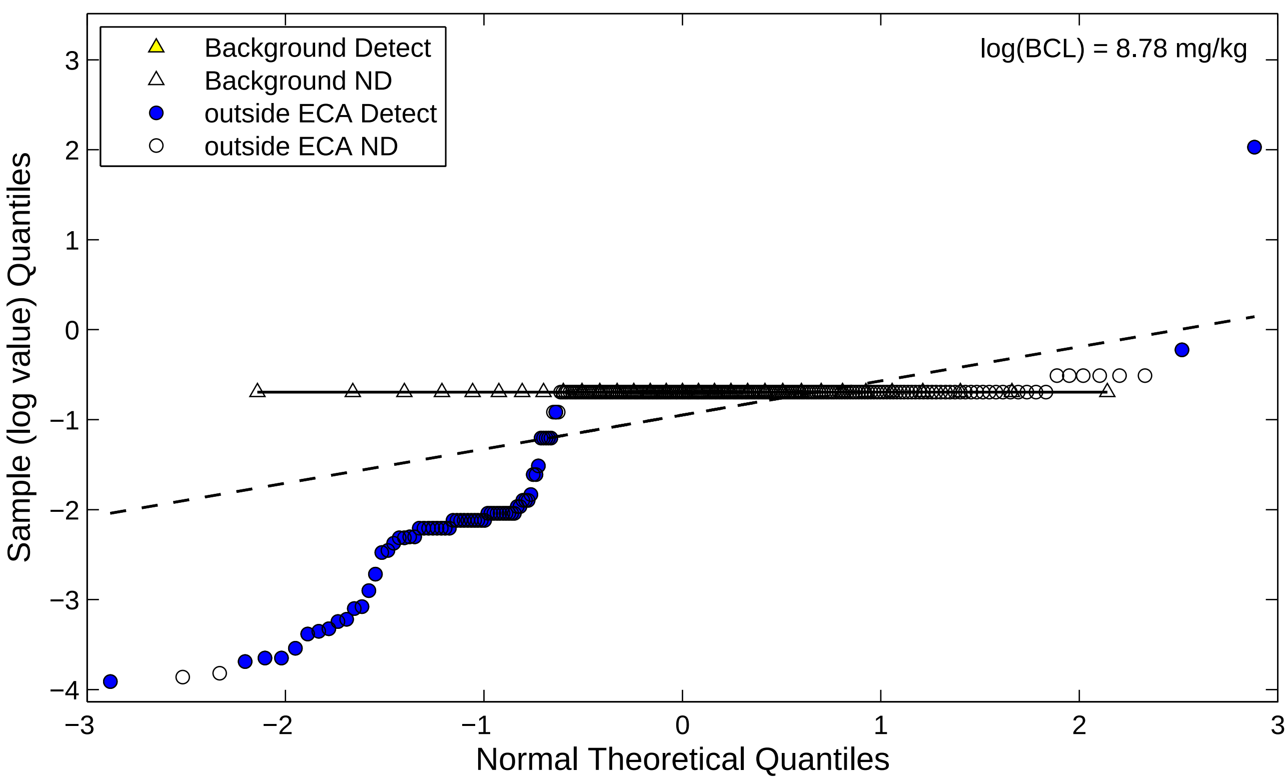
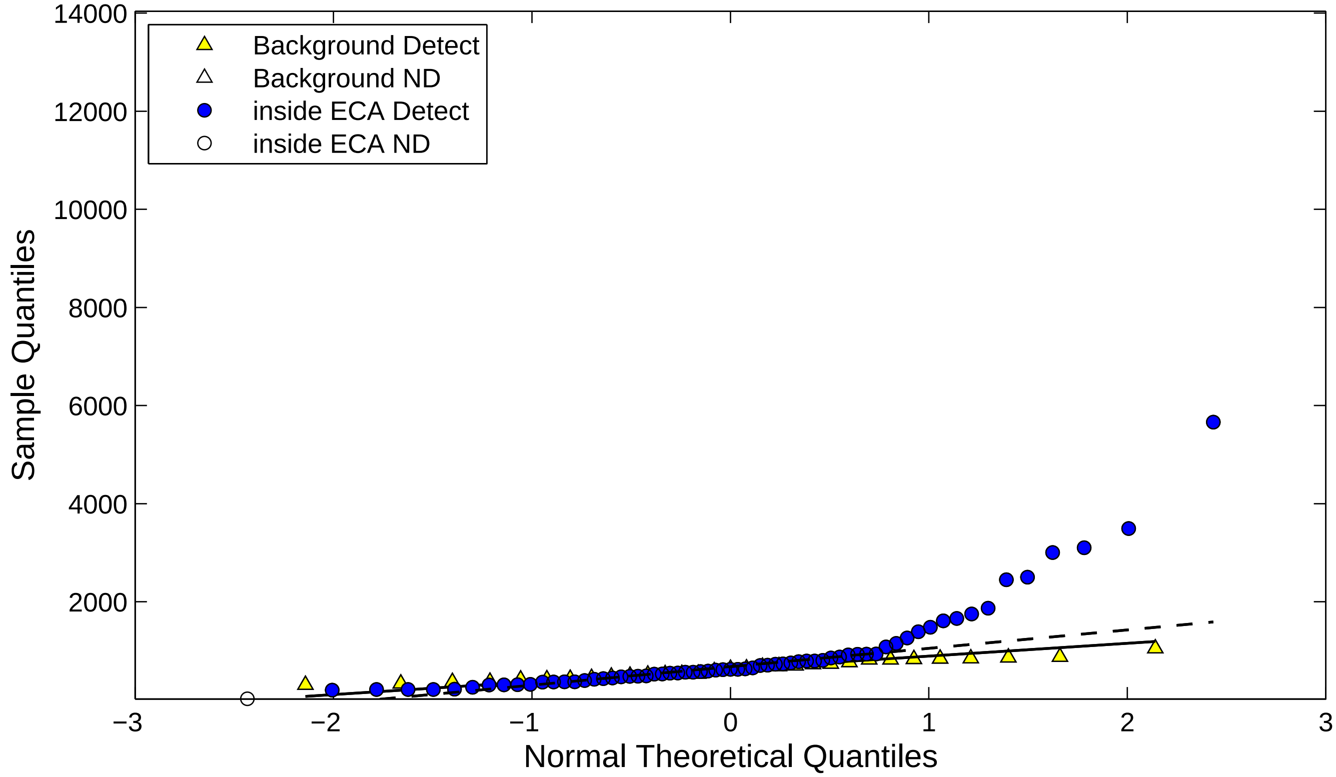


Figure C2−24A. Normal Q−Q Plots
Sodium



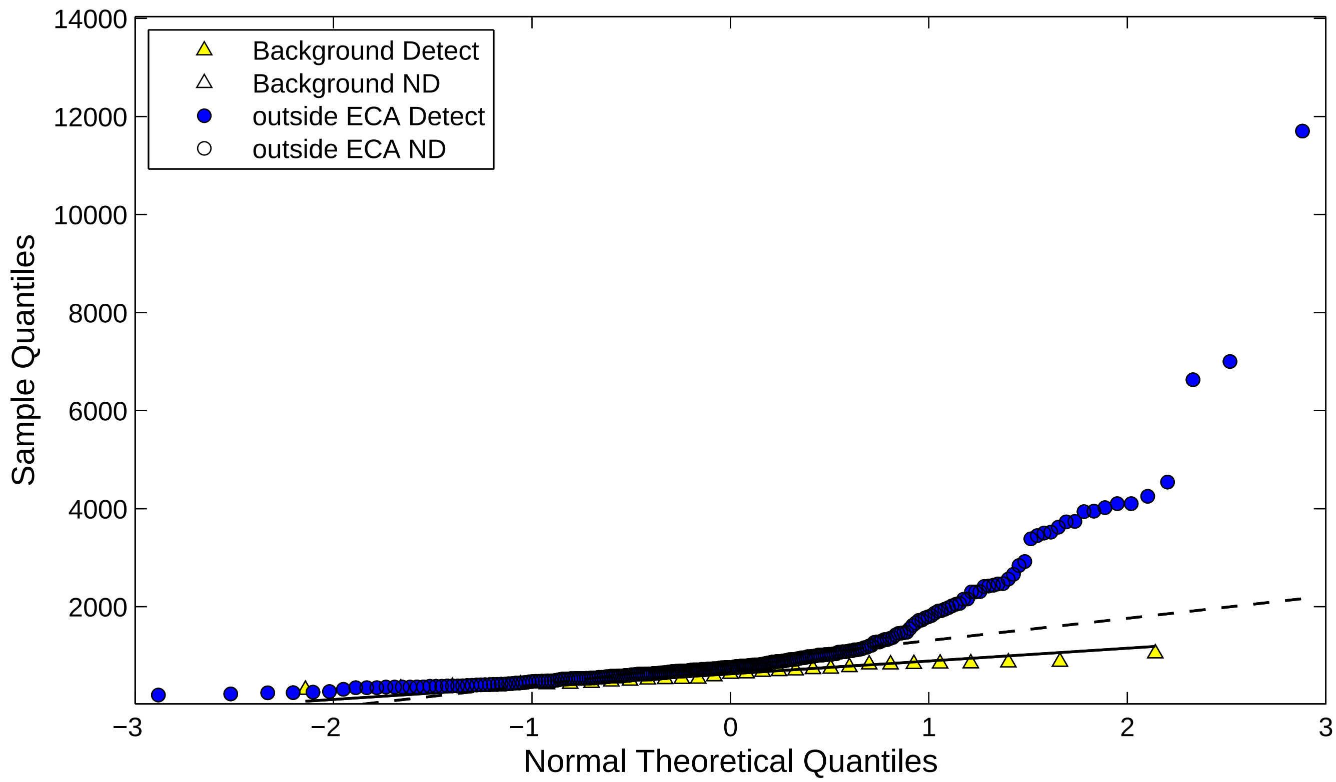
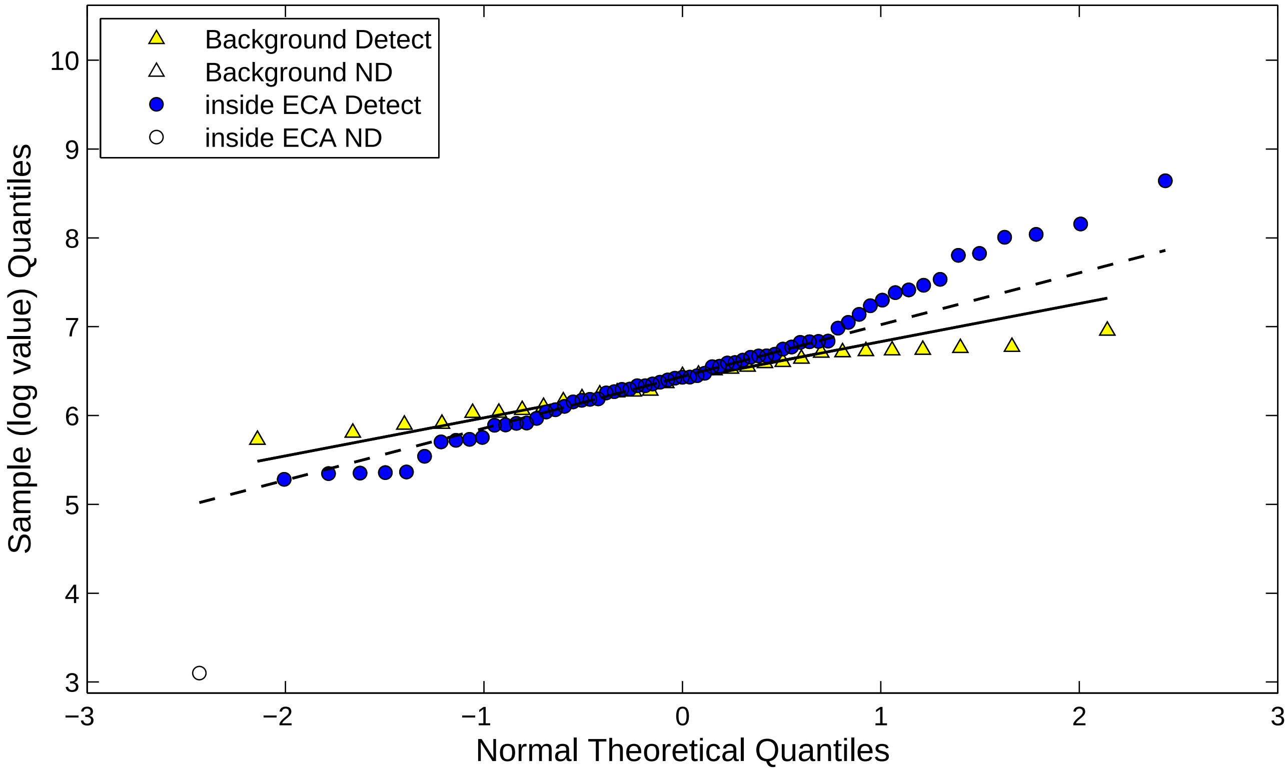


Figure C2−24B. Lognormal Q−Q Plots
Sodium



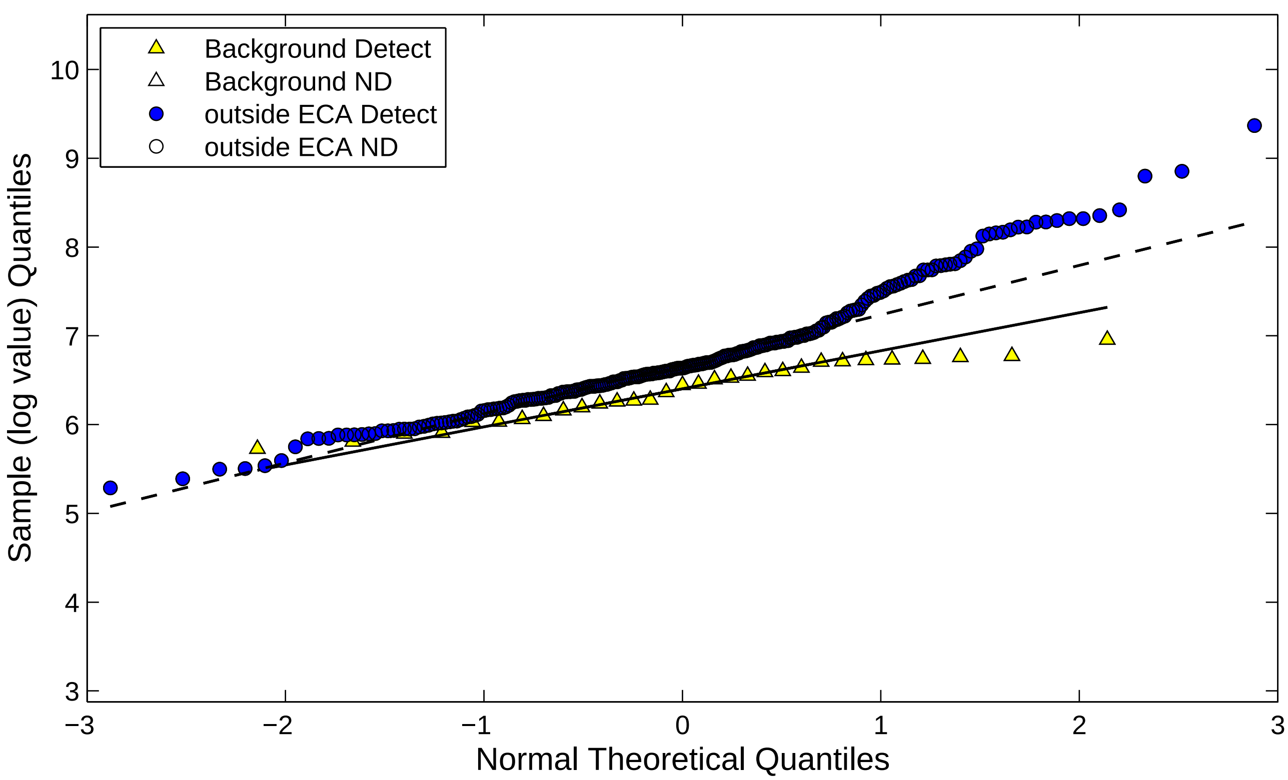
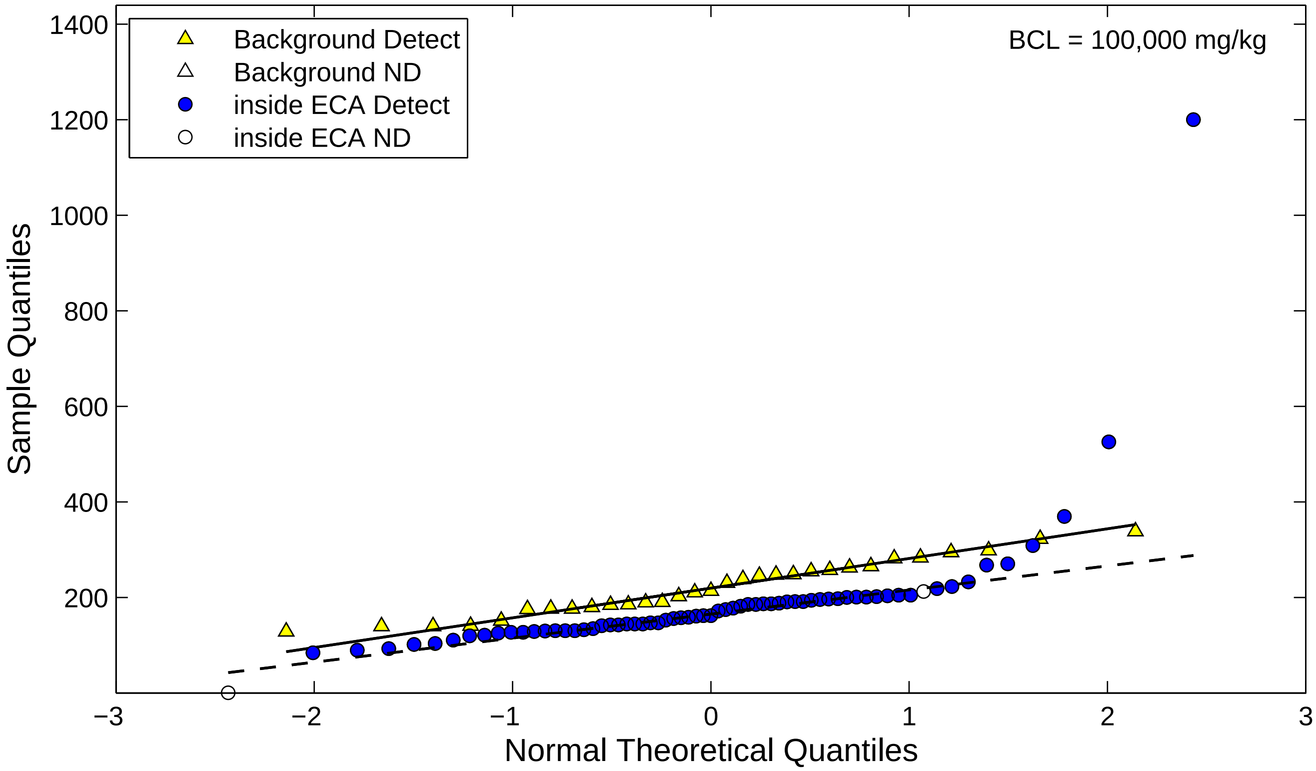
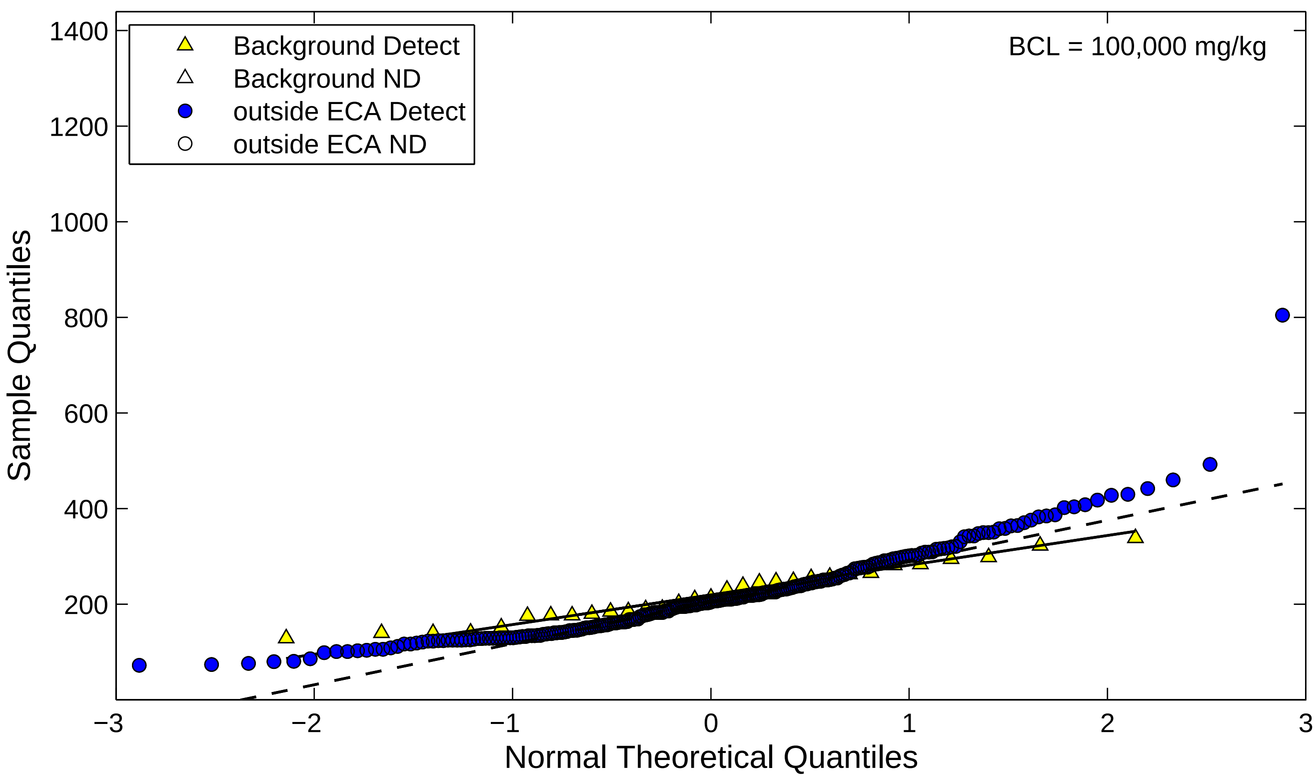


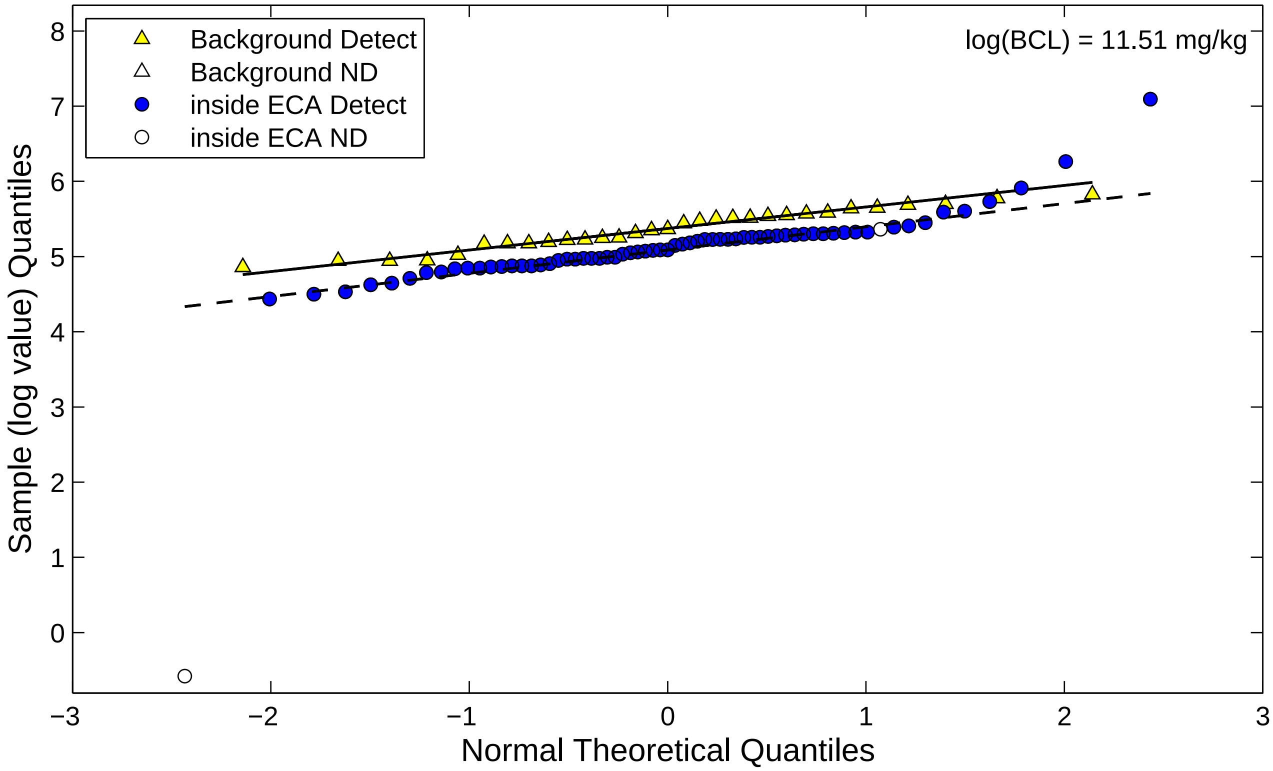
Figure C2−25A. Normal Q−Q Plots
Strontium

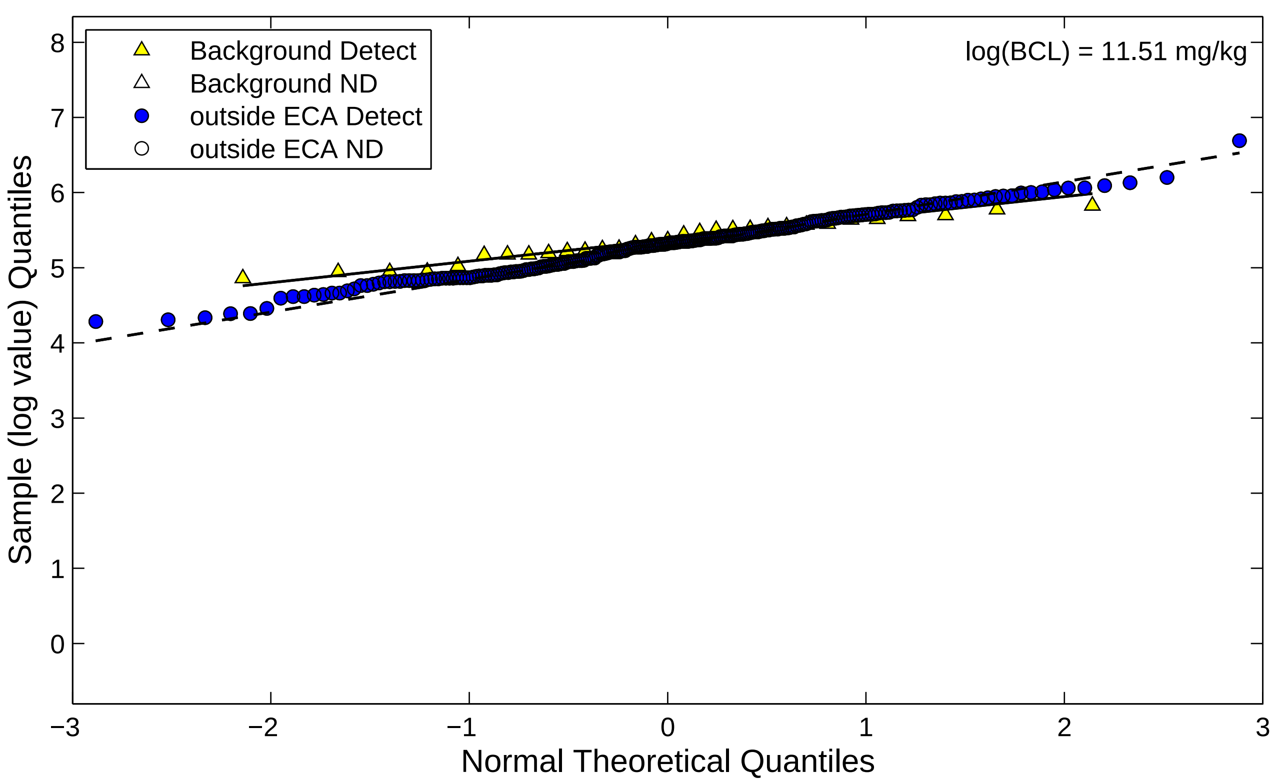




Ramboll Environ

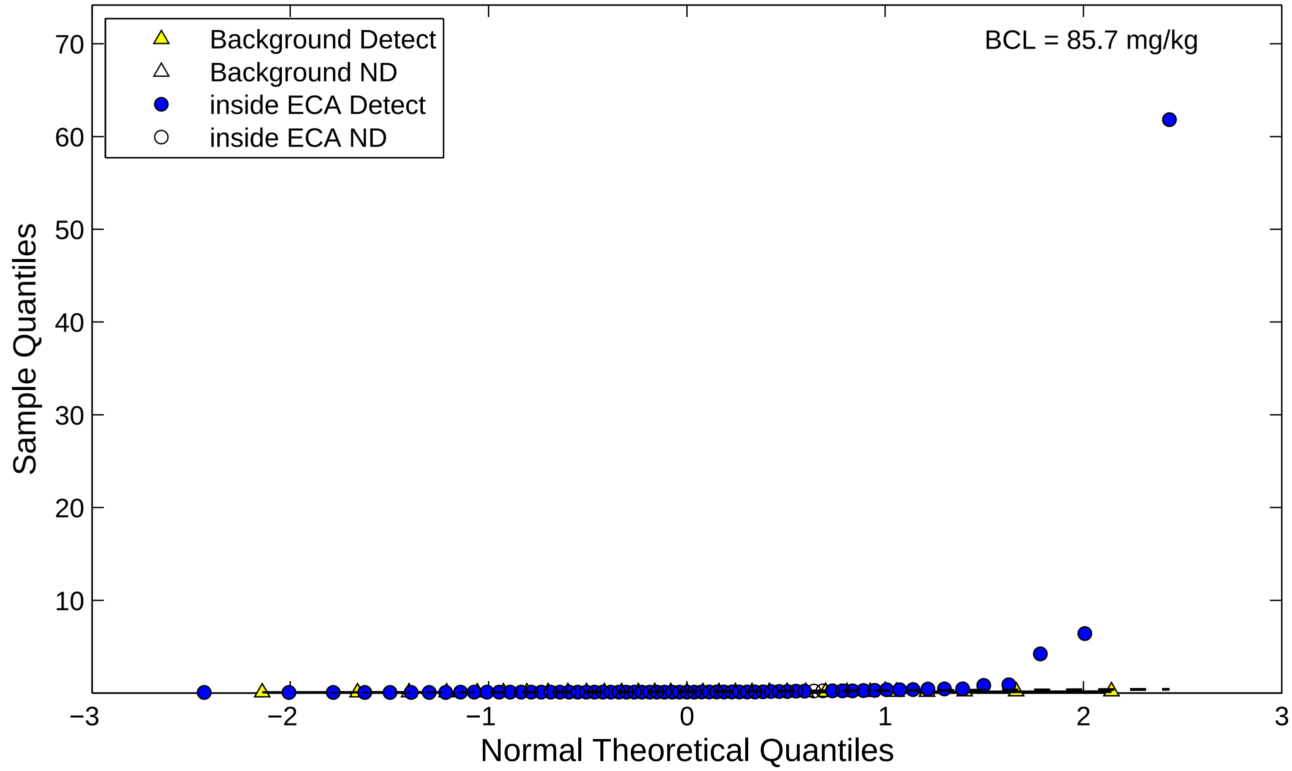
Figure C2−25B. Lognormal Q−Q Plots
Strontium





Ramboll Environ

Figure C2−26A. Normal Q−Q Plots
Thallium



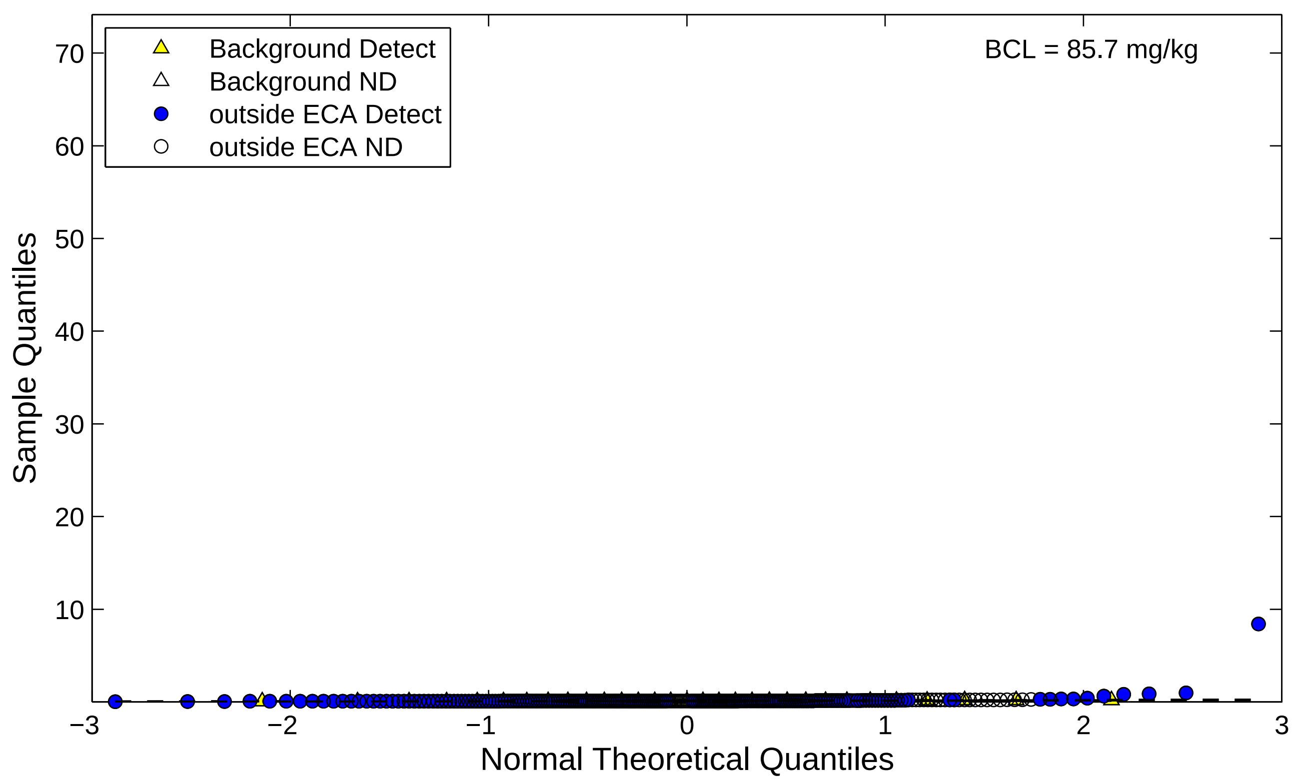
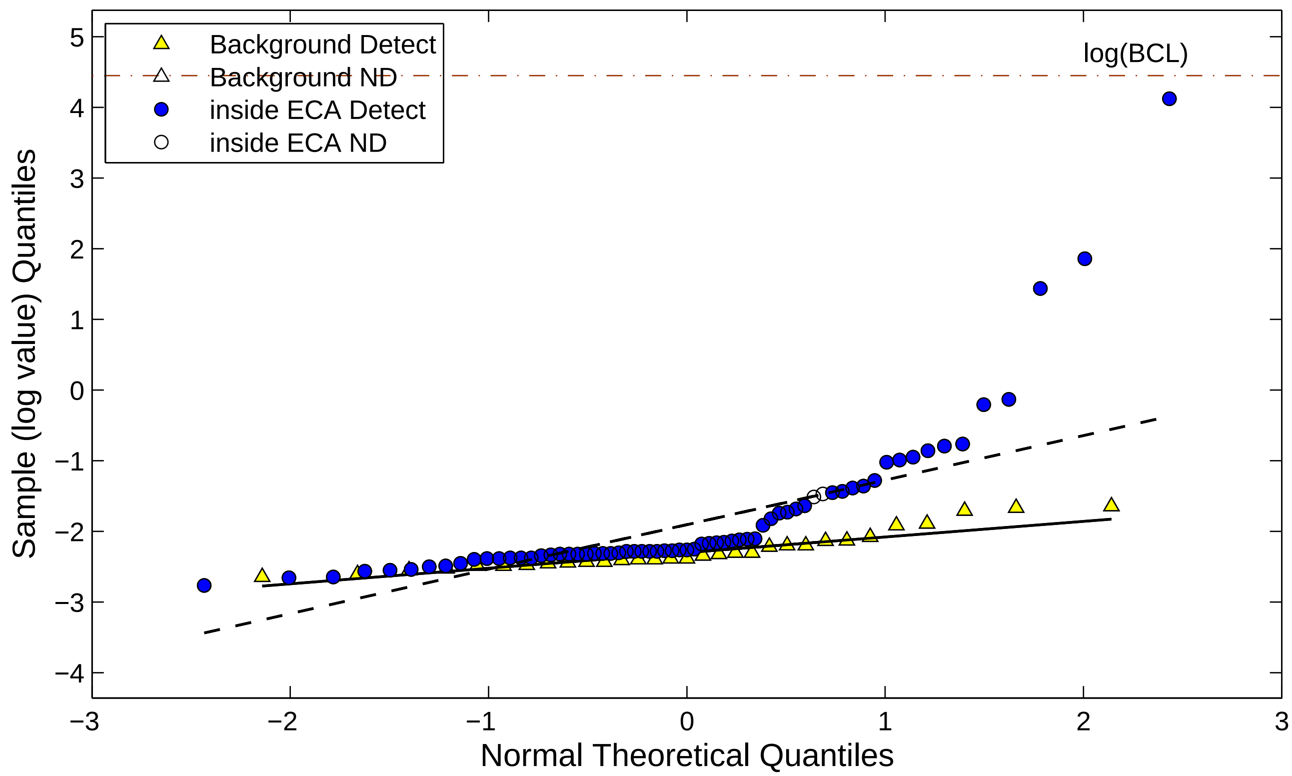
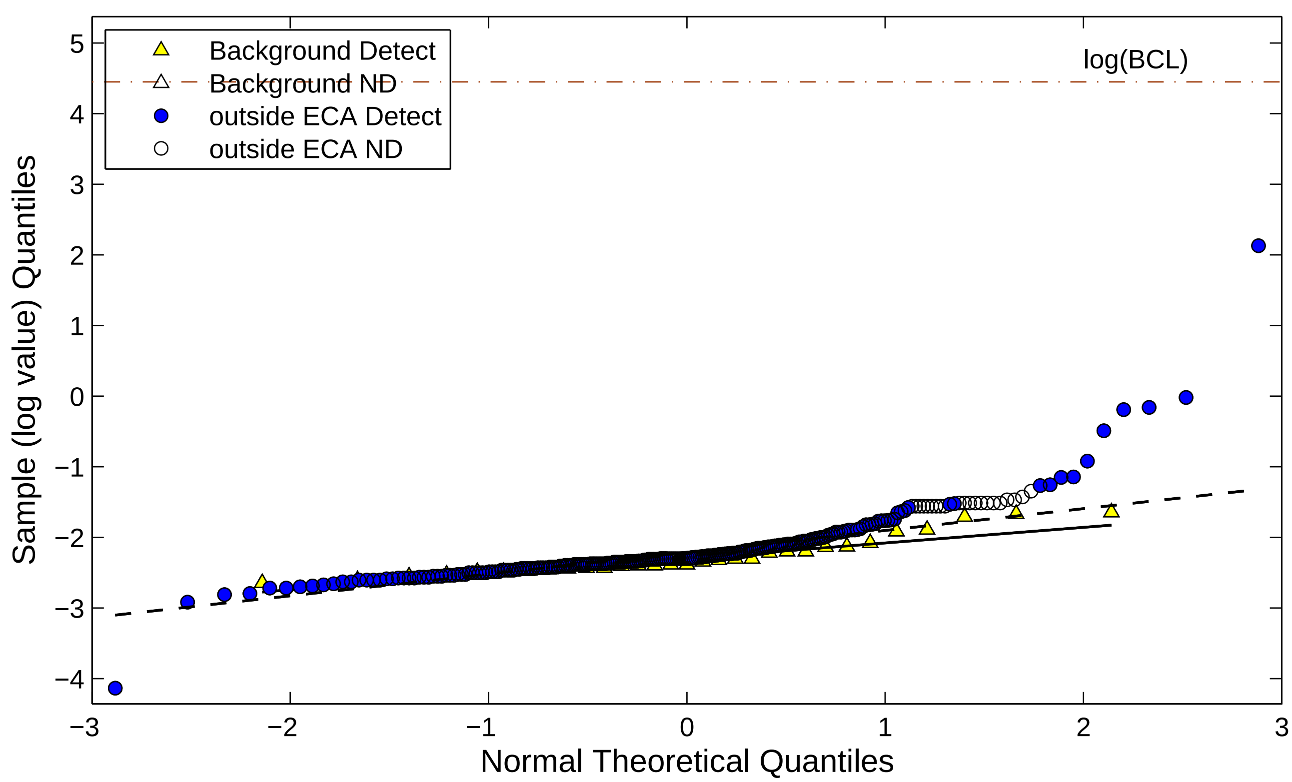


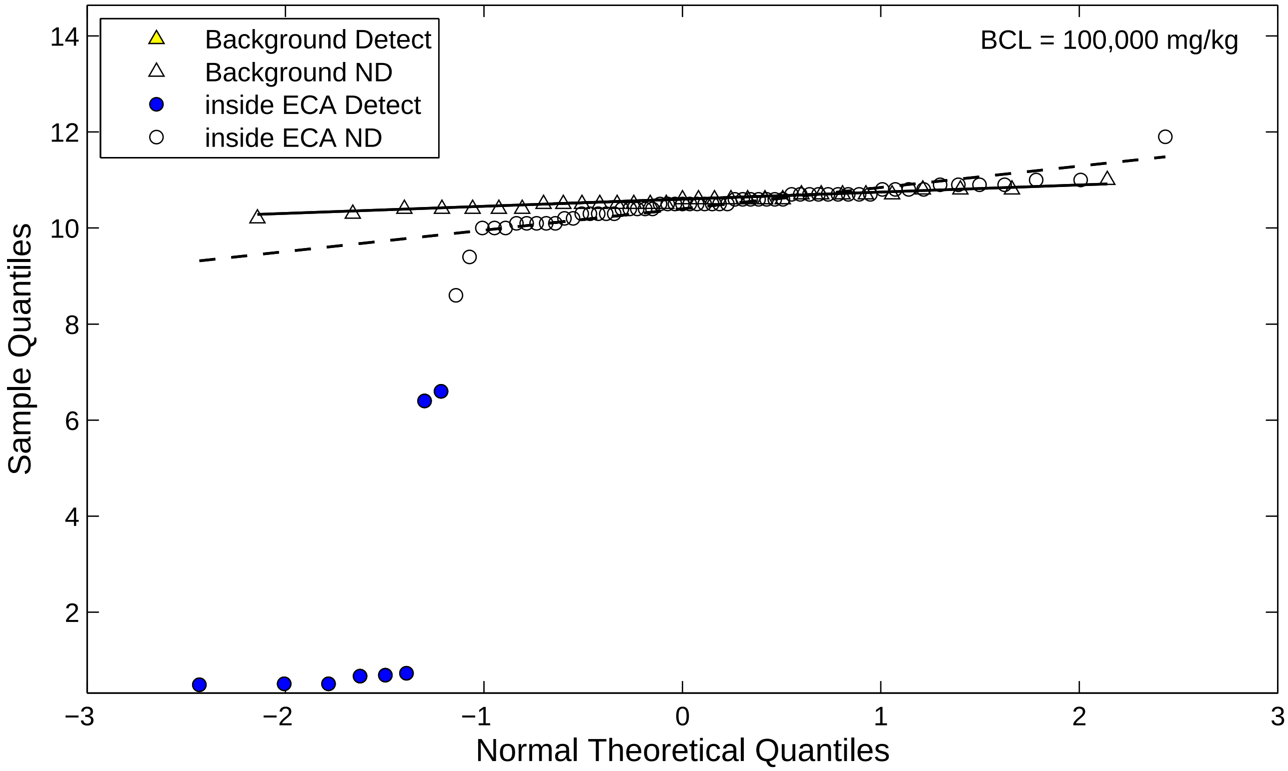
Figure C2−26B. Lognormal Q−Q Plots
Thallium





Ramboll Environ

Figure C2−27A. Normal Q−Q Plots
Tin



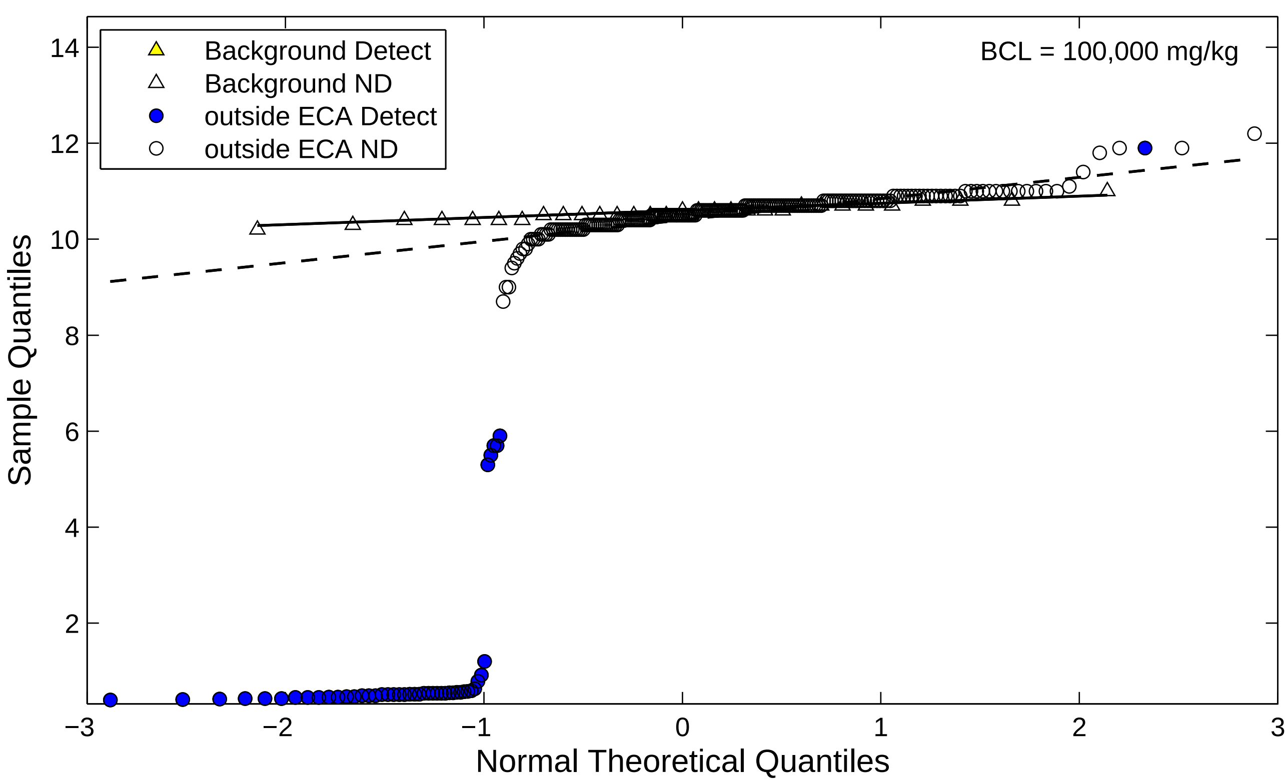
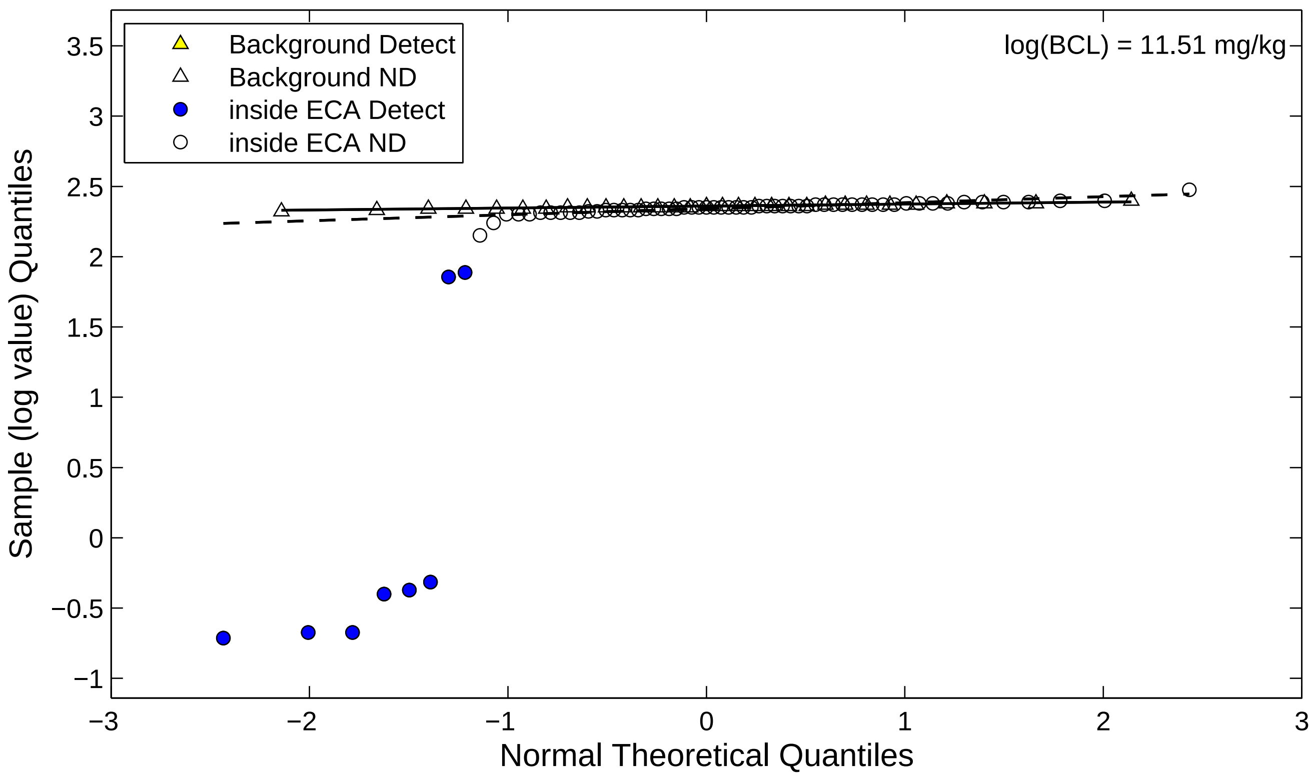


Figure C2−27B. Lognormal Q−Q Plots
Tin



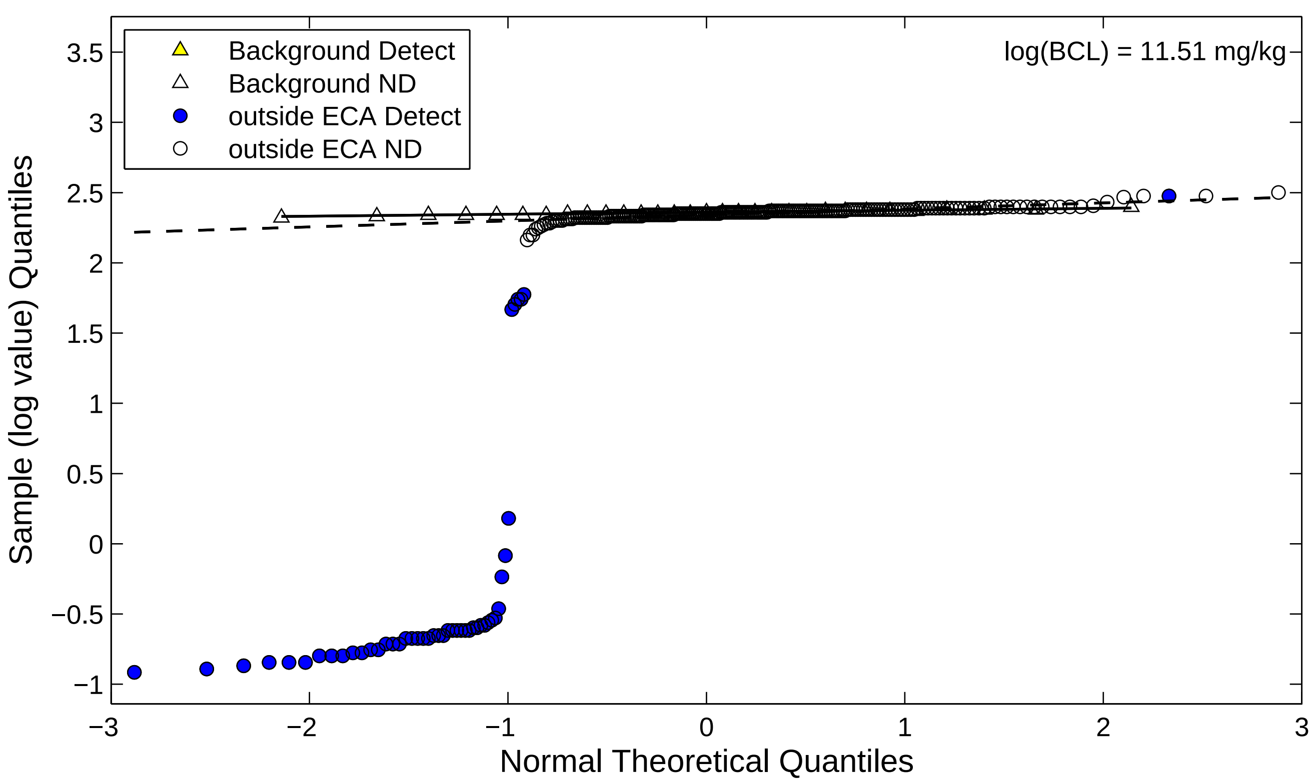
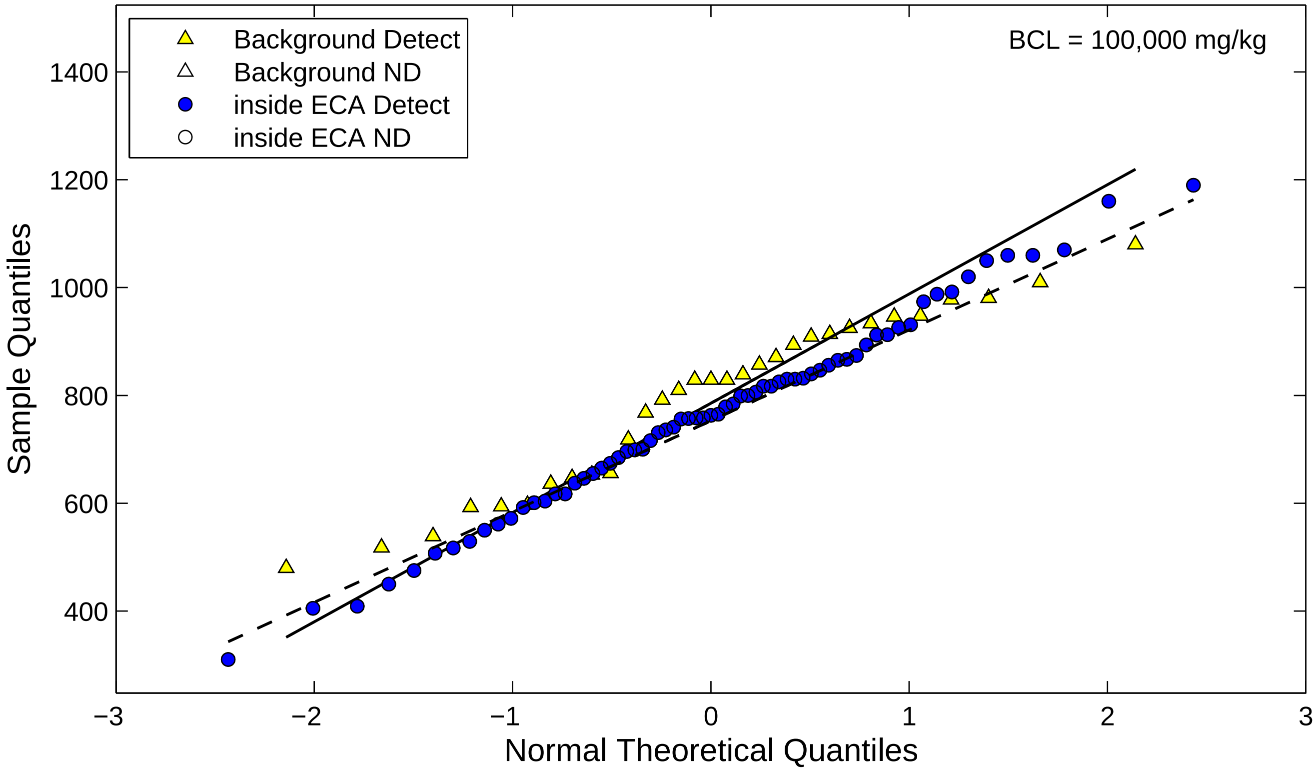


Figure C2−28A. Normal Q−Q Plots
Titanium



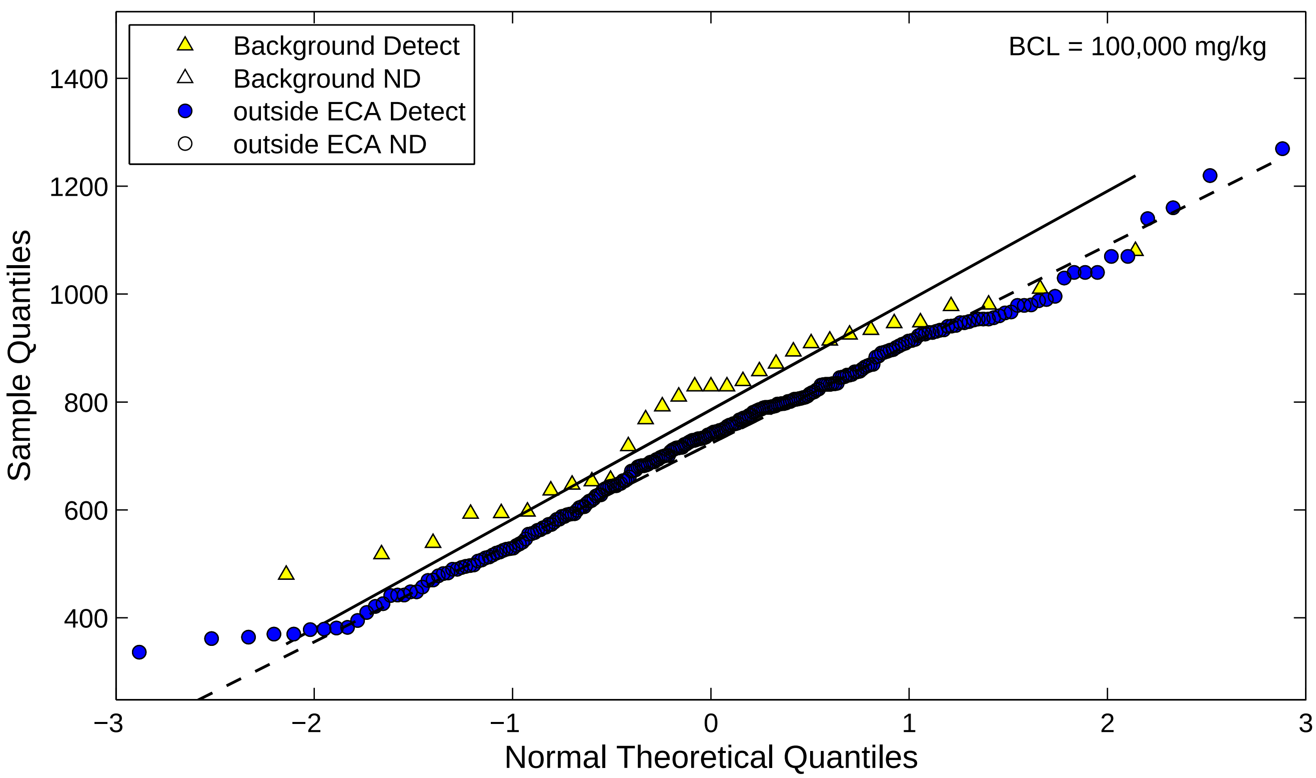
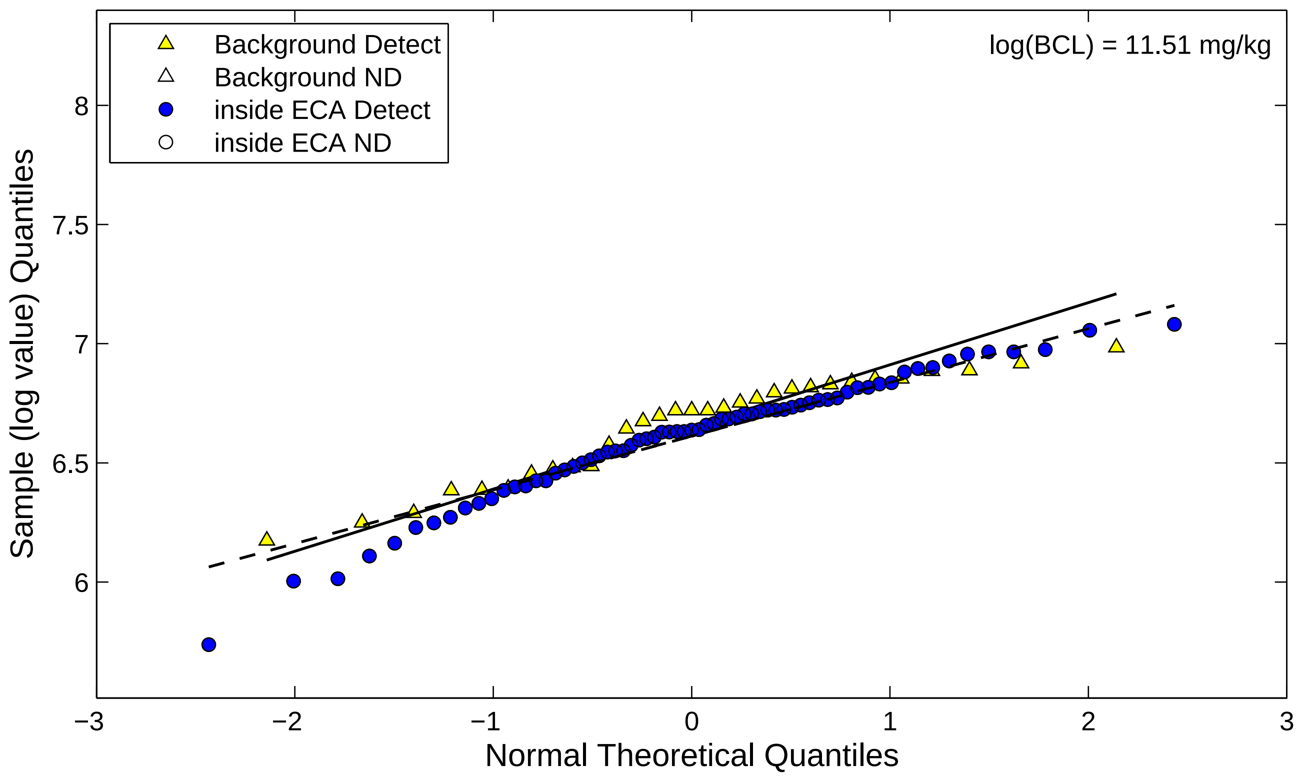
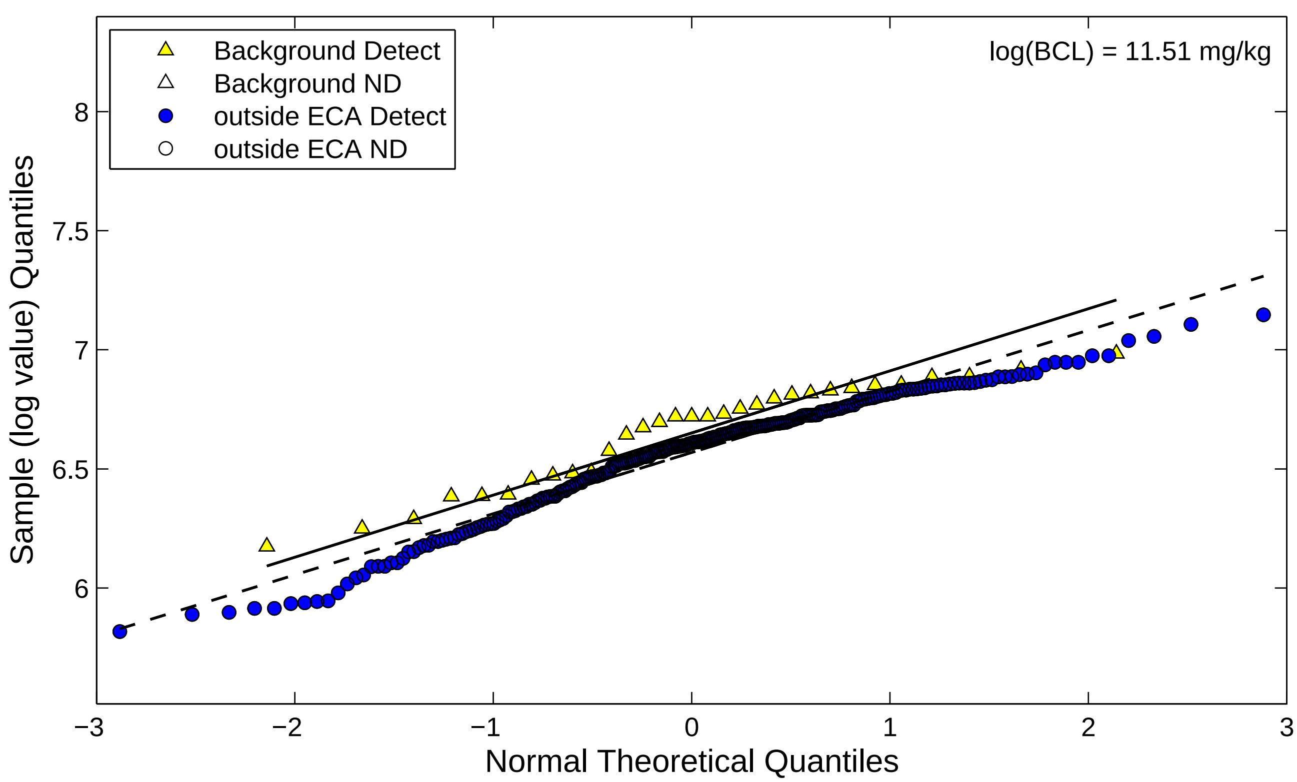


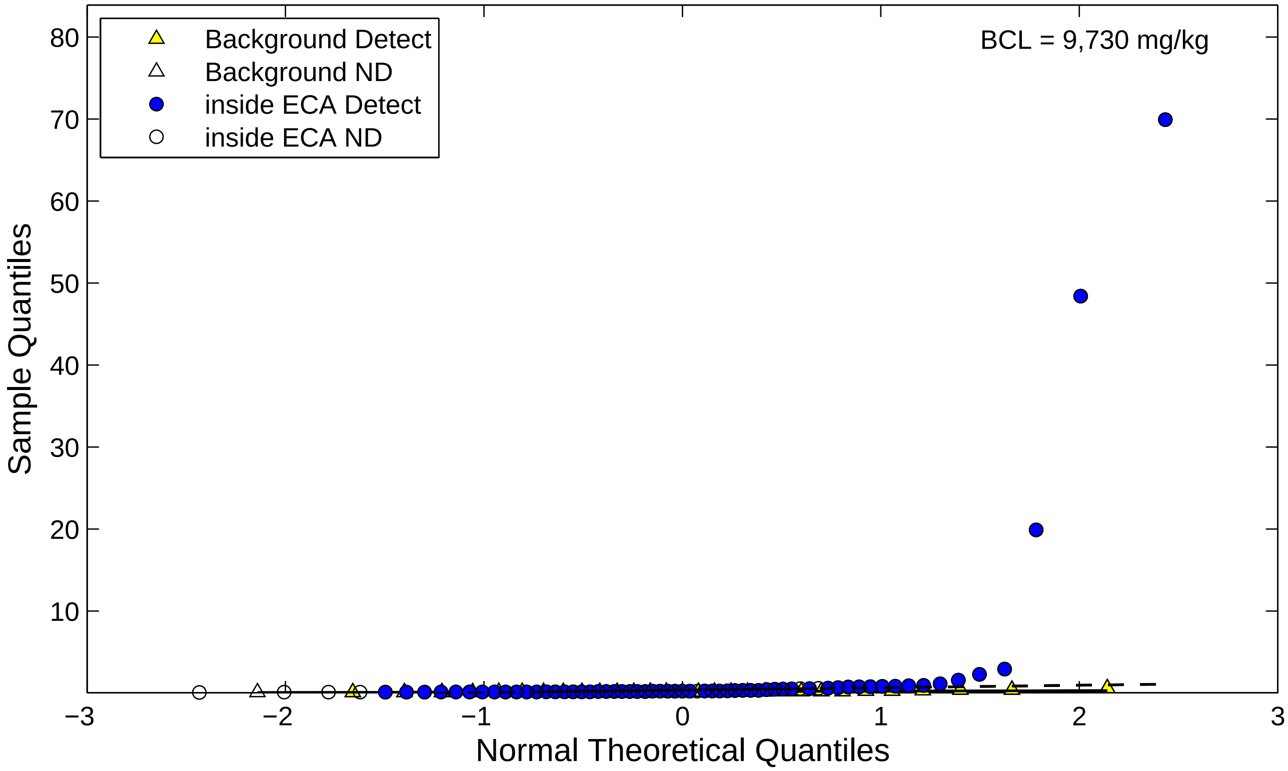
Figure C2−28B. Lognormal Q−Q Plots
Titanium

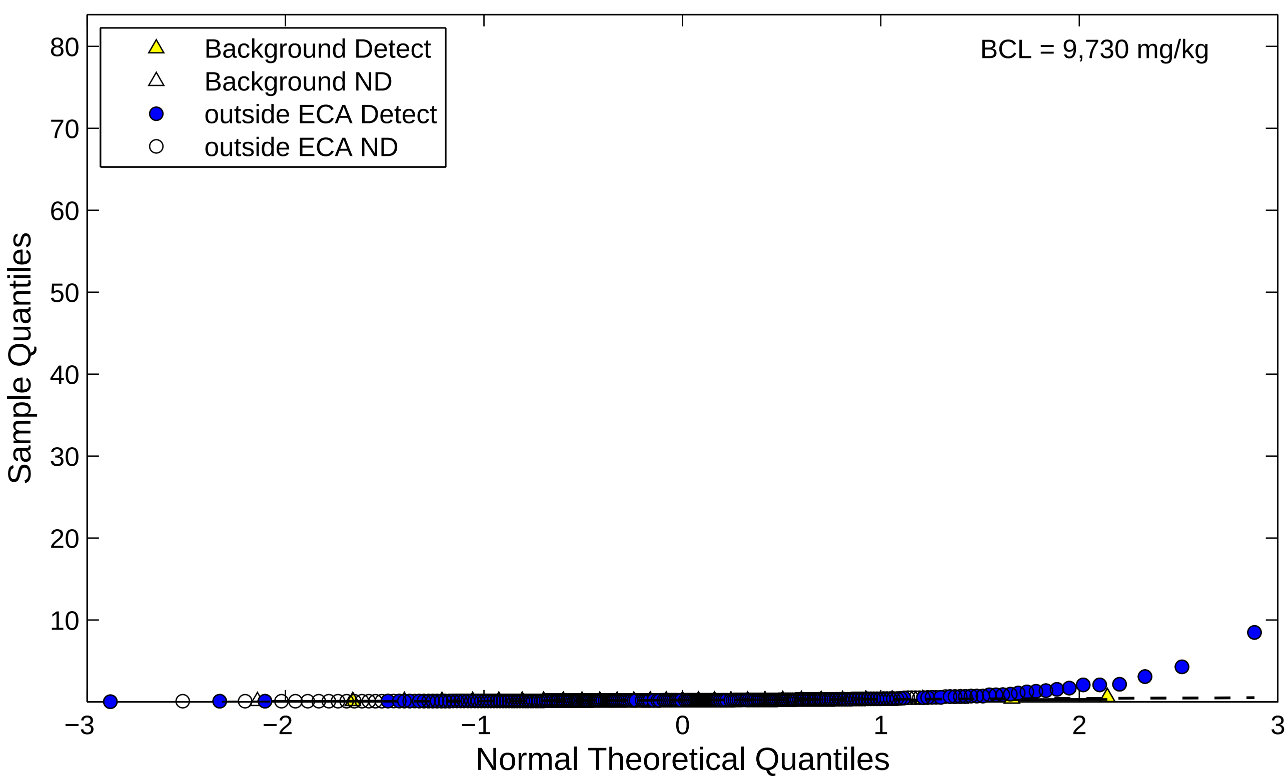




Ramboll Environ

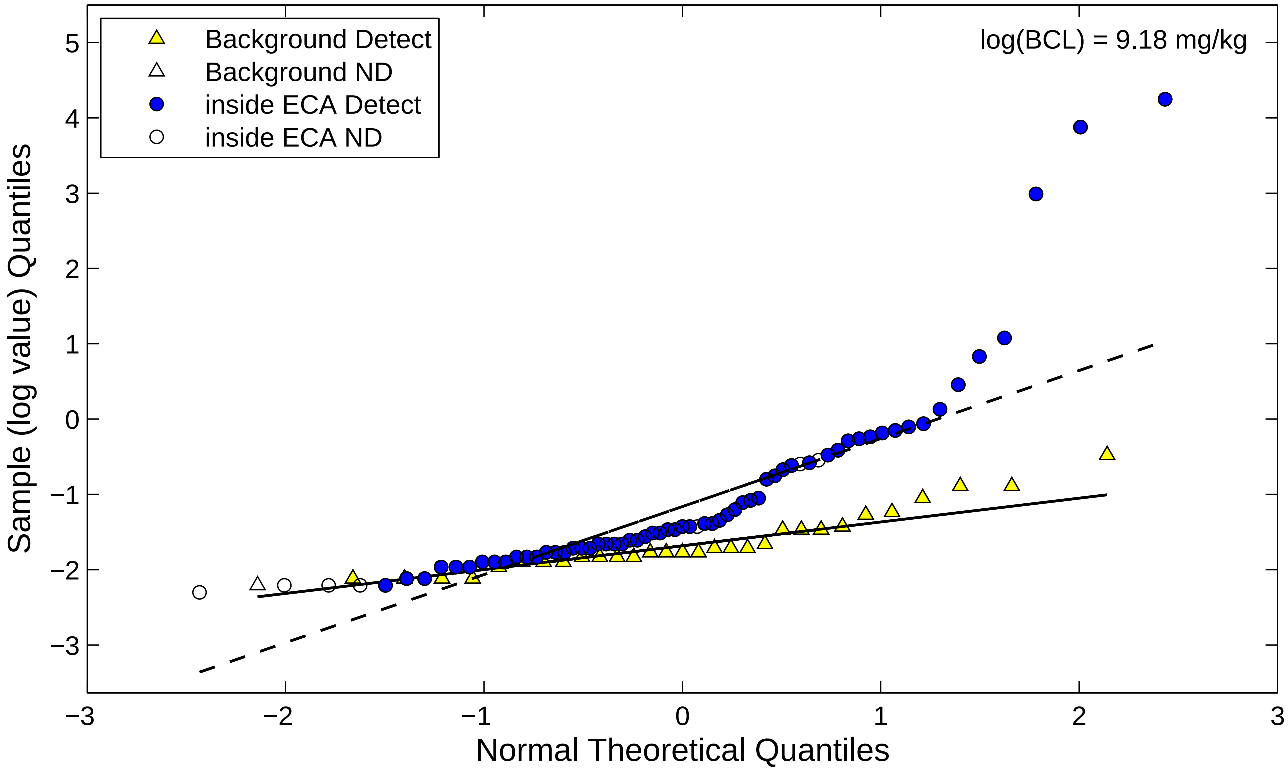
Figure C2−29A. Normal Q−Q Plots
Tungsten





Ramboll Environ

Figure C2−29B. Lognormal Q−Q Plots
Tungsten



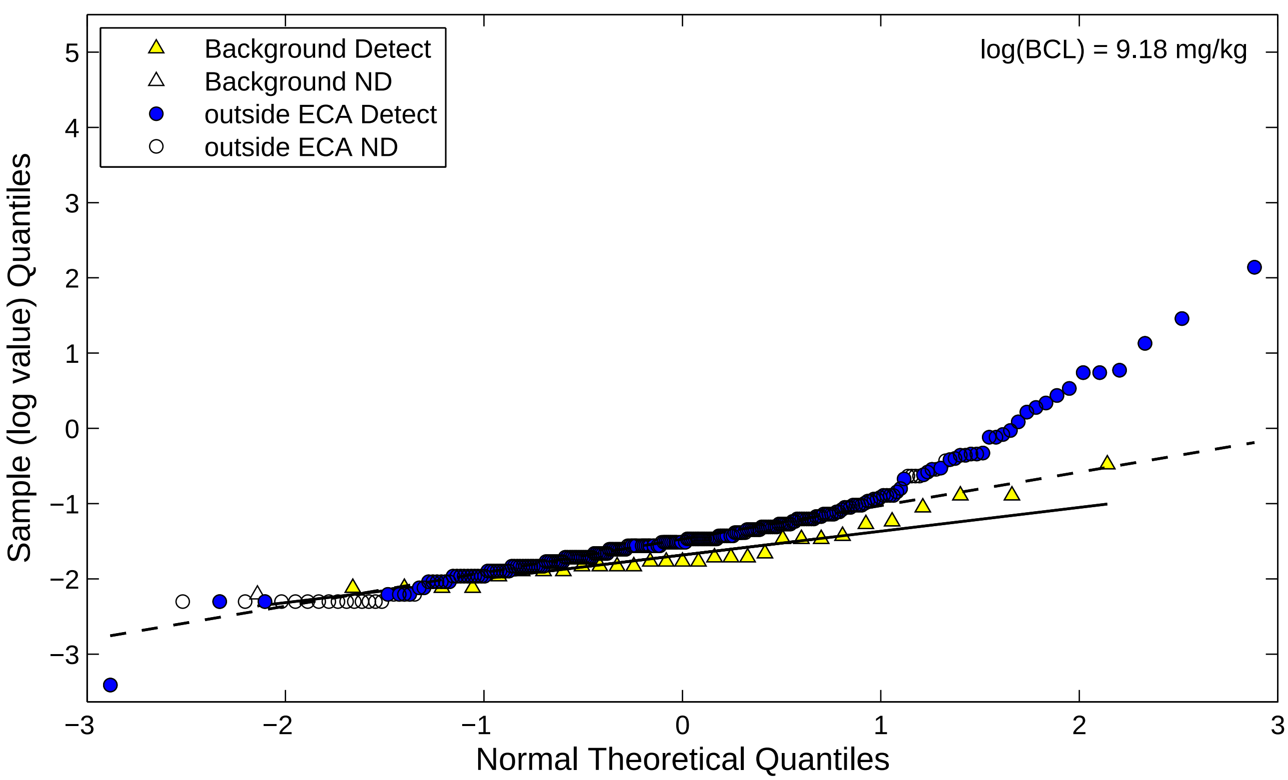
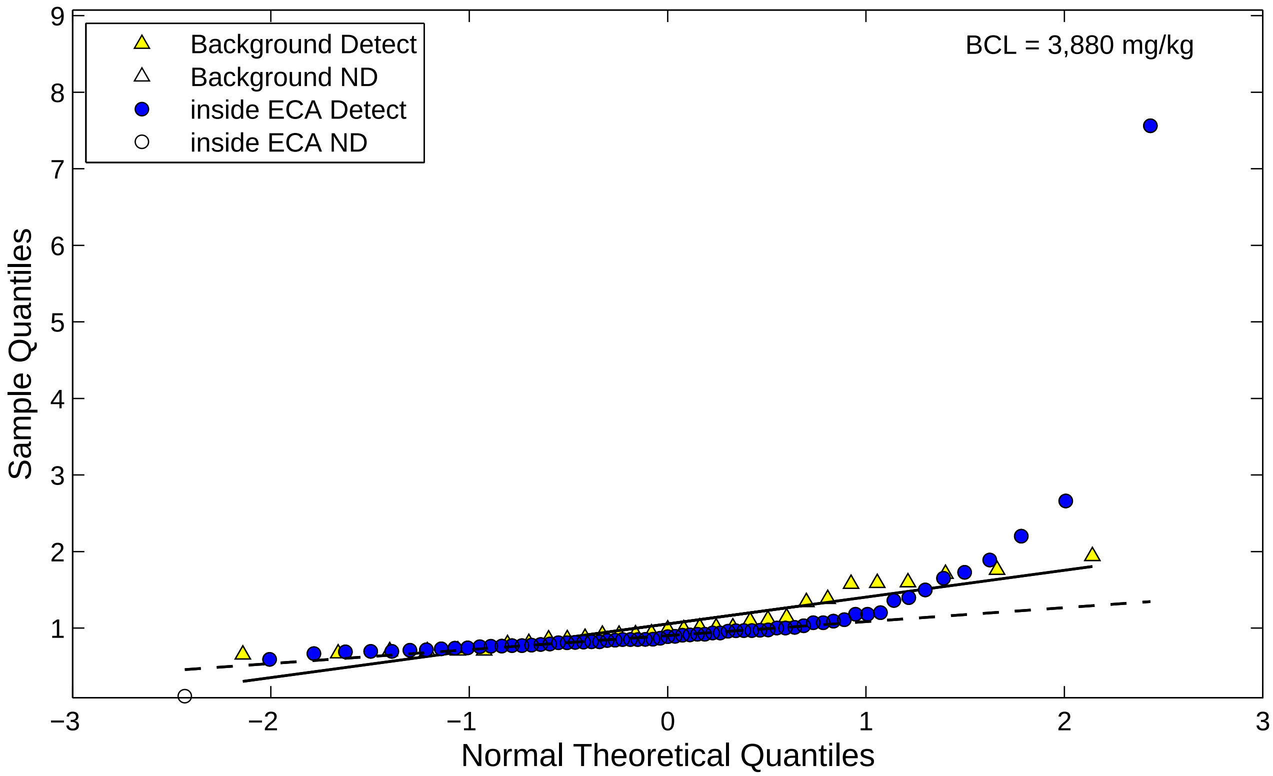


Figure C2−30A. Normal Q−Q Plots
Uranium



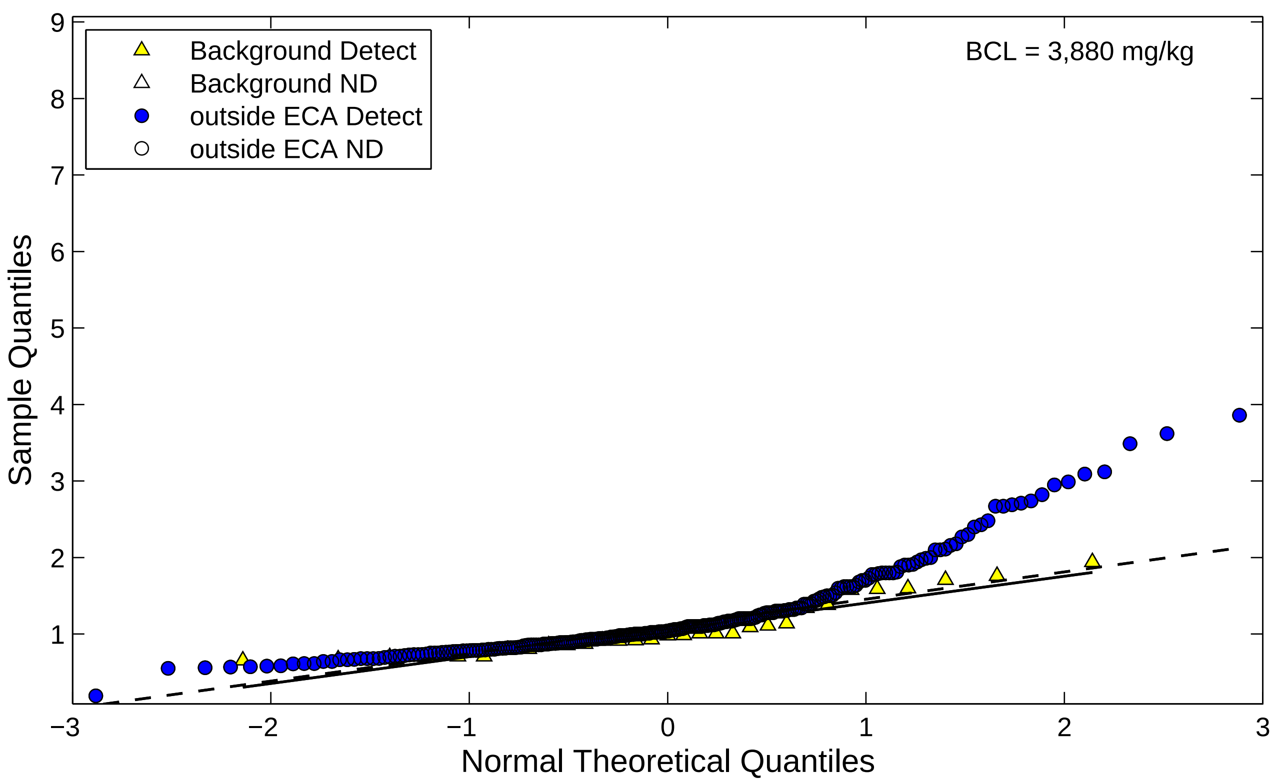
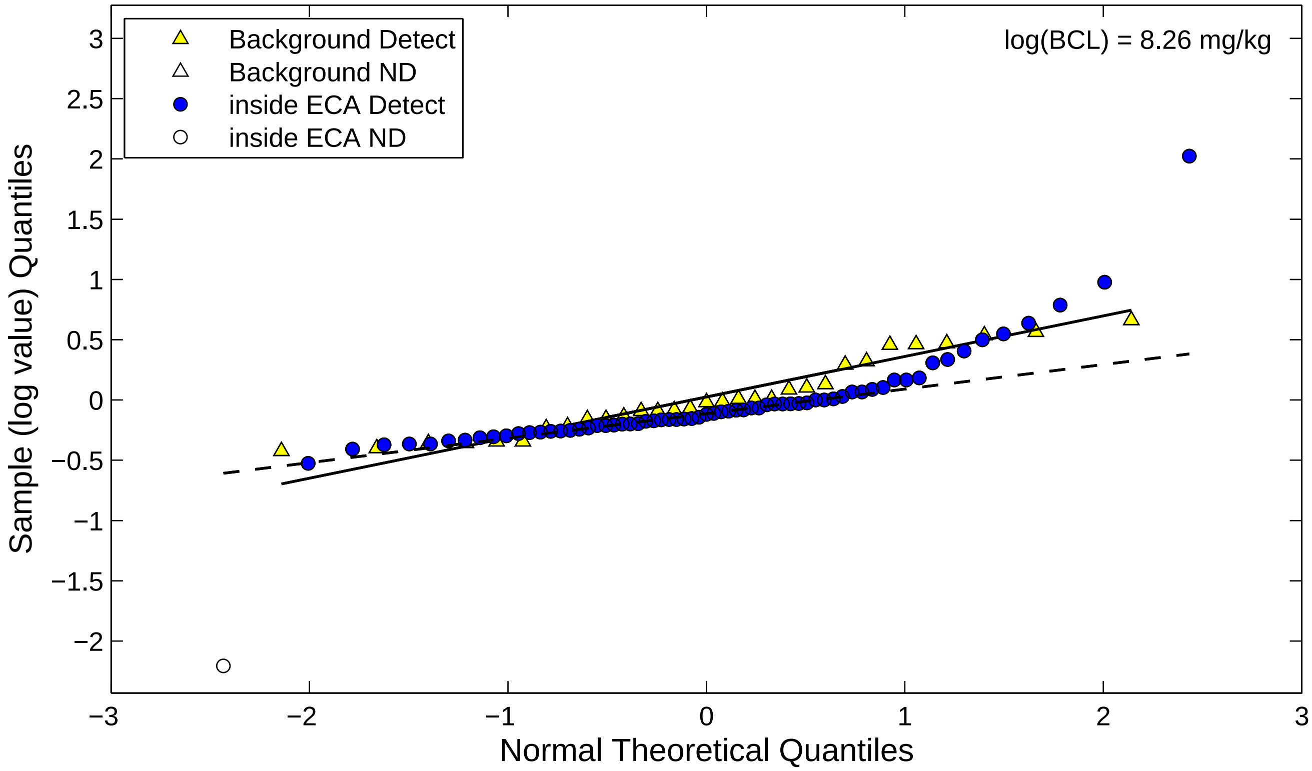
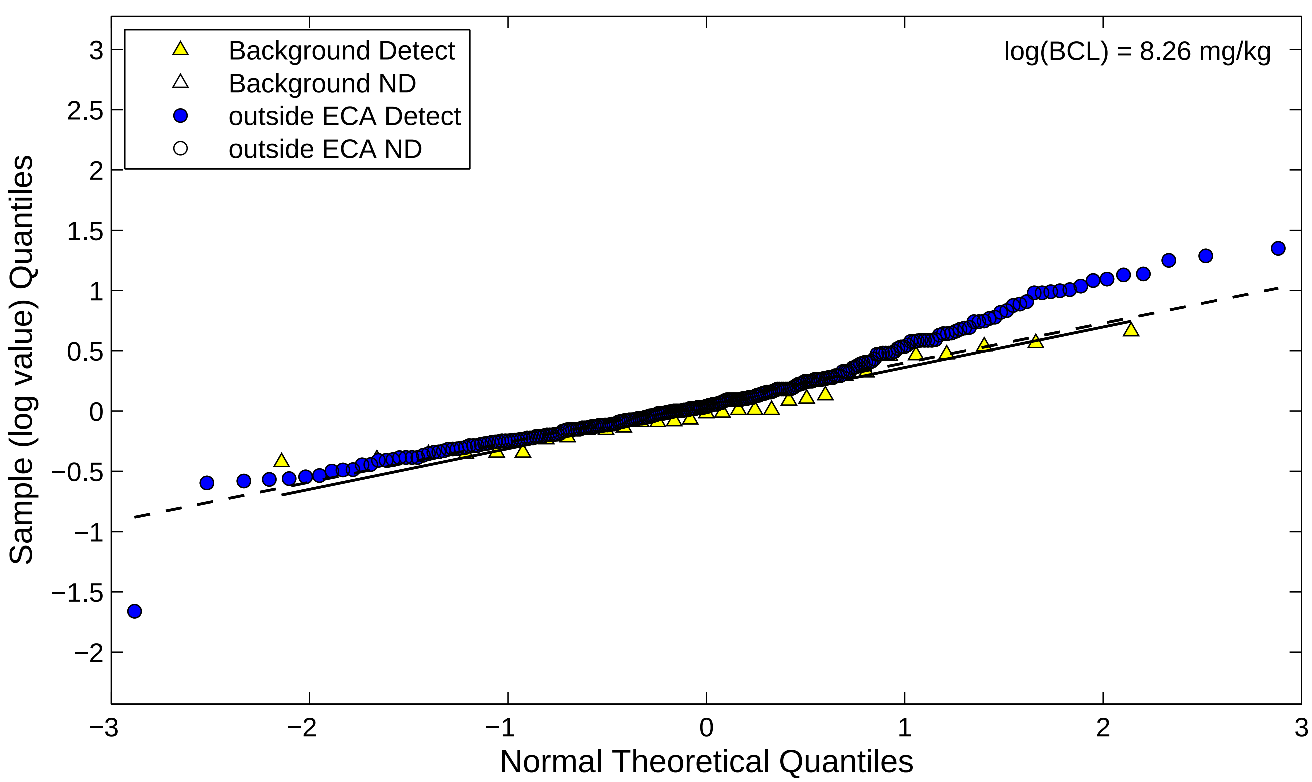


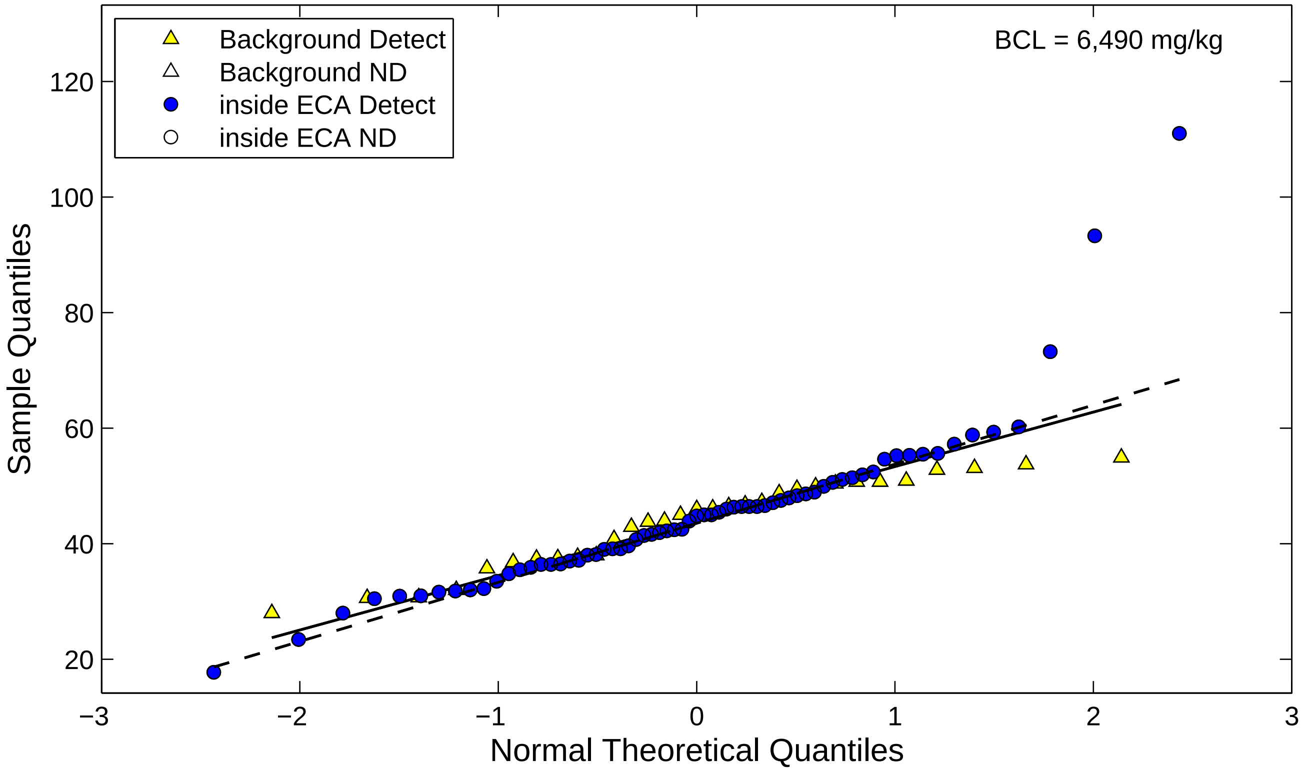
Figure C2−30B. Lognormal Q−Q Plots
Uranium





Ramboll Environ

Figure C2−31A. Normal Q−Q Plots
Vanadium



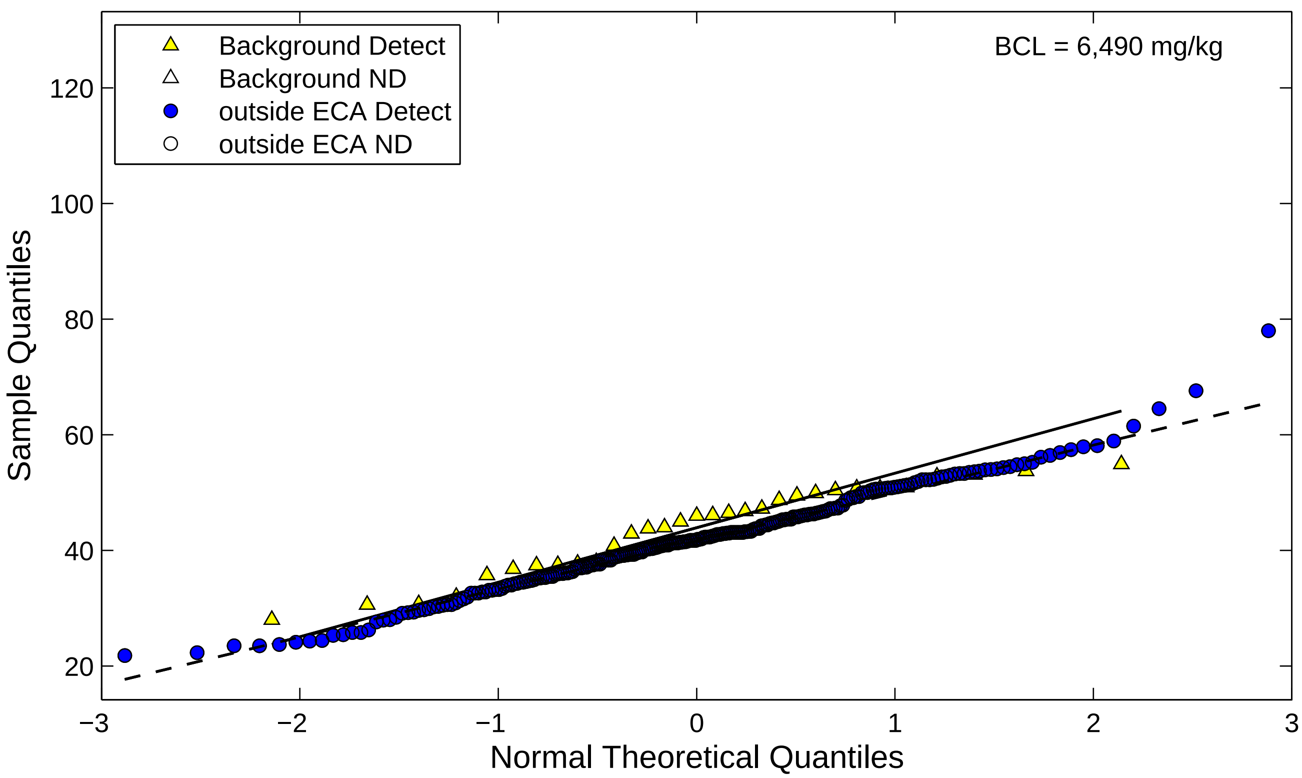
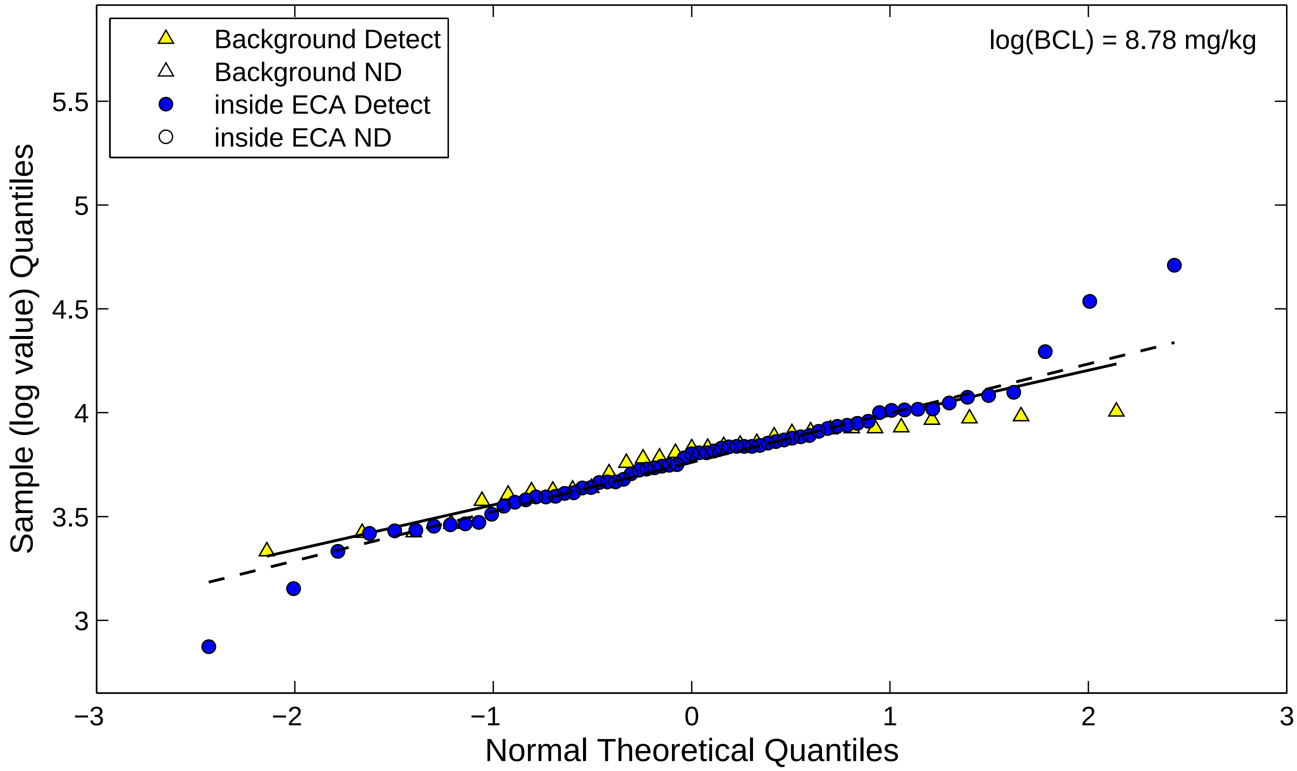
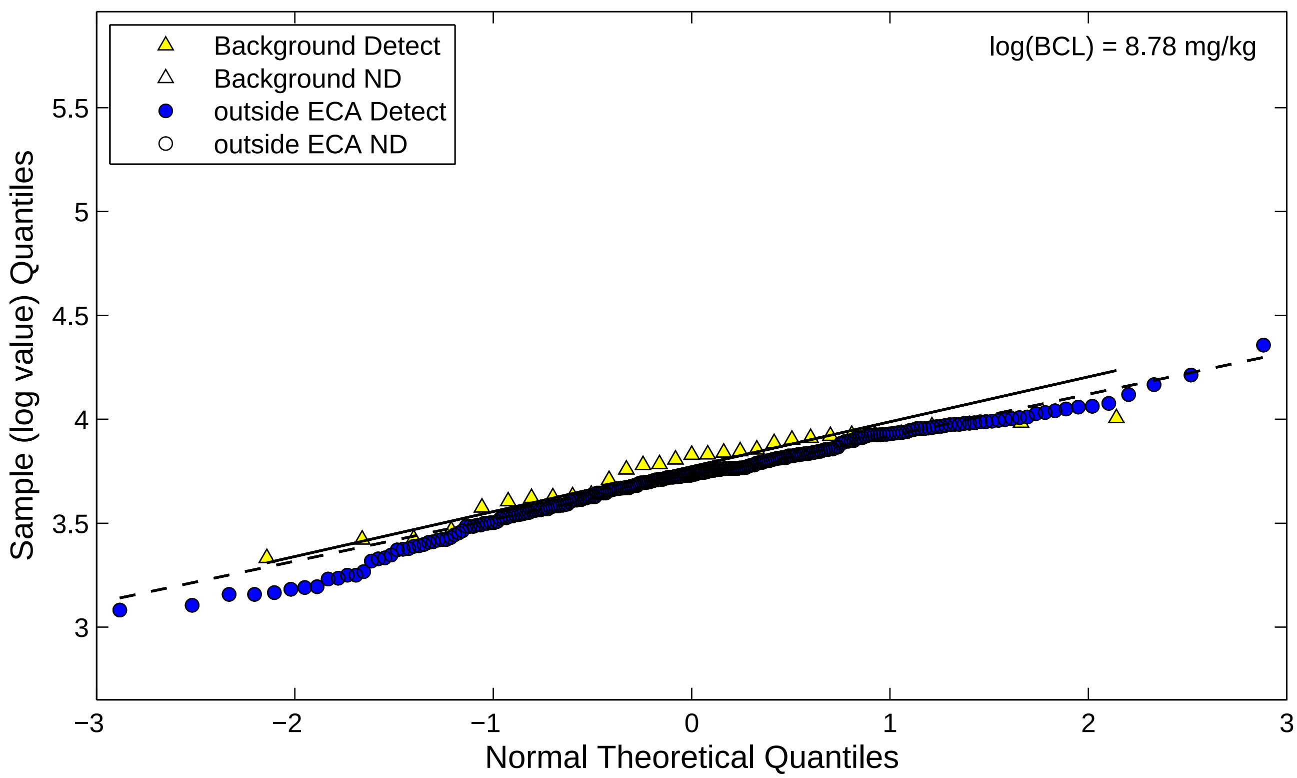


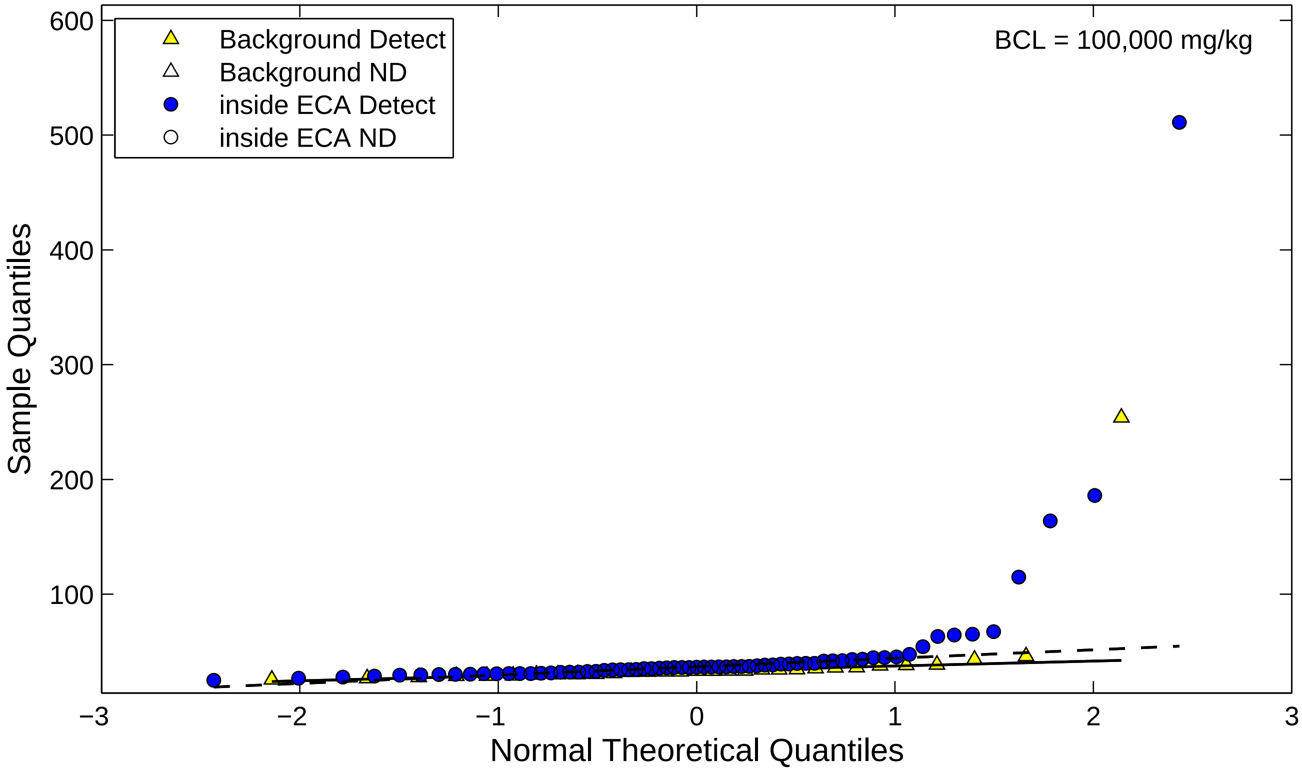
Figure C2−31B. Lognormal Q−Q Plots
Vanadium





Ramboll Environ

Figure C2−32A. Normal Q−Q Plots
Zinc



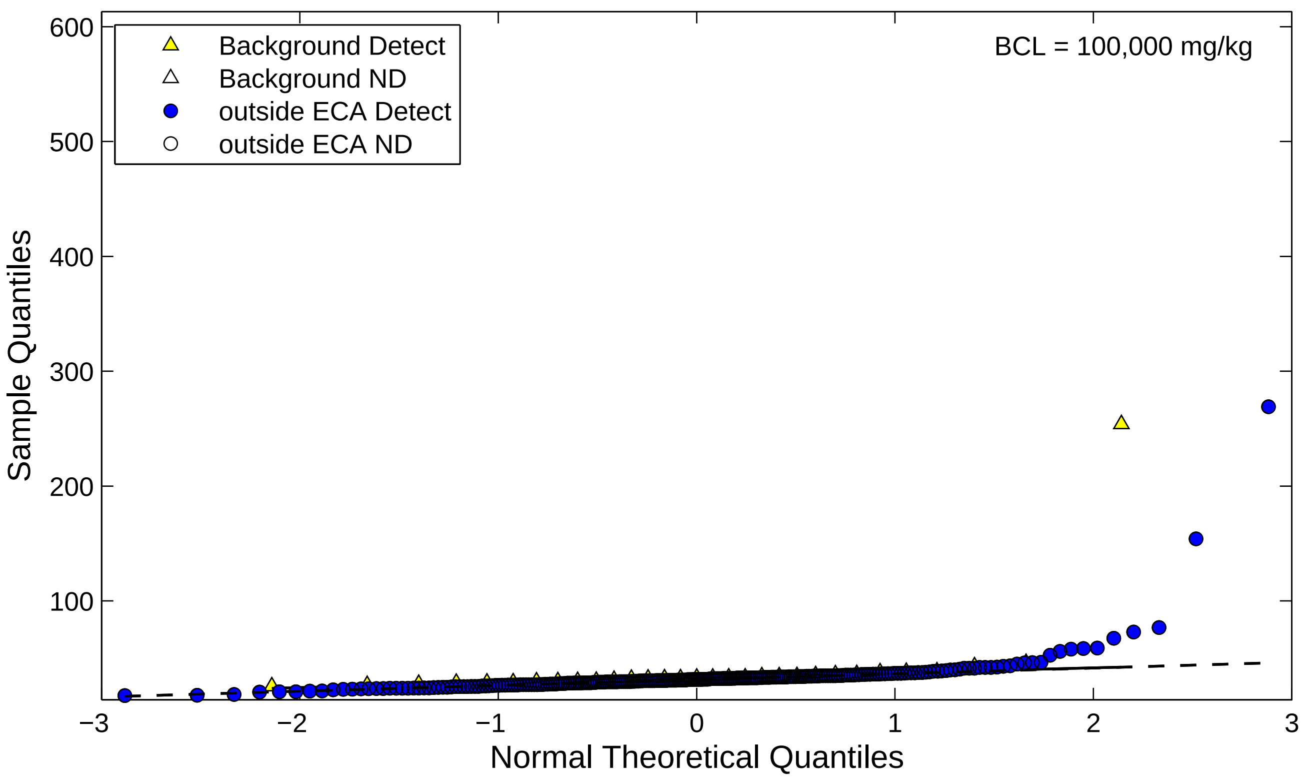
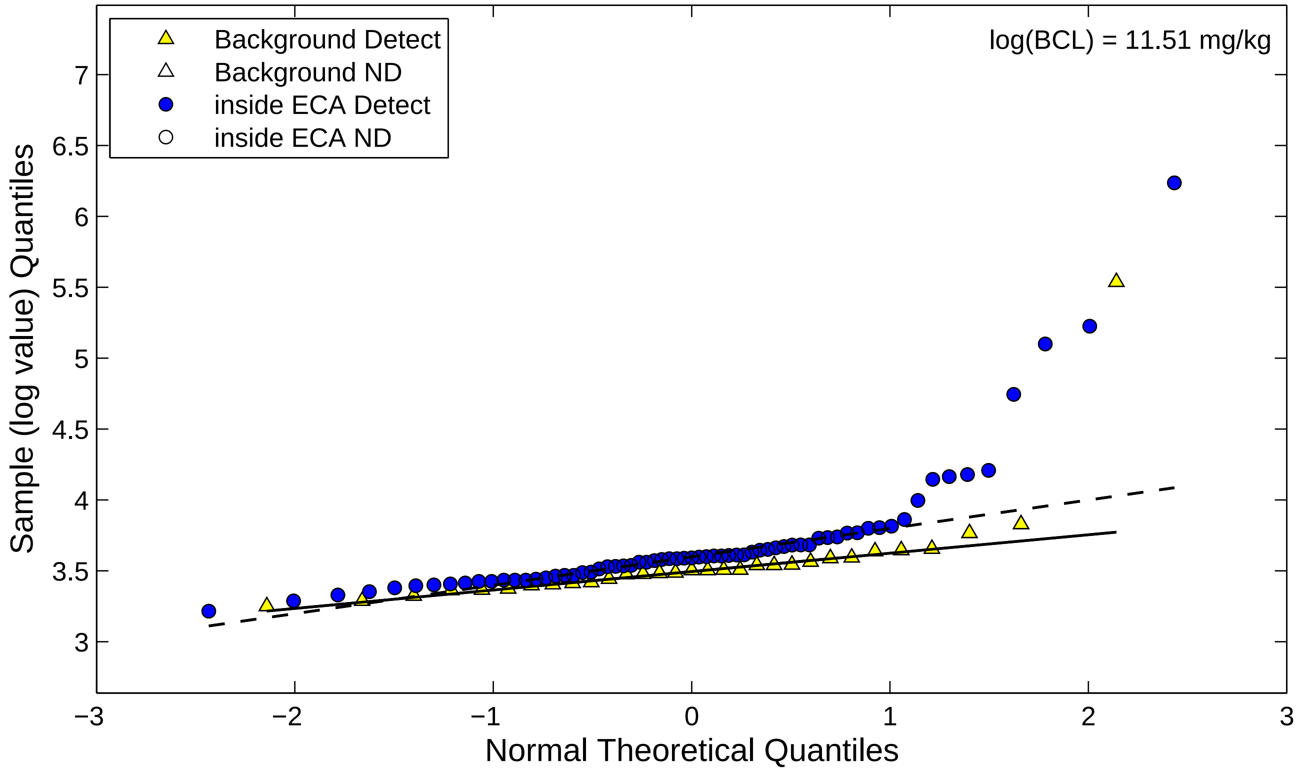


Figure C2−32B. Lognormal Q−Q Plots
Zinc



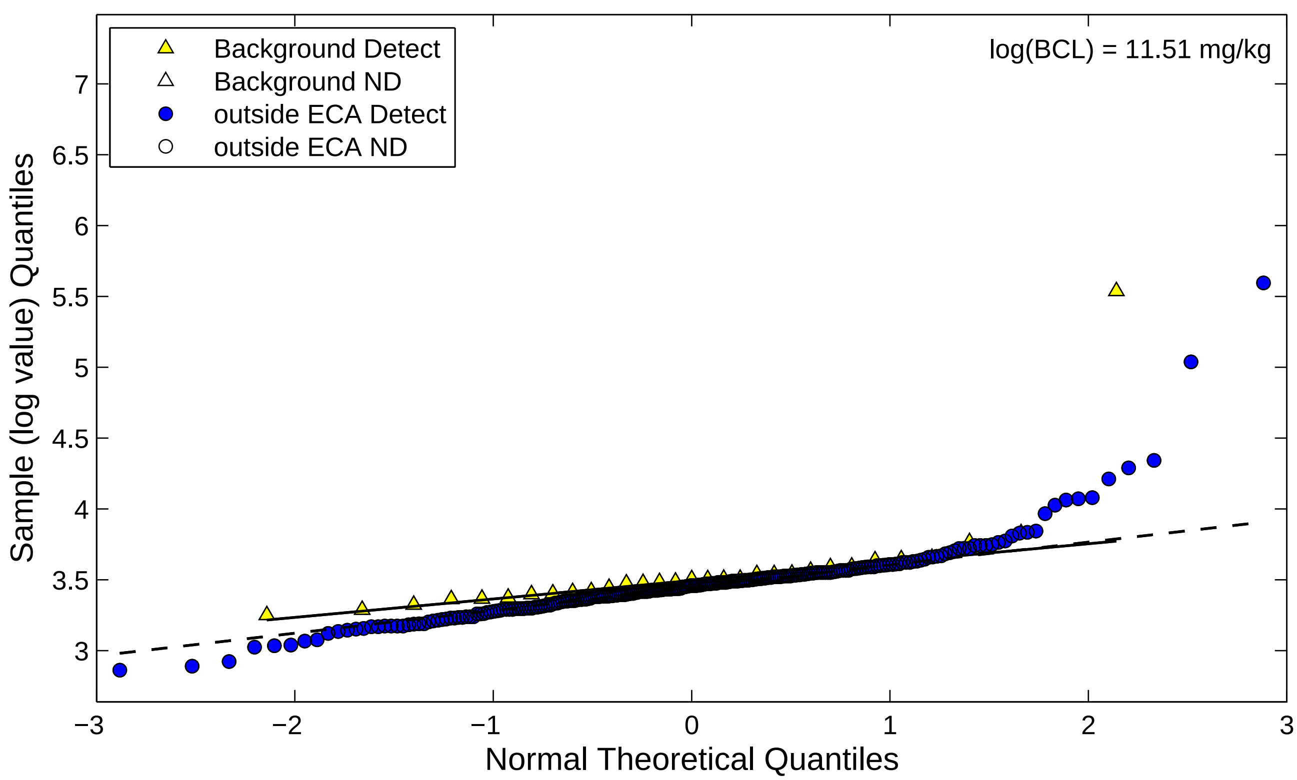
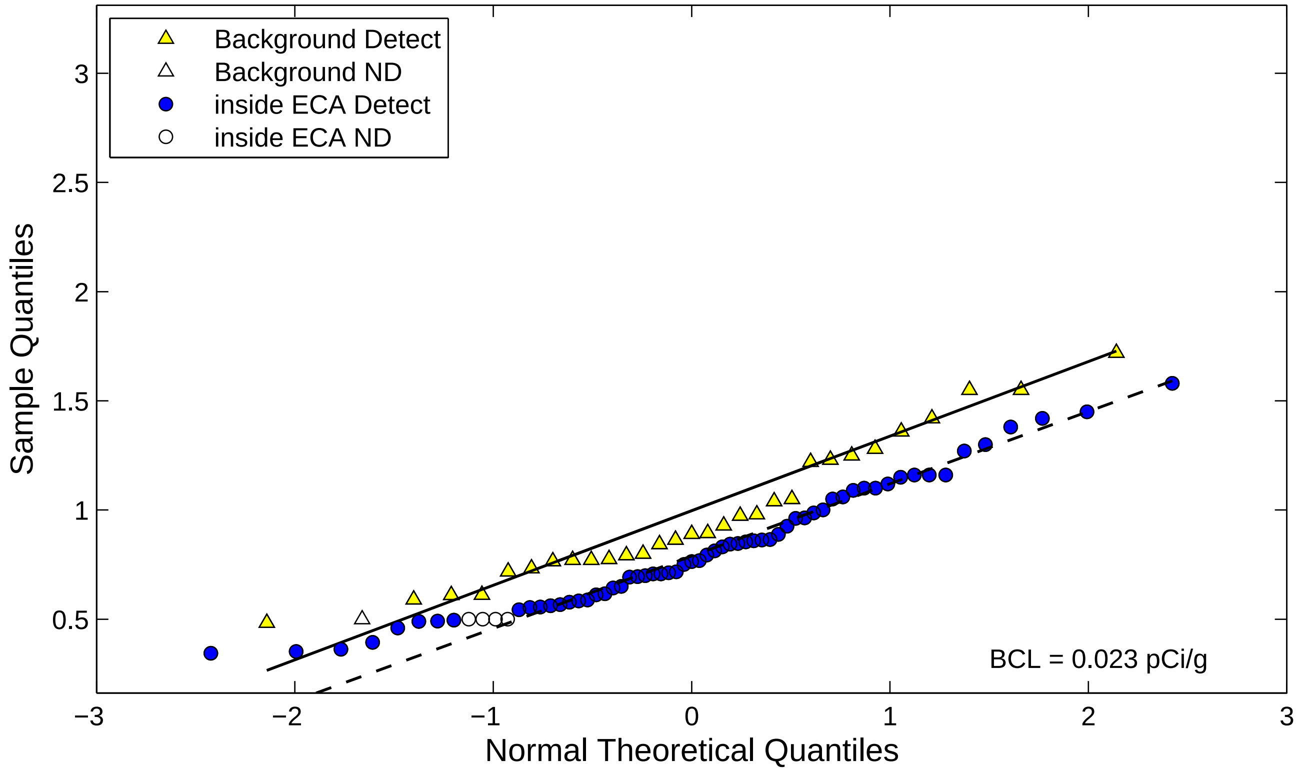


Figure C2−33A. Normal Q−Q Plots
Ra−226



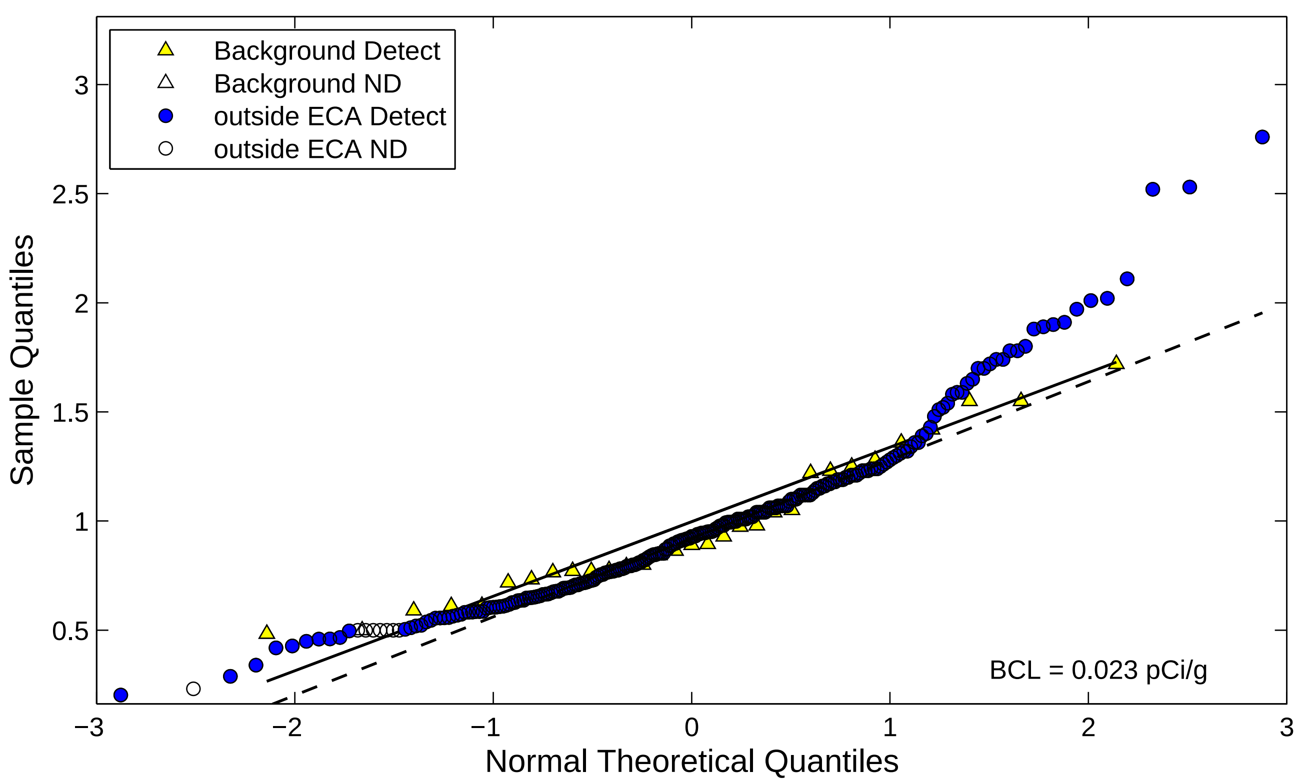
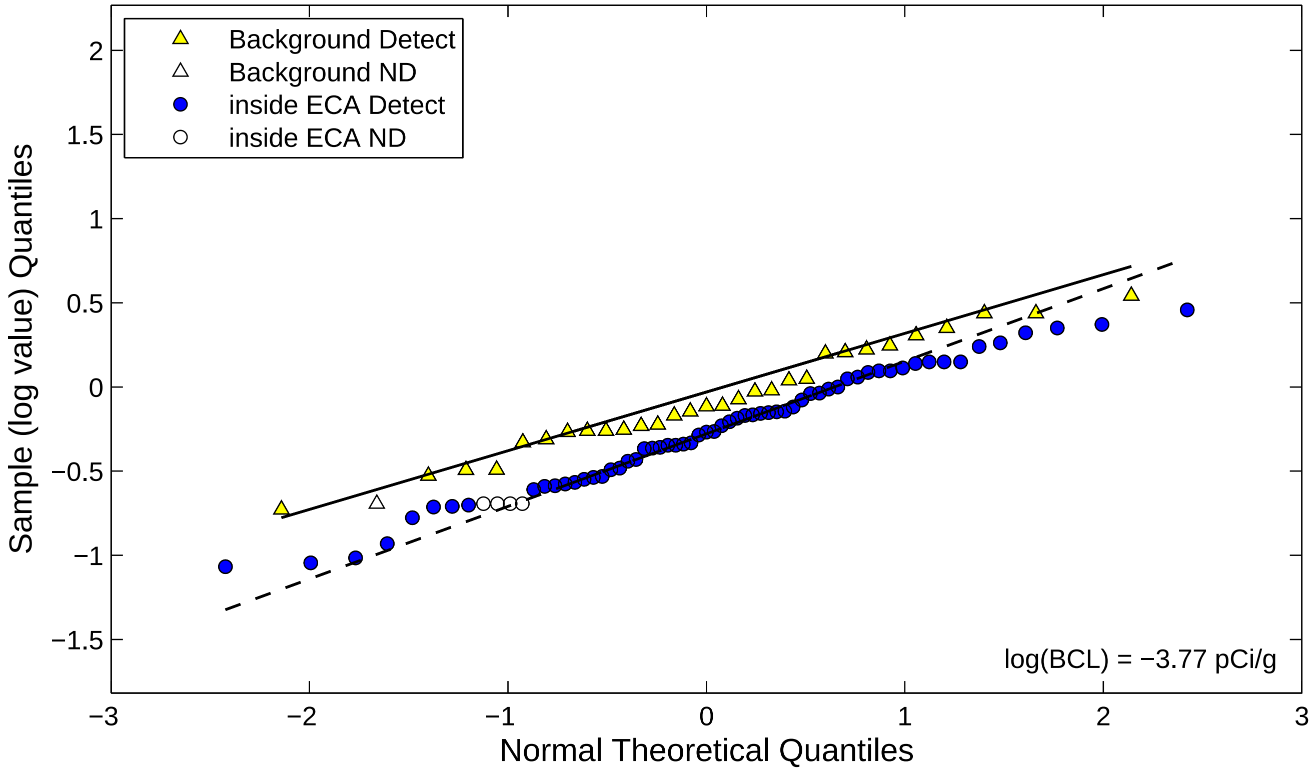


Figure C2−33B. Lognormal Q−Q Plots
Ra−226



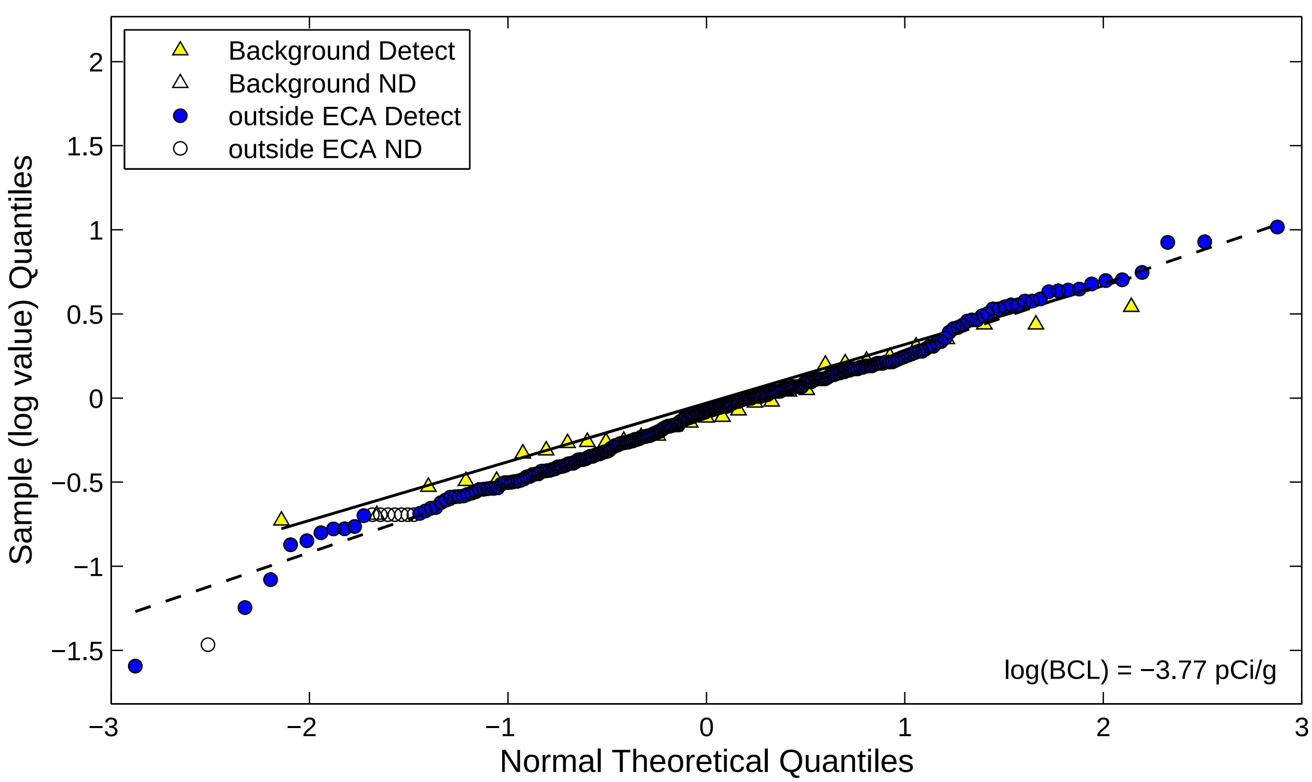
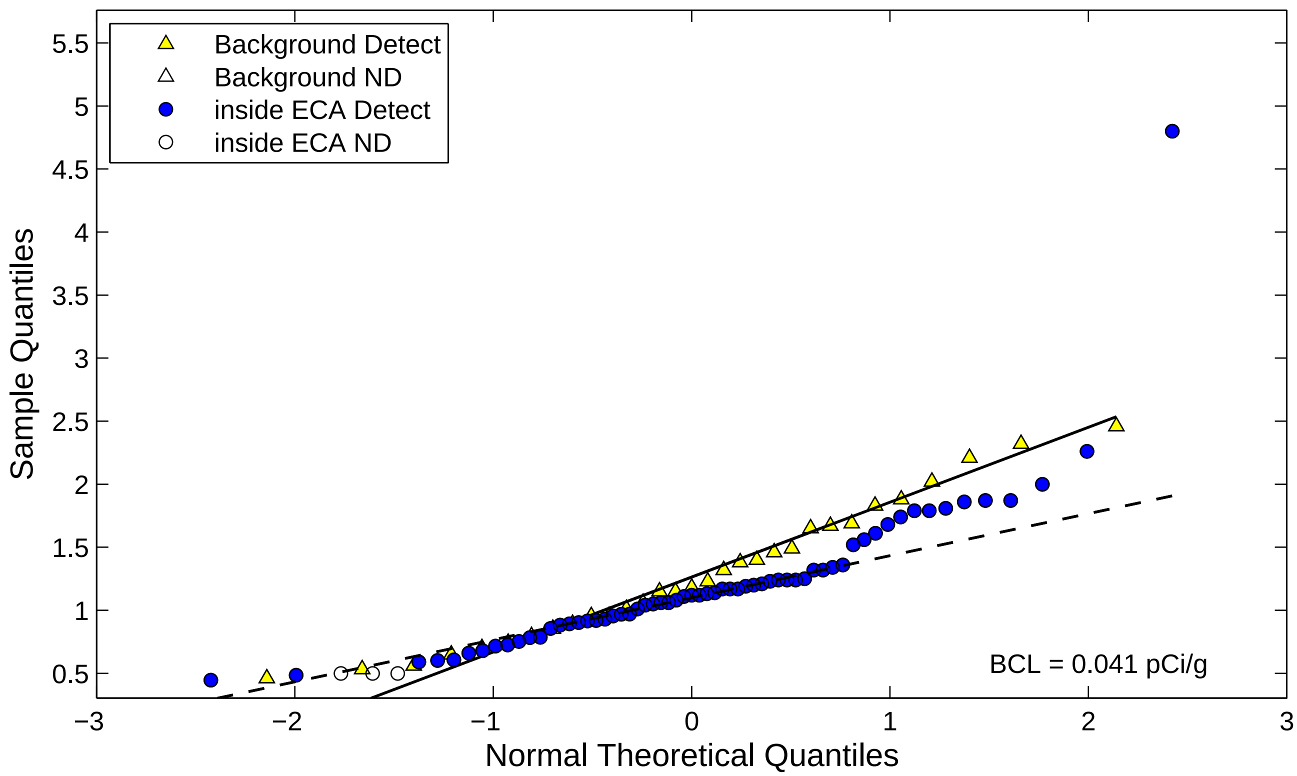


Figure C2−34A. Normal Q−Q Plots
Ra−228



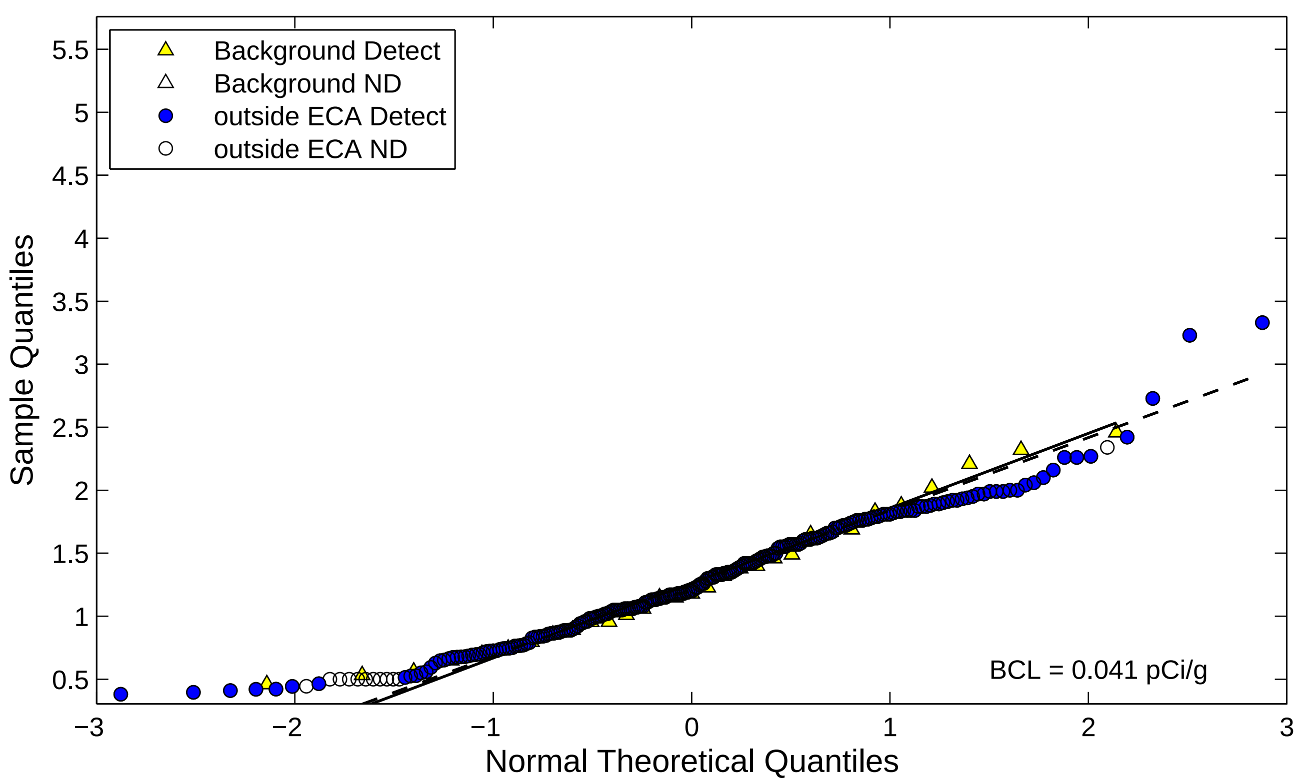
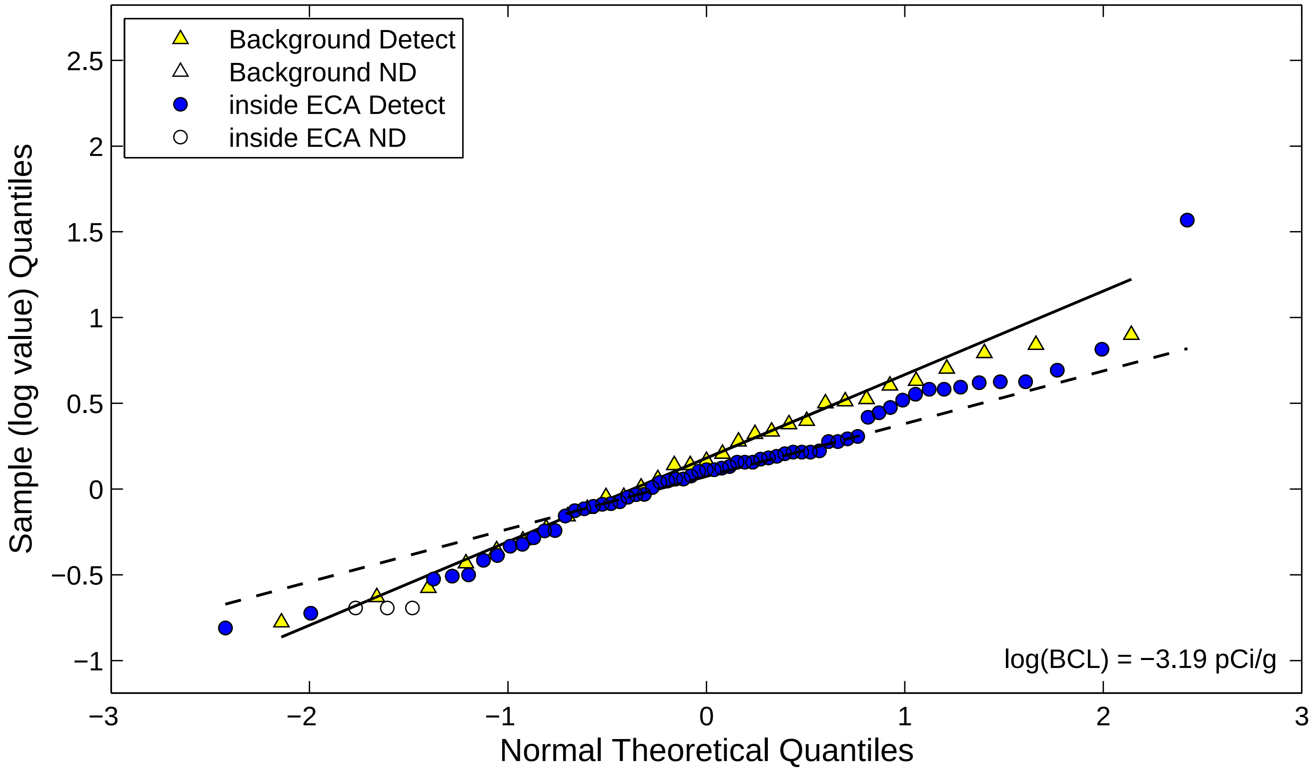


Figure C2−34B. Lognormal Q−Q Plots
Ra−228



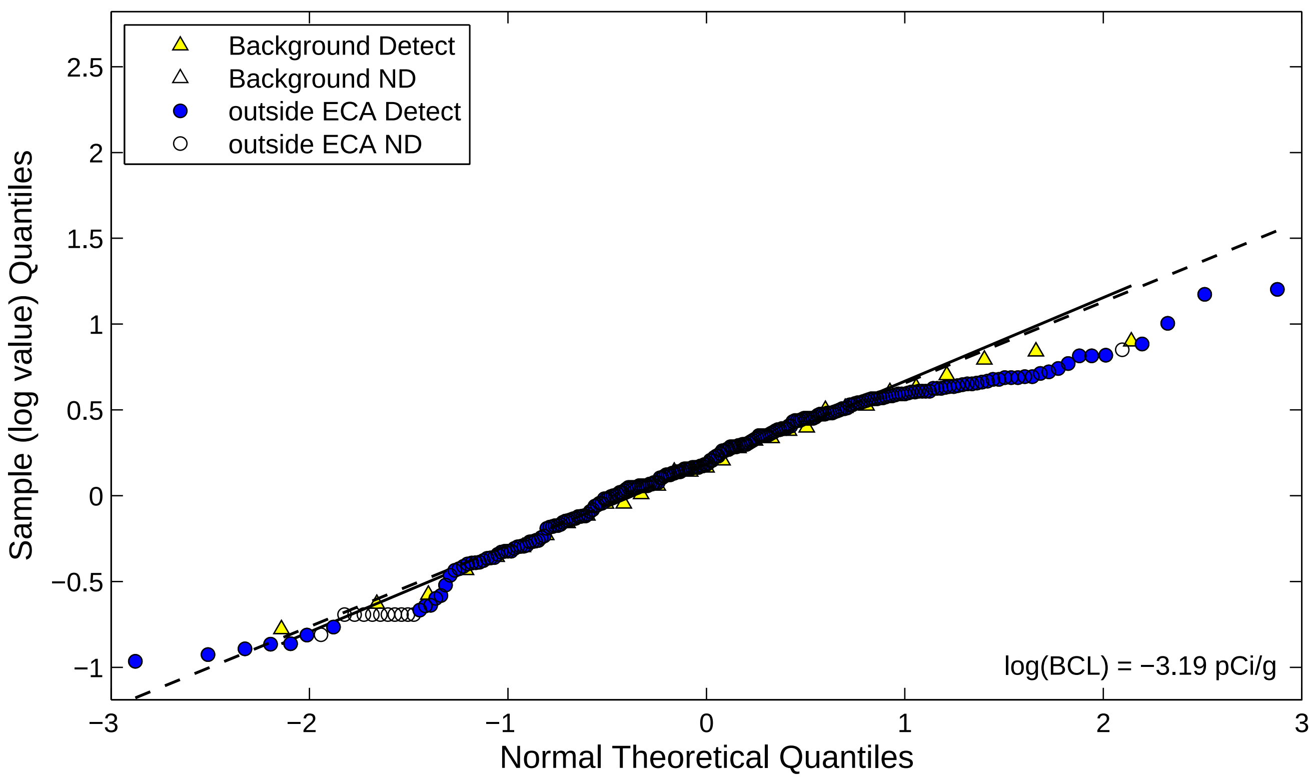
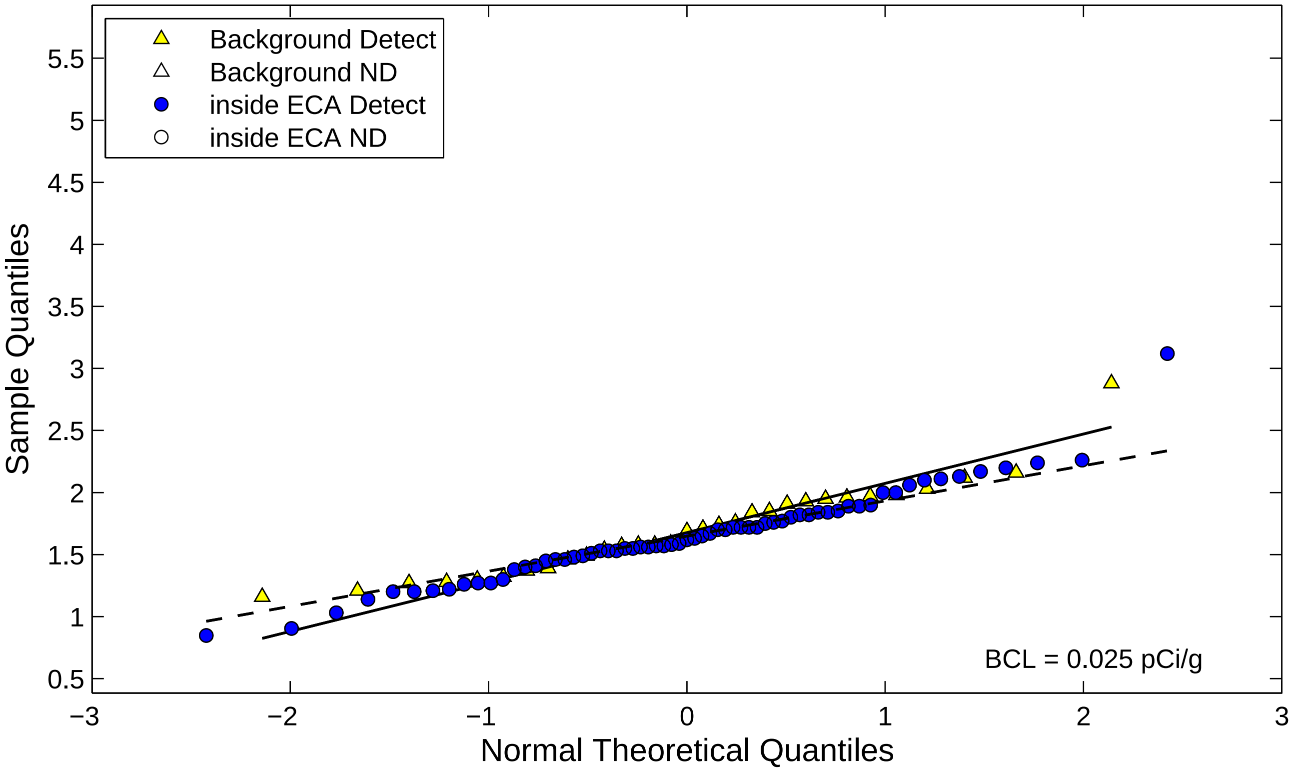


Figure C2−35A. Normal Q−Q Plots
Th−228



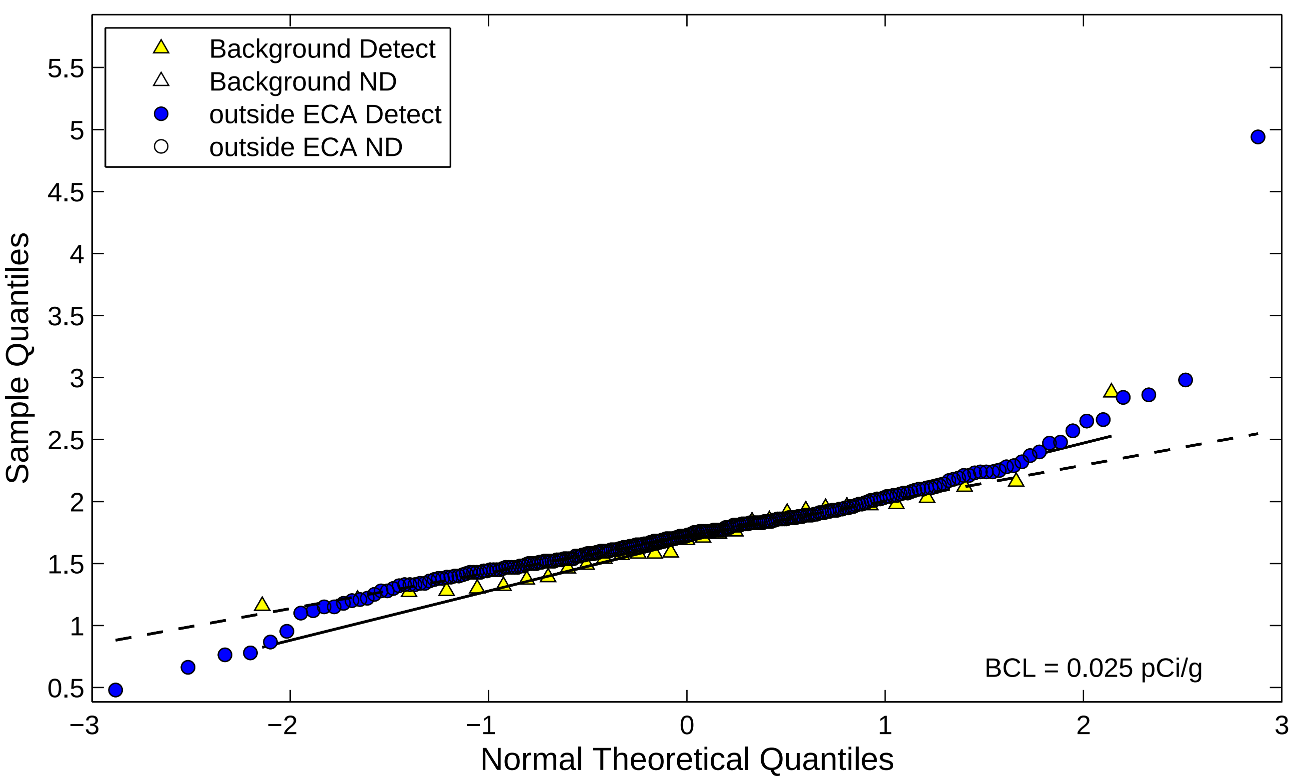
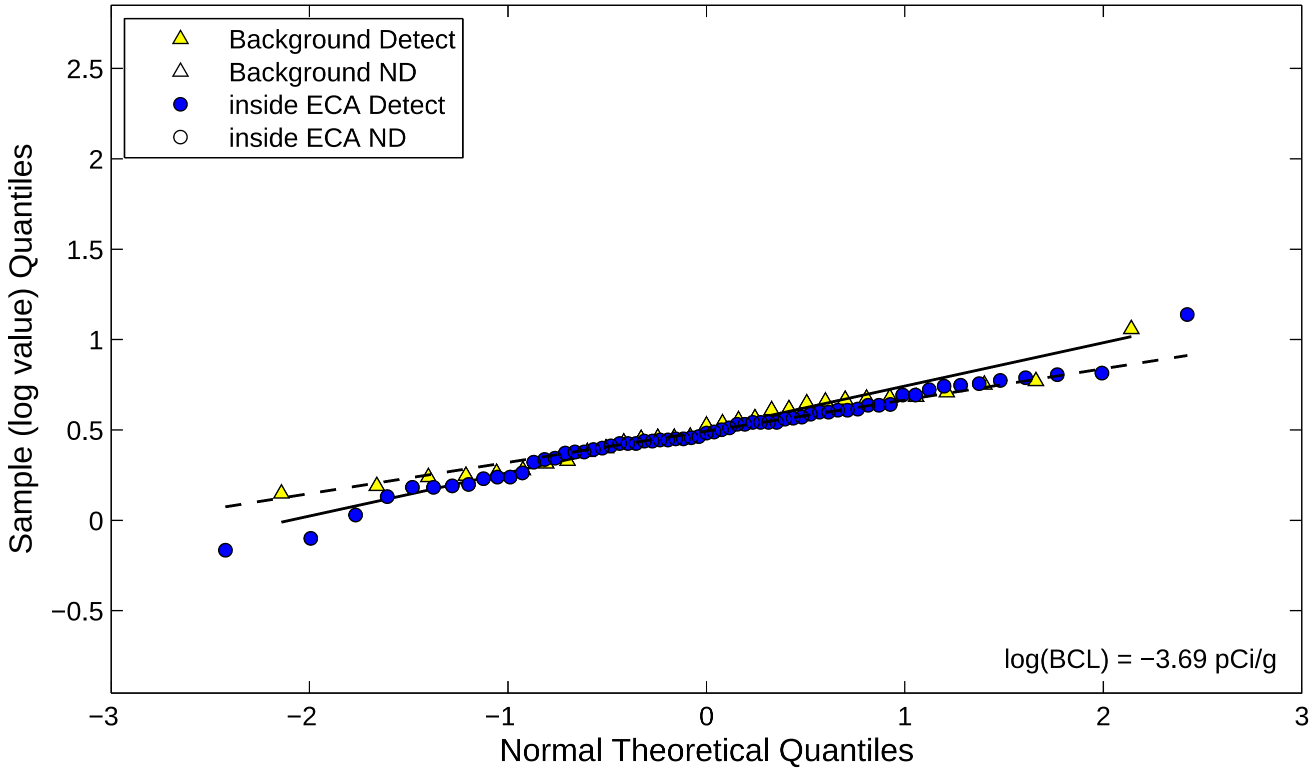


Figure C2−35B. Lognormal Q−Q Plots
Th−228



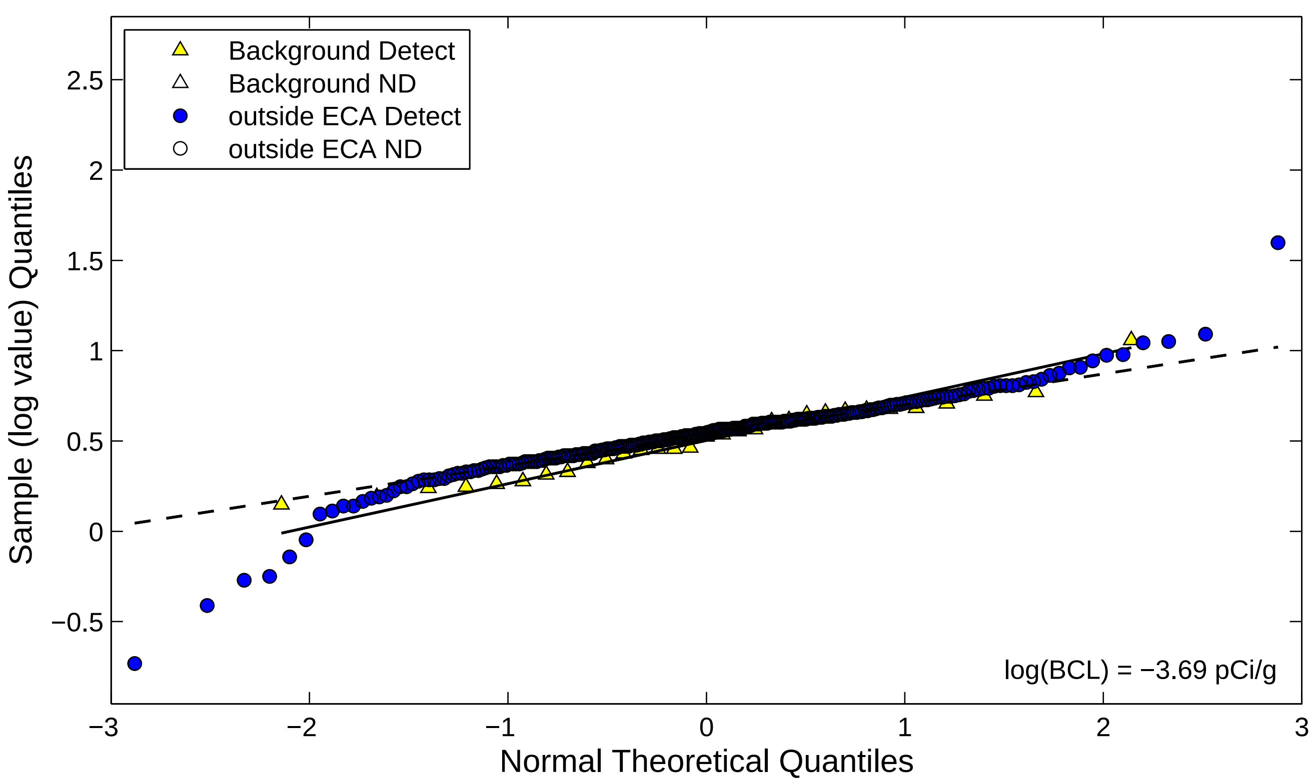
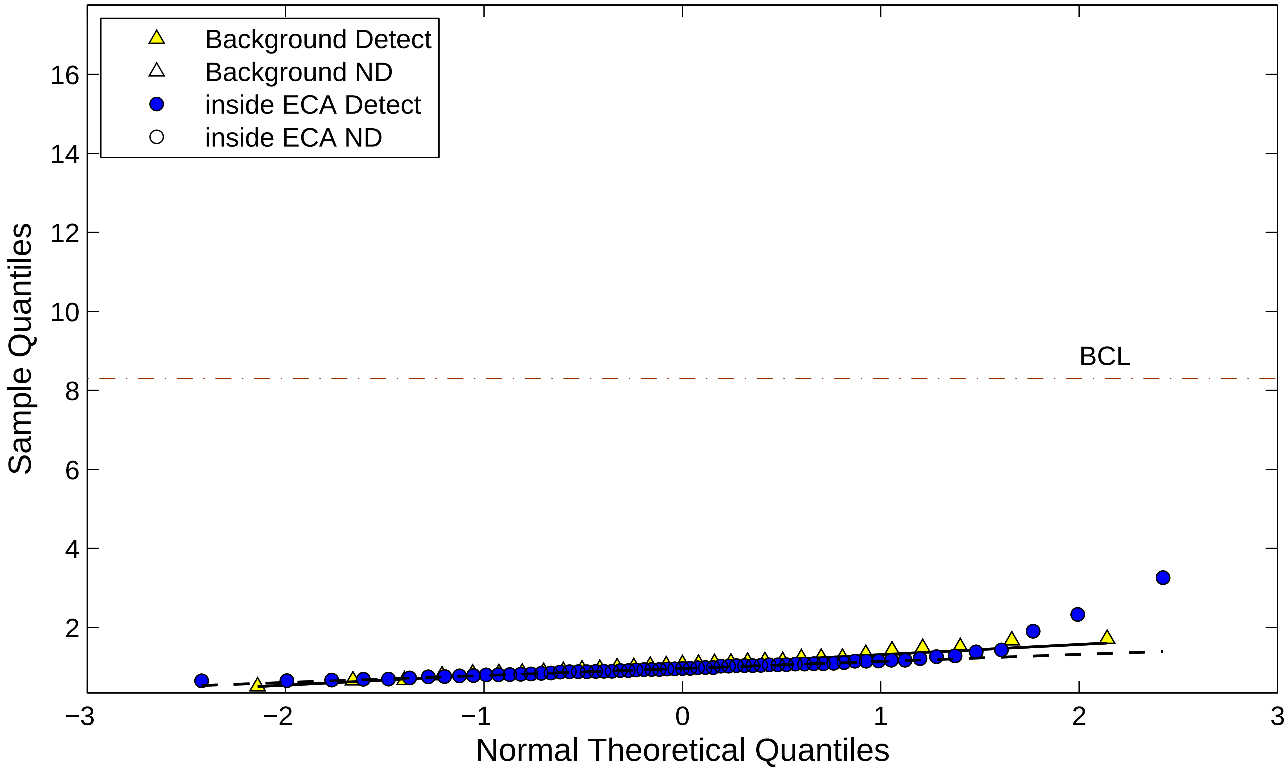


Figure C2−36A. Normal Q−Q Plots
Th−230



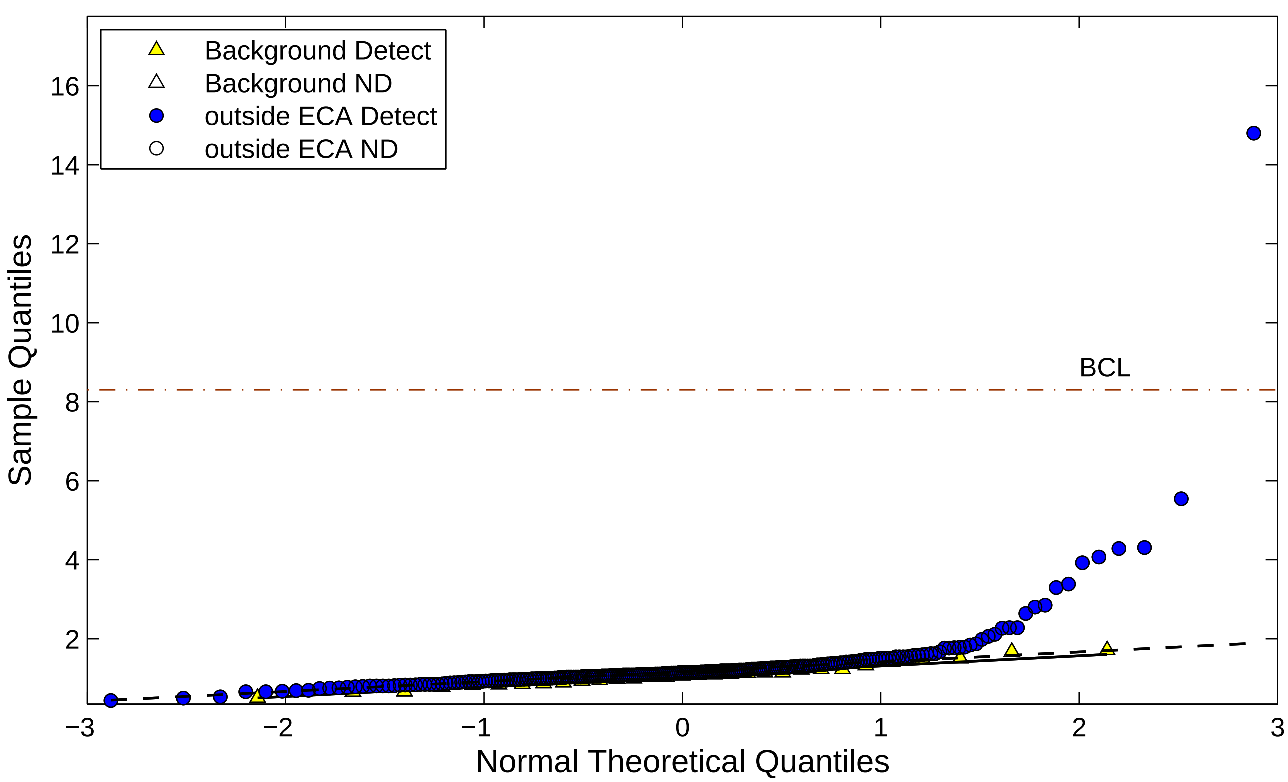


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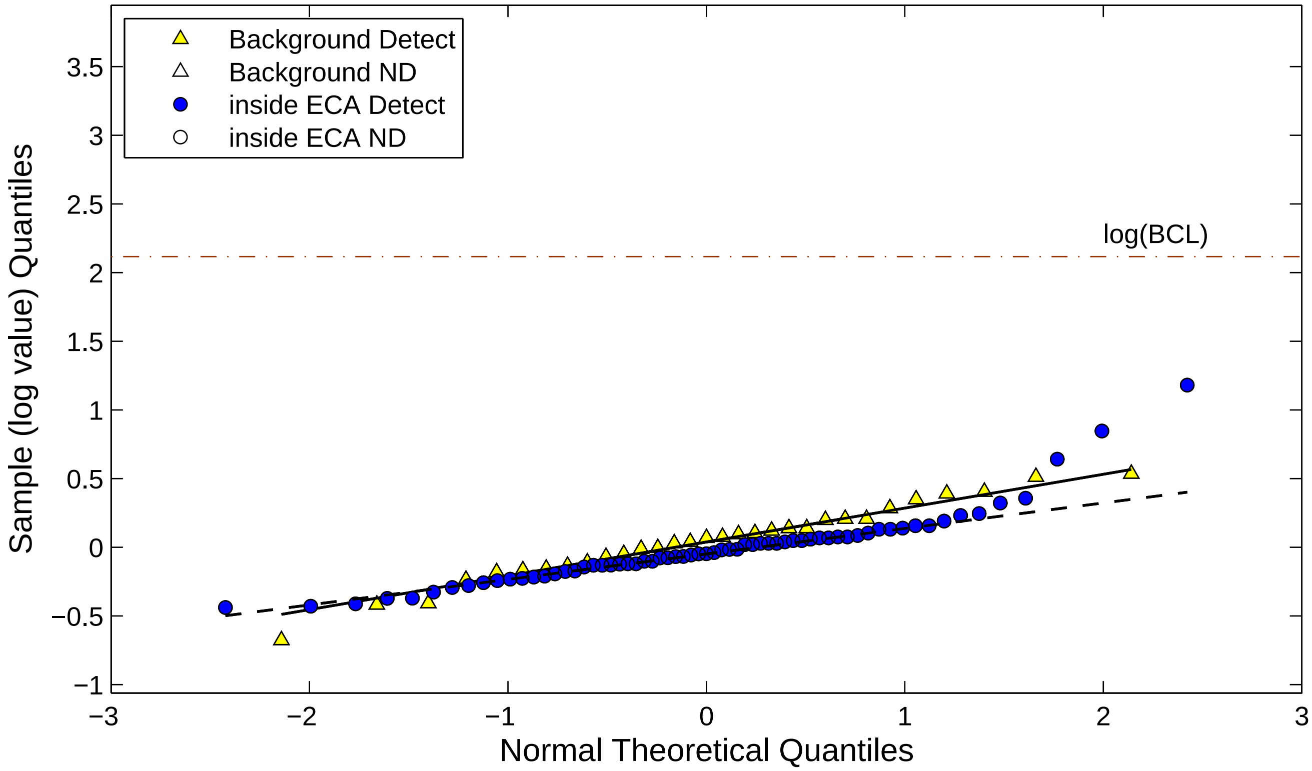
Figure C2−36B. Lognormal Q−Q Plots
Th−230



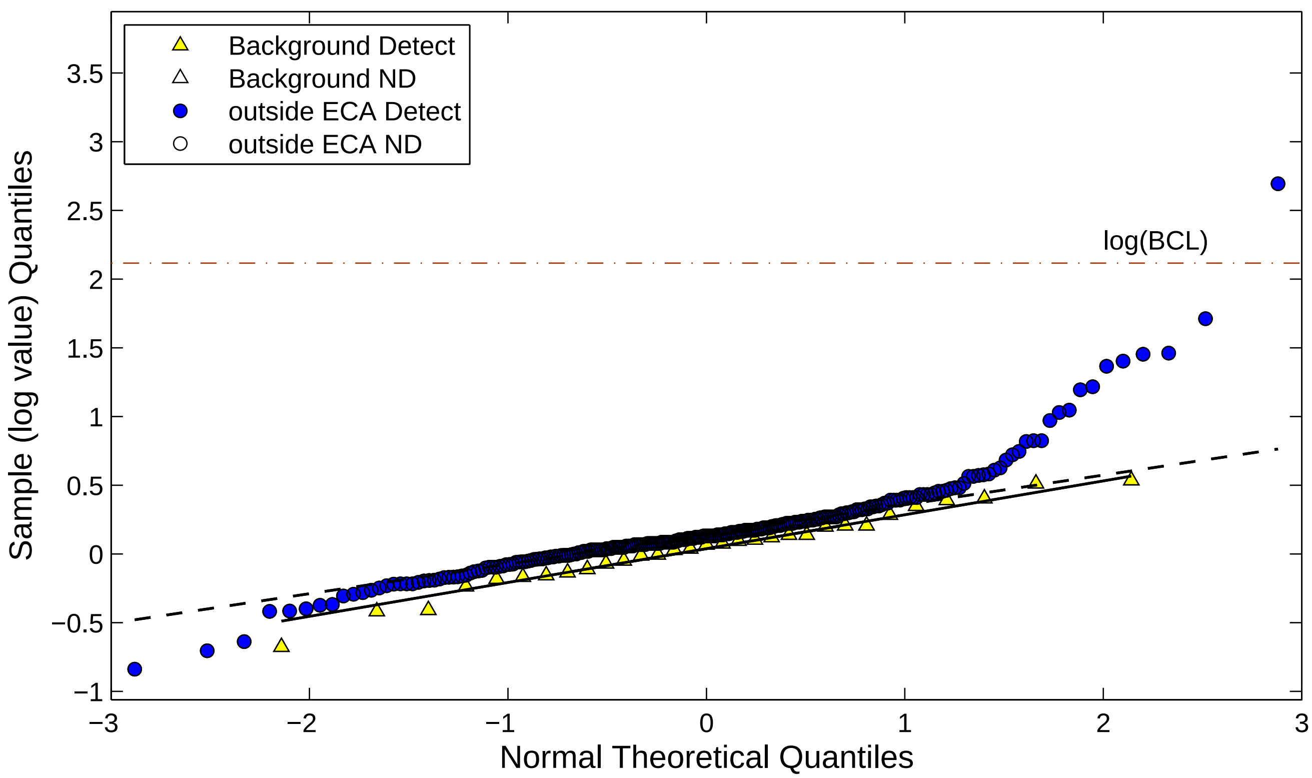
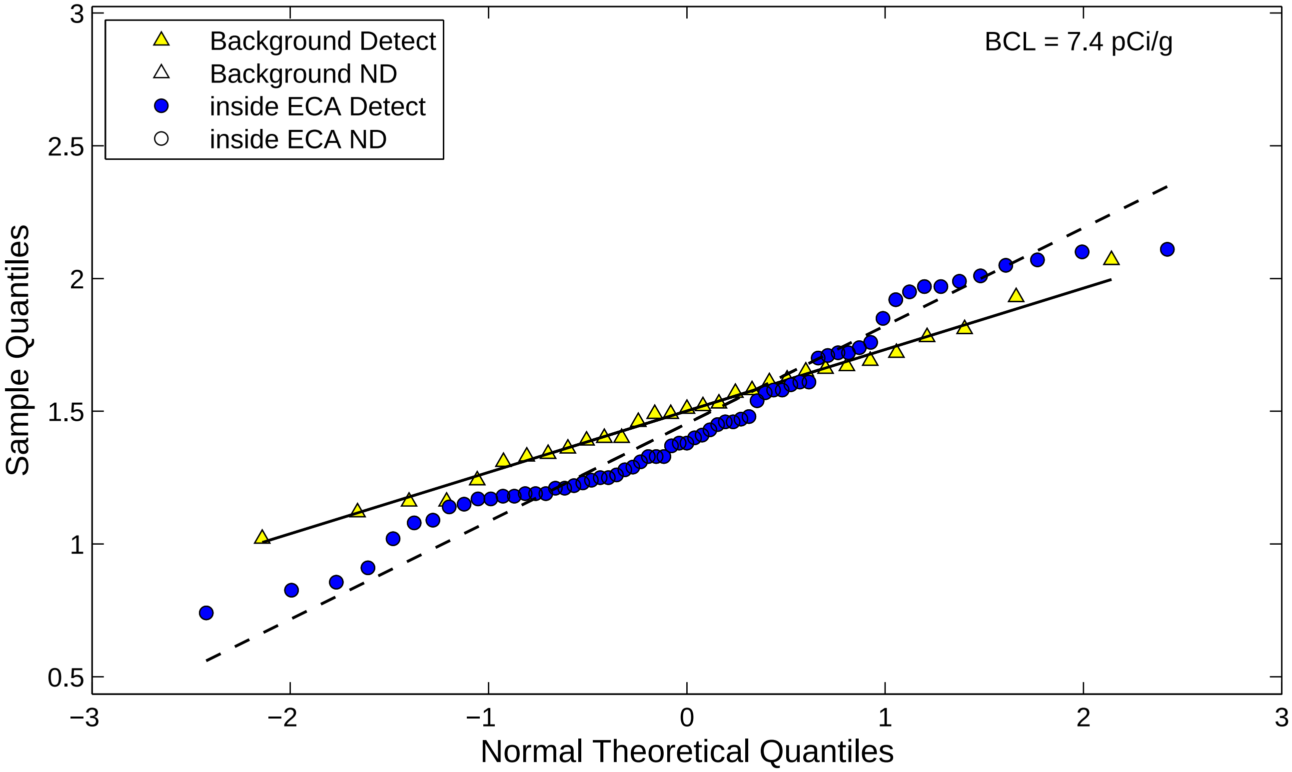


Figure C2−37A. Normal Q−Q Plots
Th−232



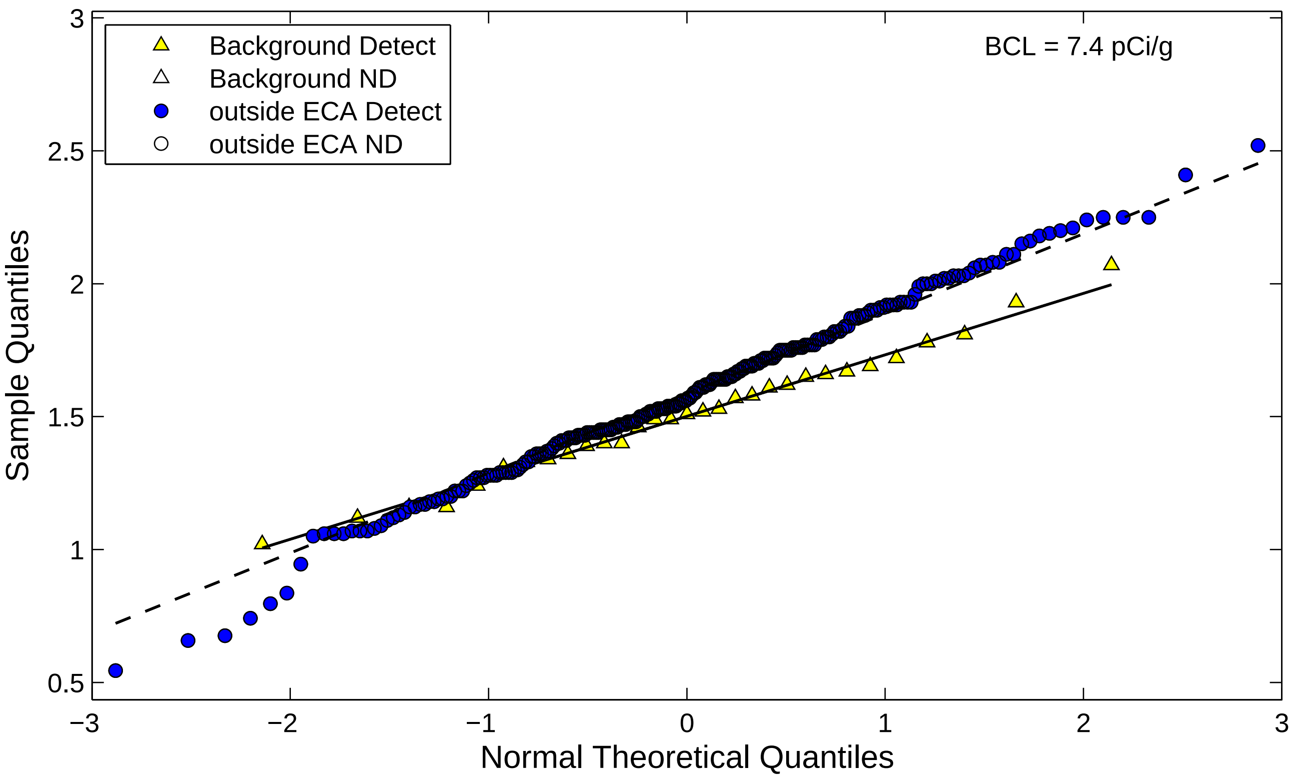
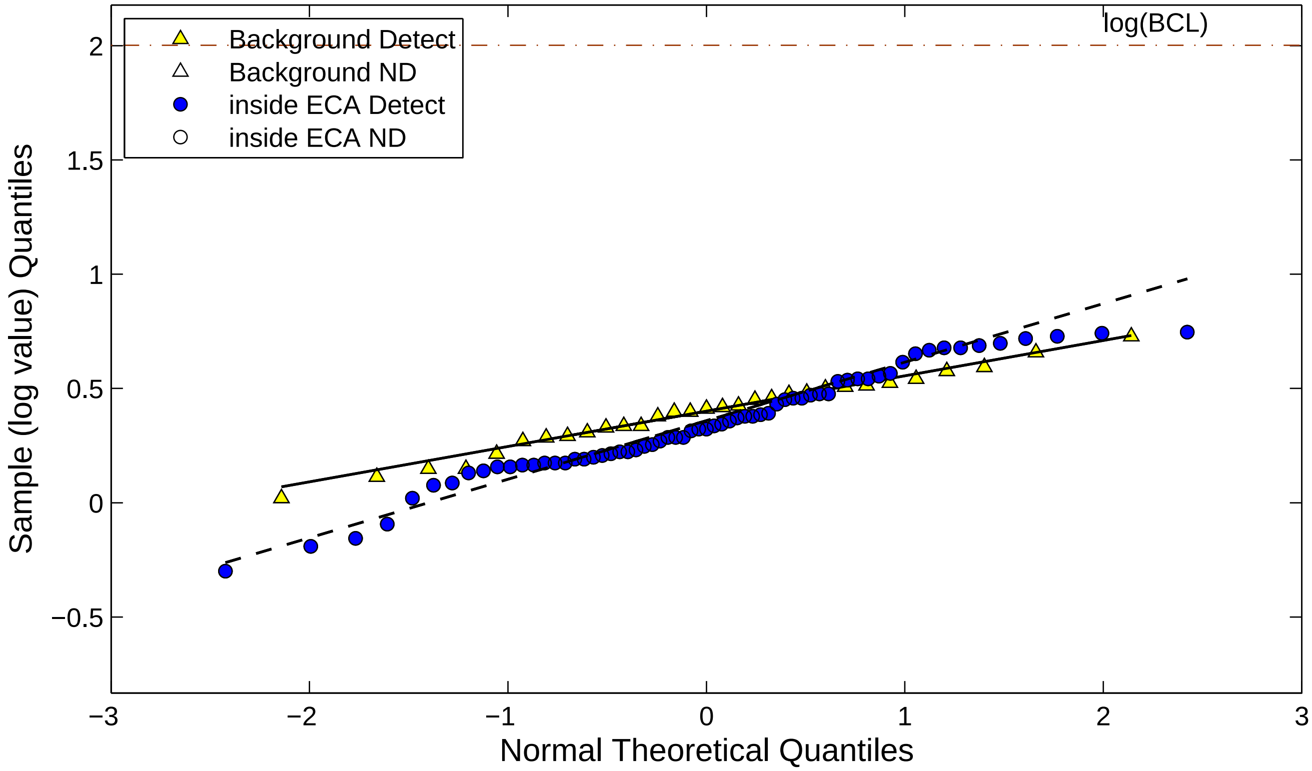


Figure C2−37B. Lognormal Q−Q Plots
Th−232



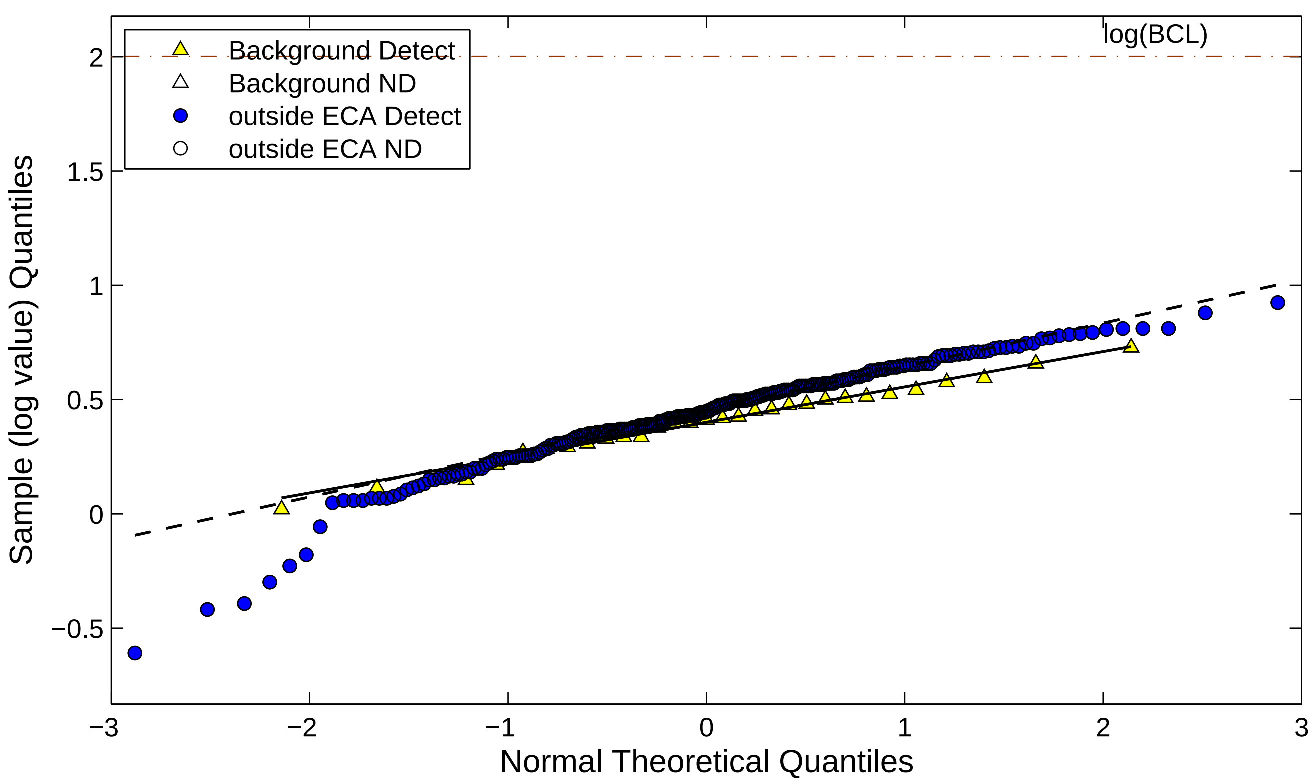
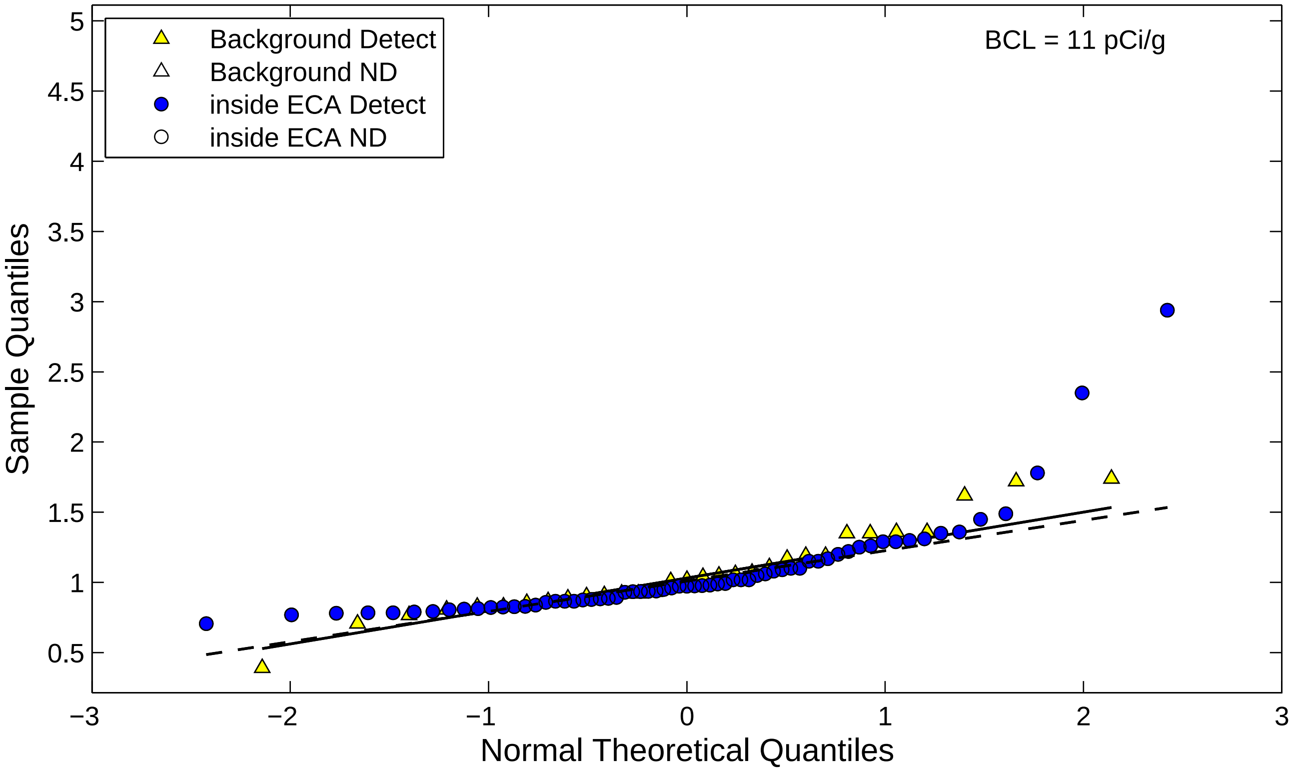


Figure C2−38A. Normal Q−Q Plots
U−234



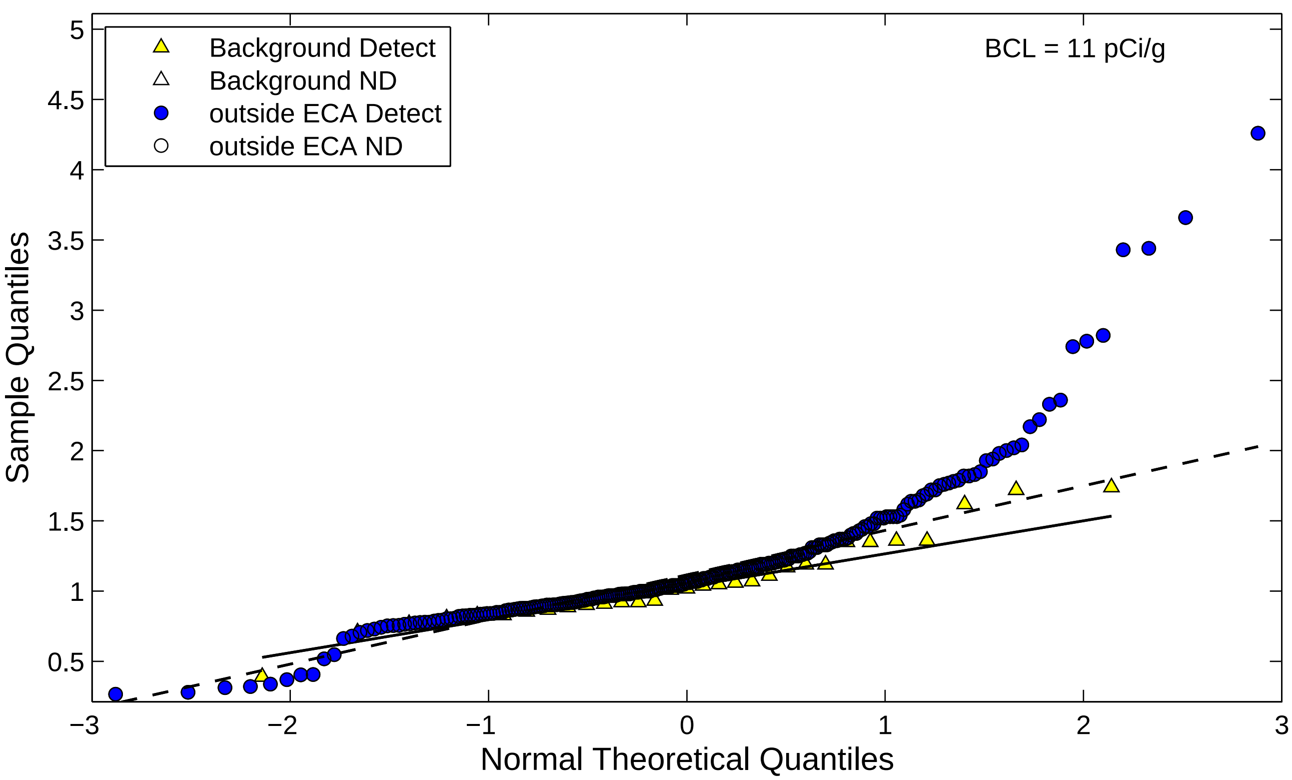


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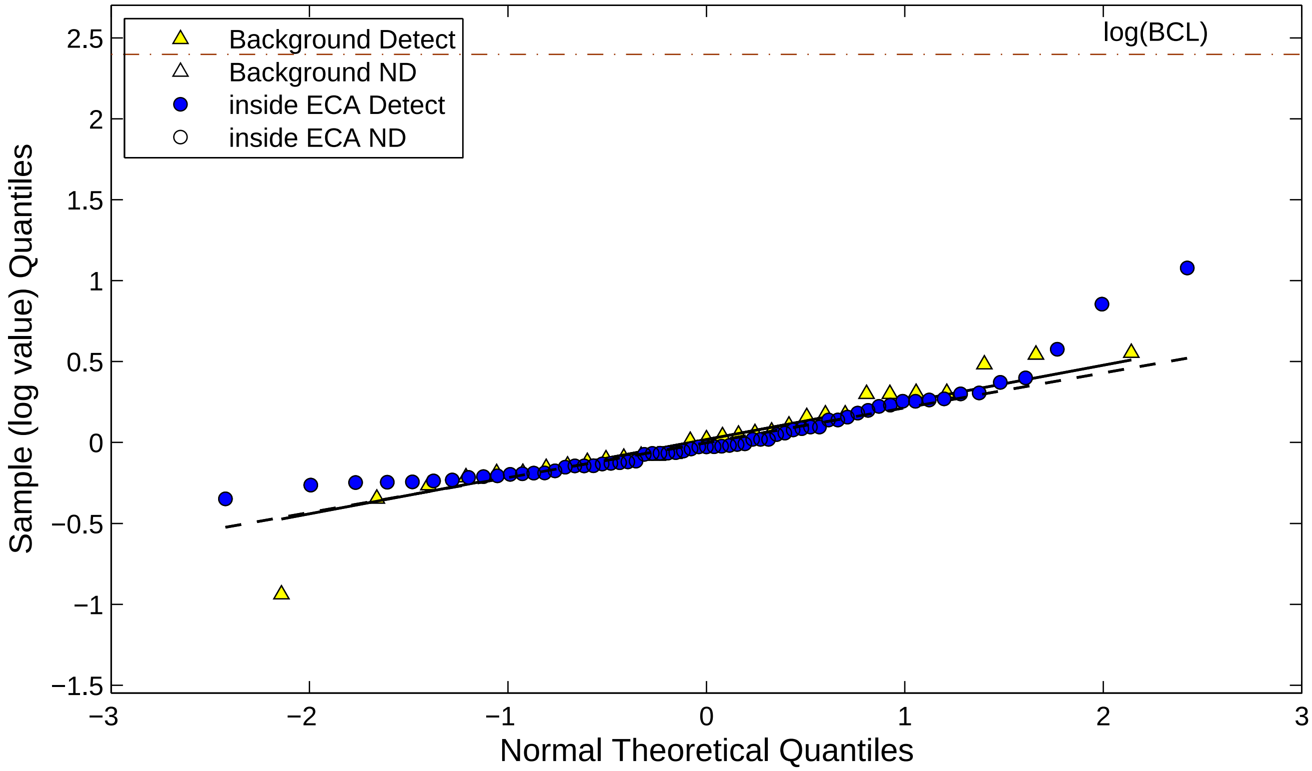
Figure C2−38B. Lognormal Q−Q Plots
U−234



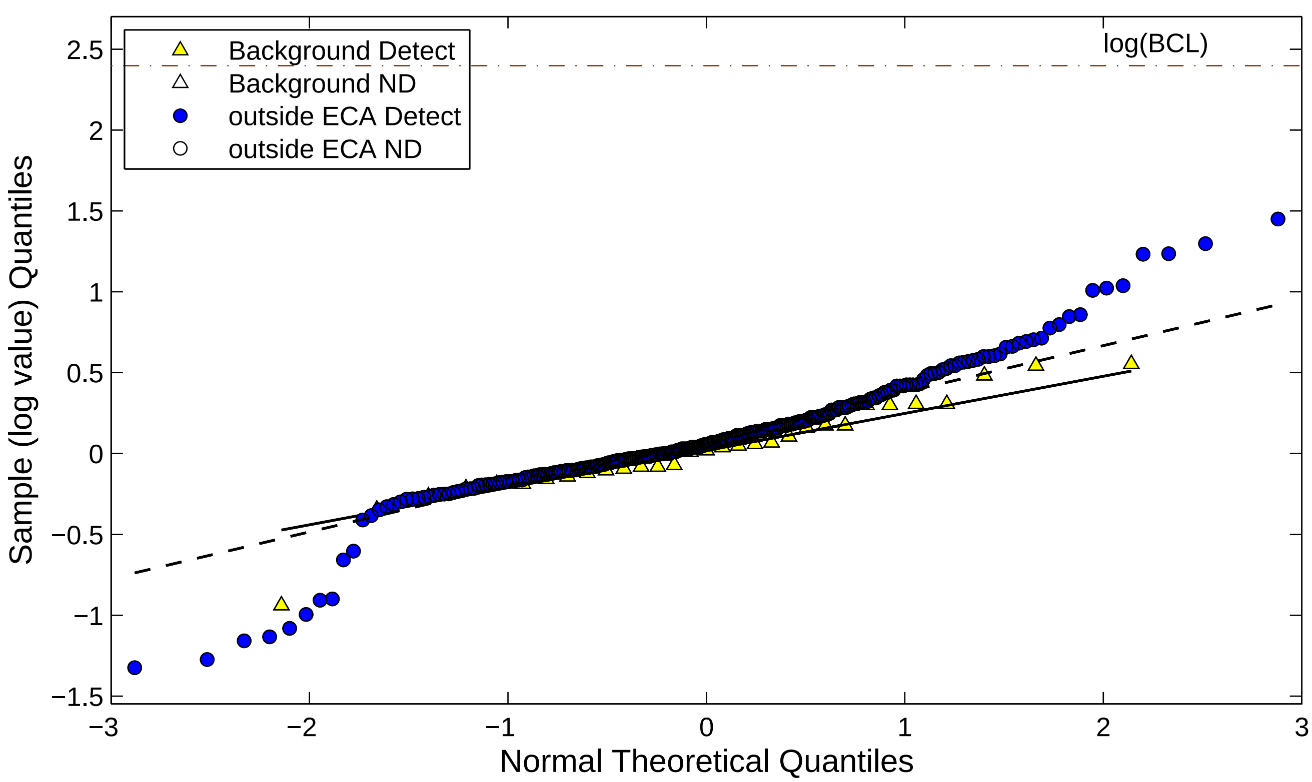
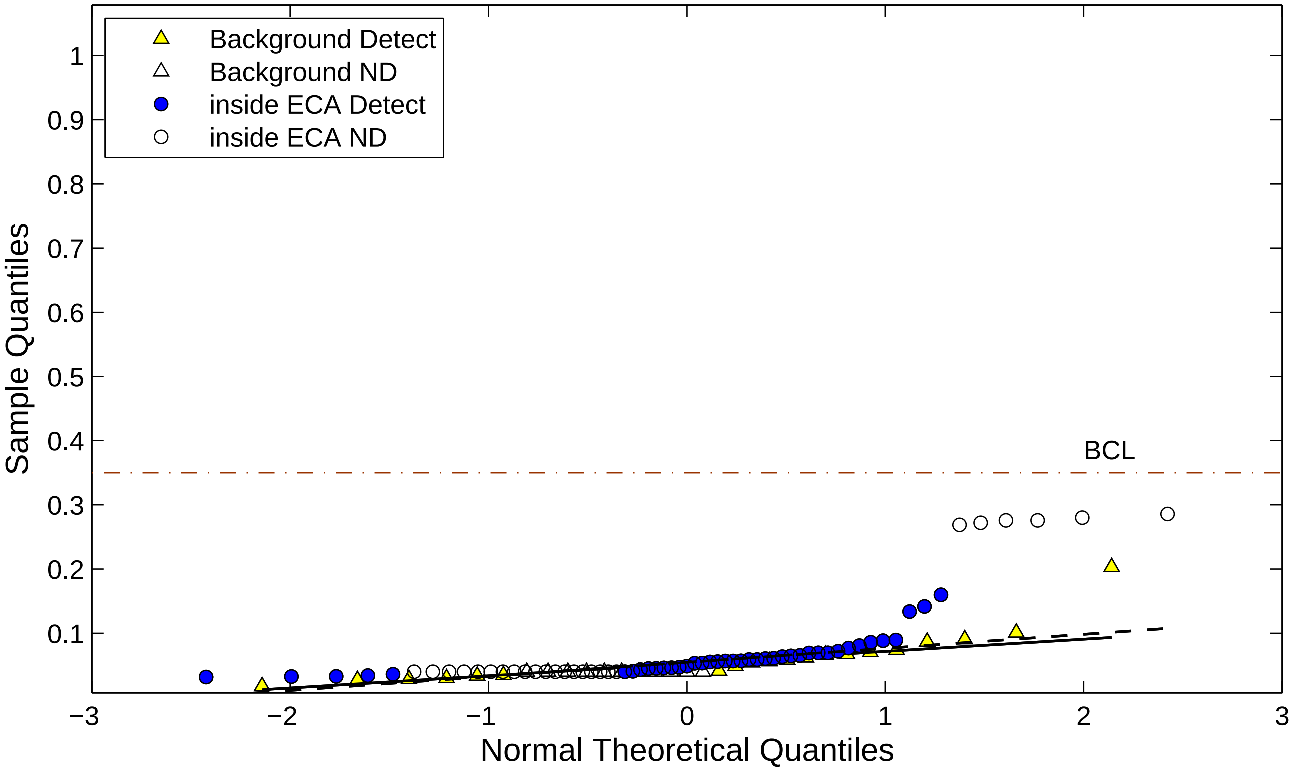


Figure C2−39A. Normal Q−Q Plots
U−235



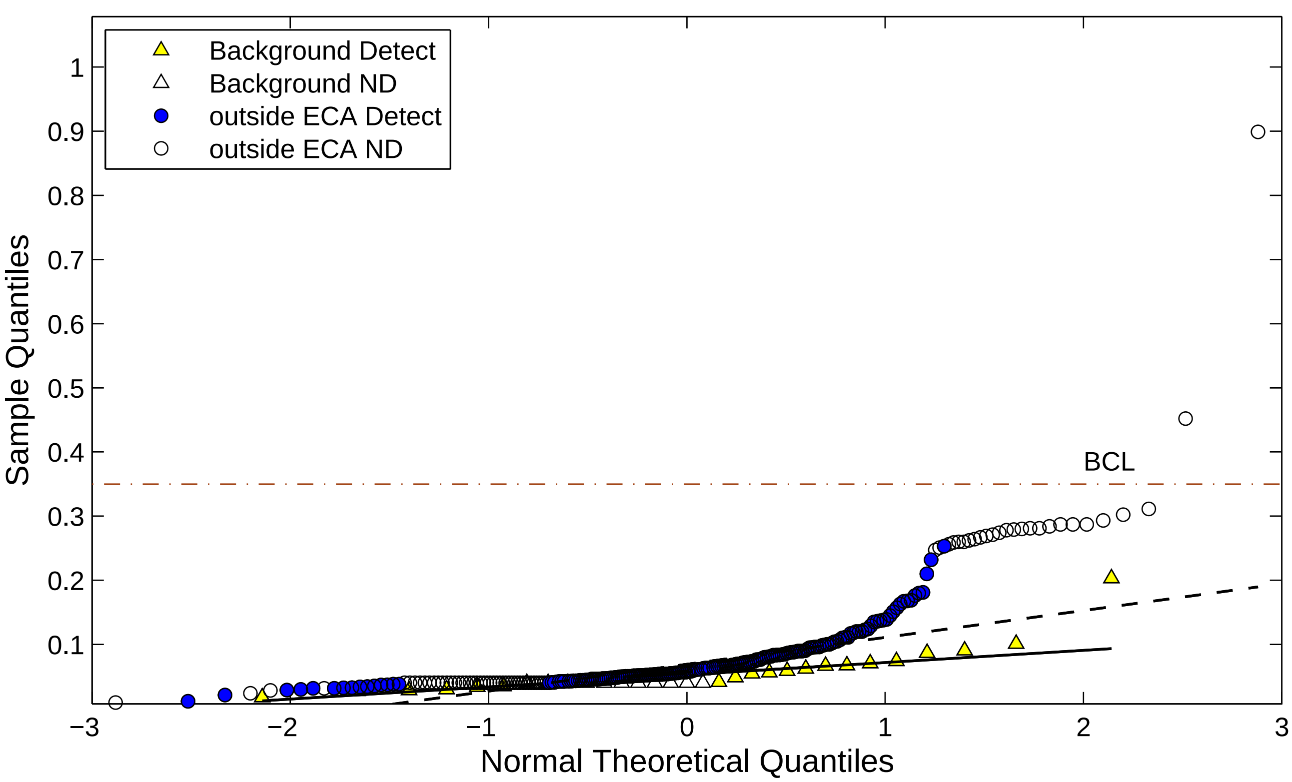
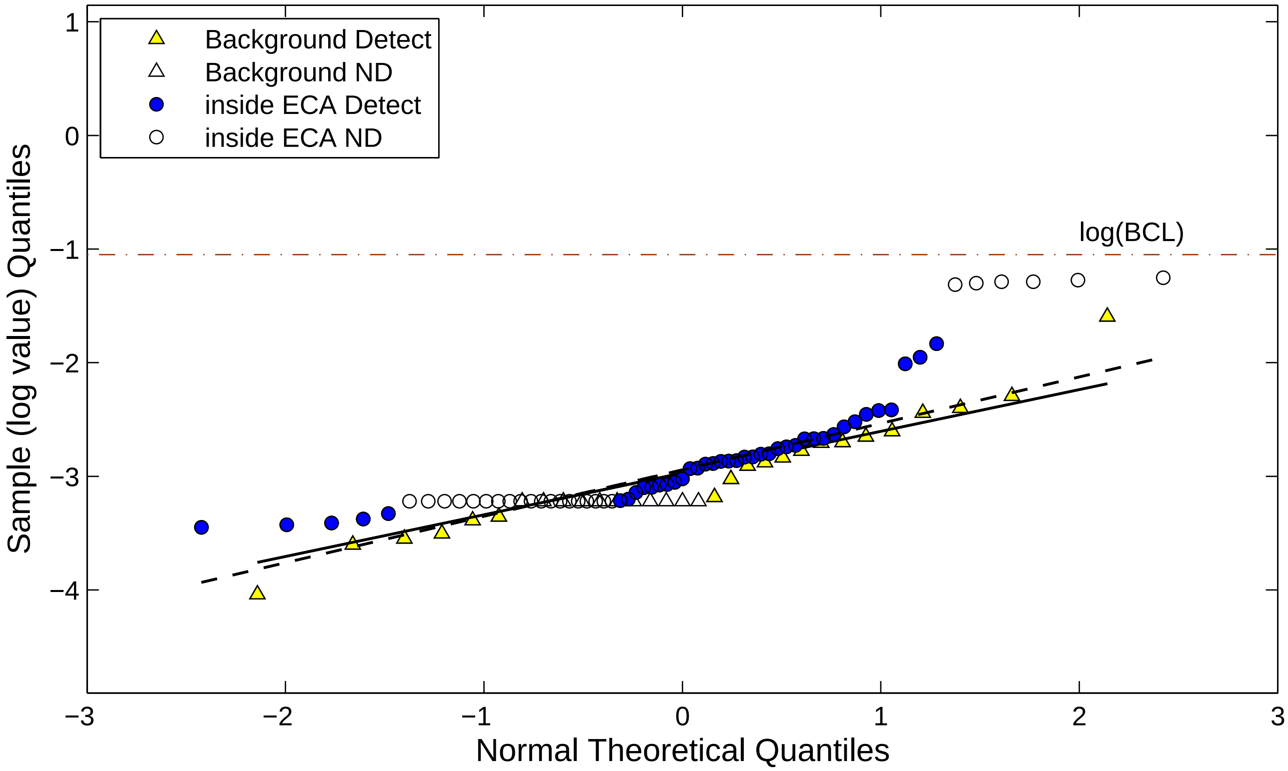


Figure C2−39B. Lognormal Q−Q Plots
U−235



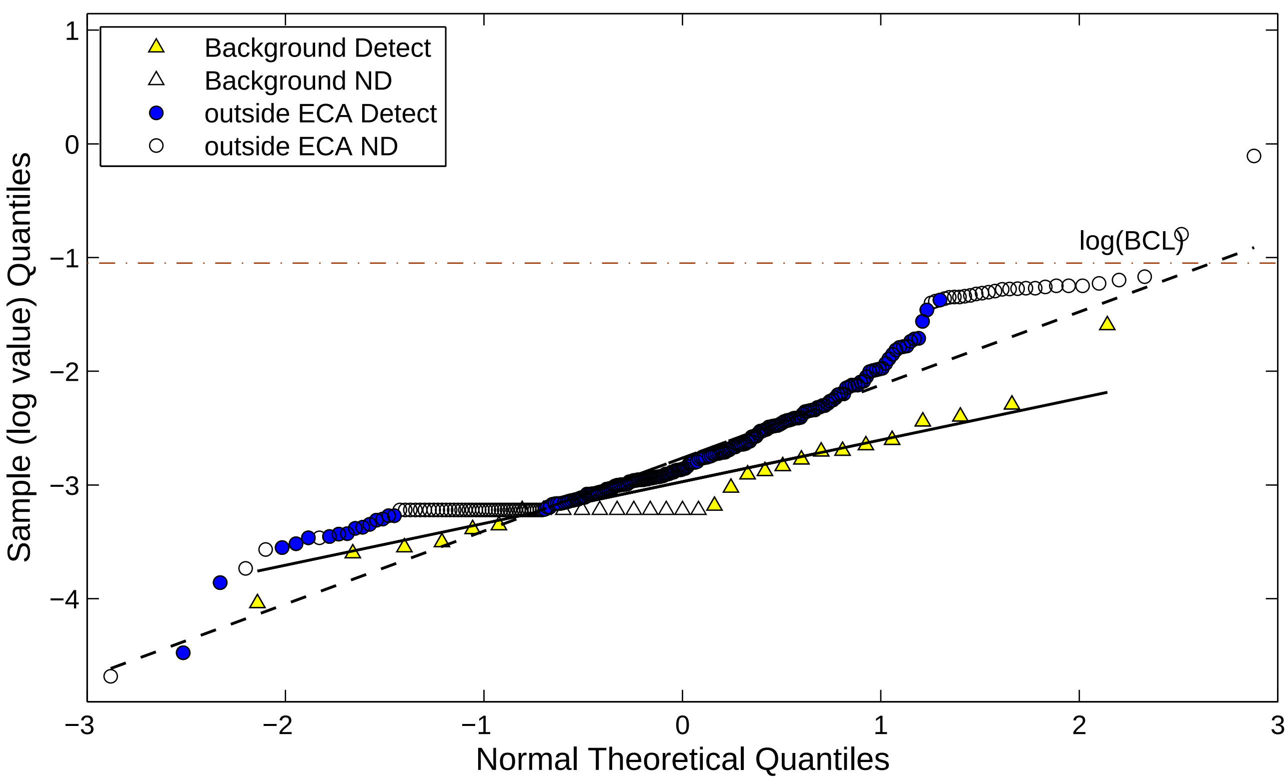
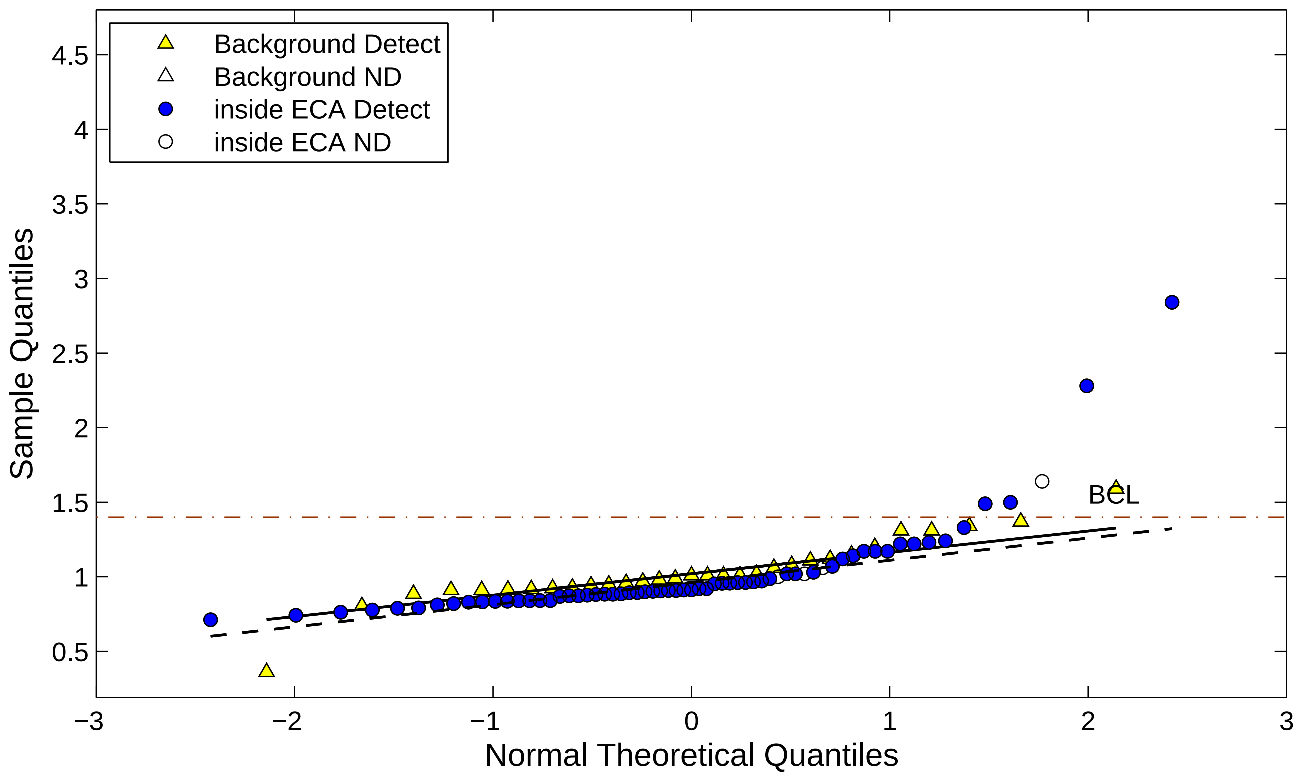
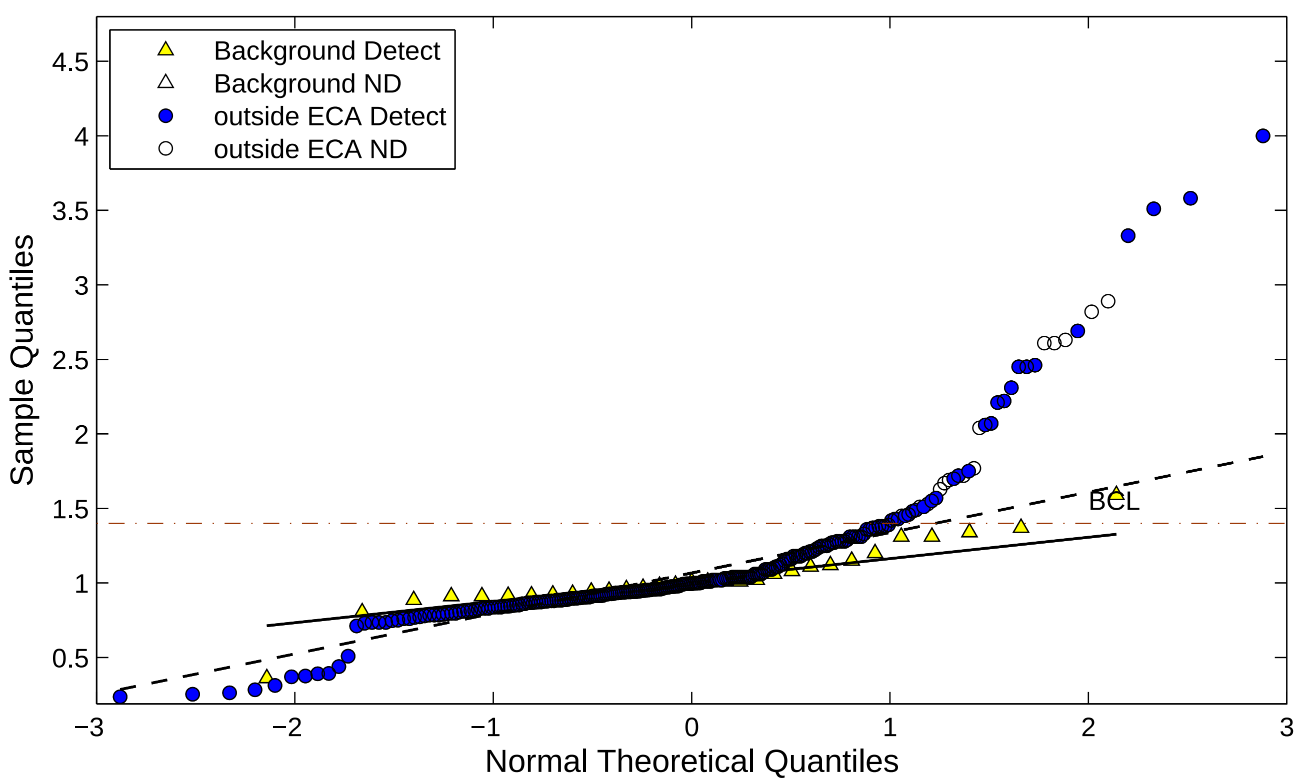


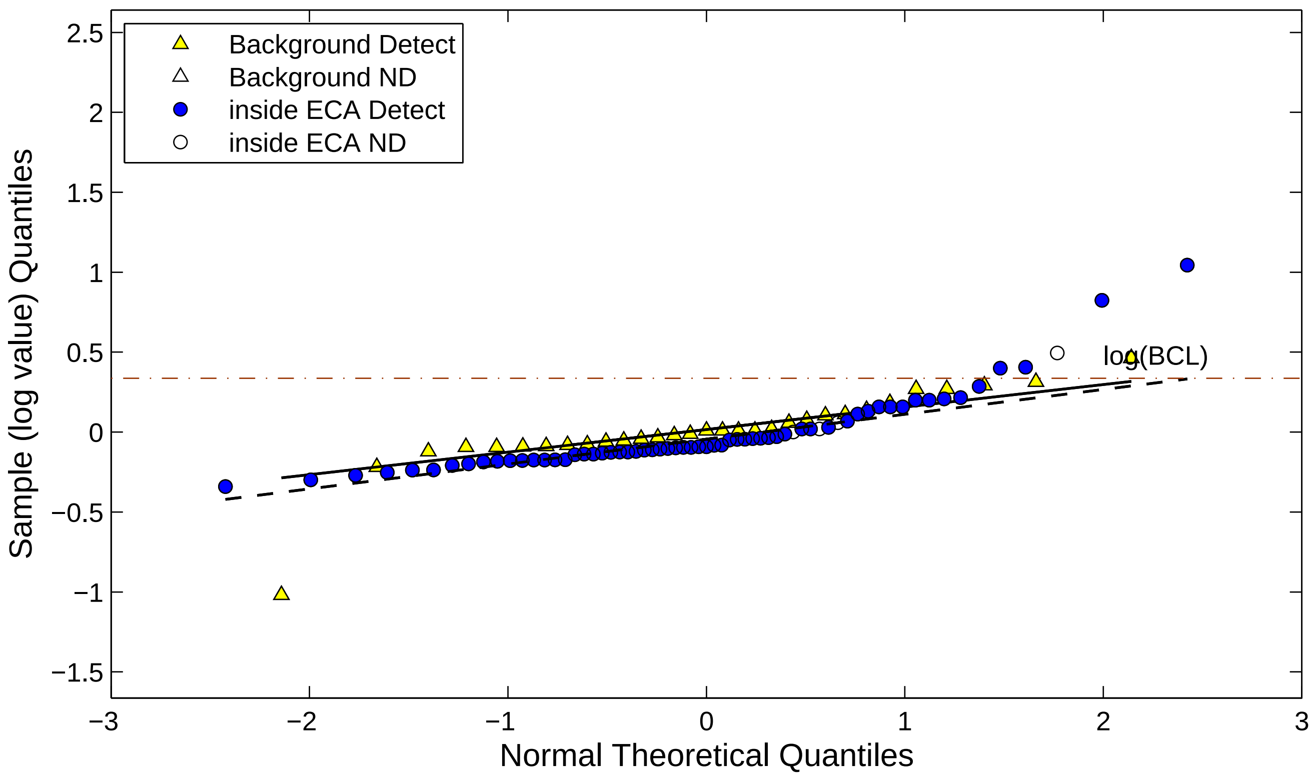
Figure C2−40A. Normal Q−Q Plots
U−238

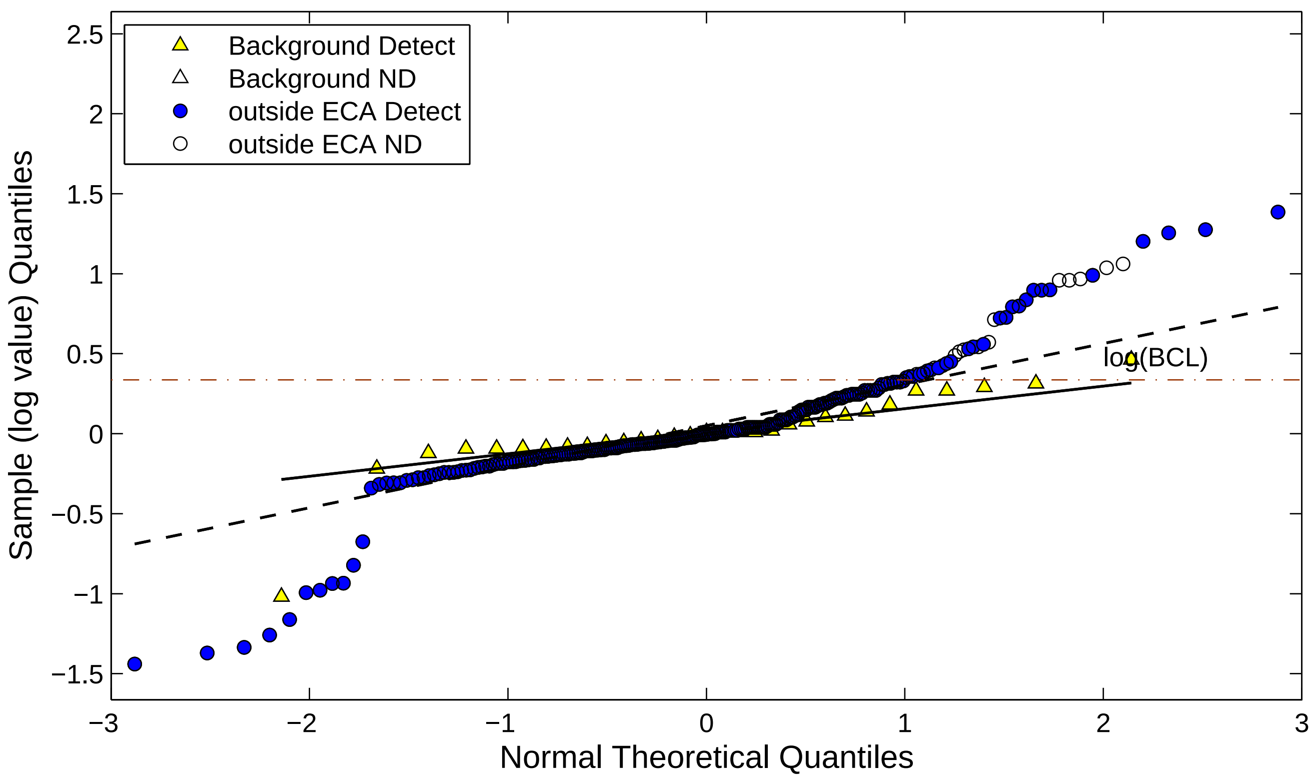




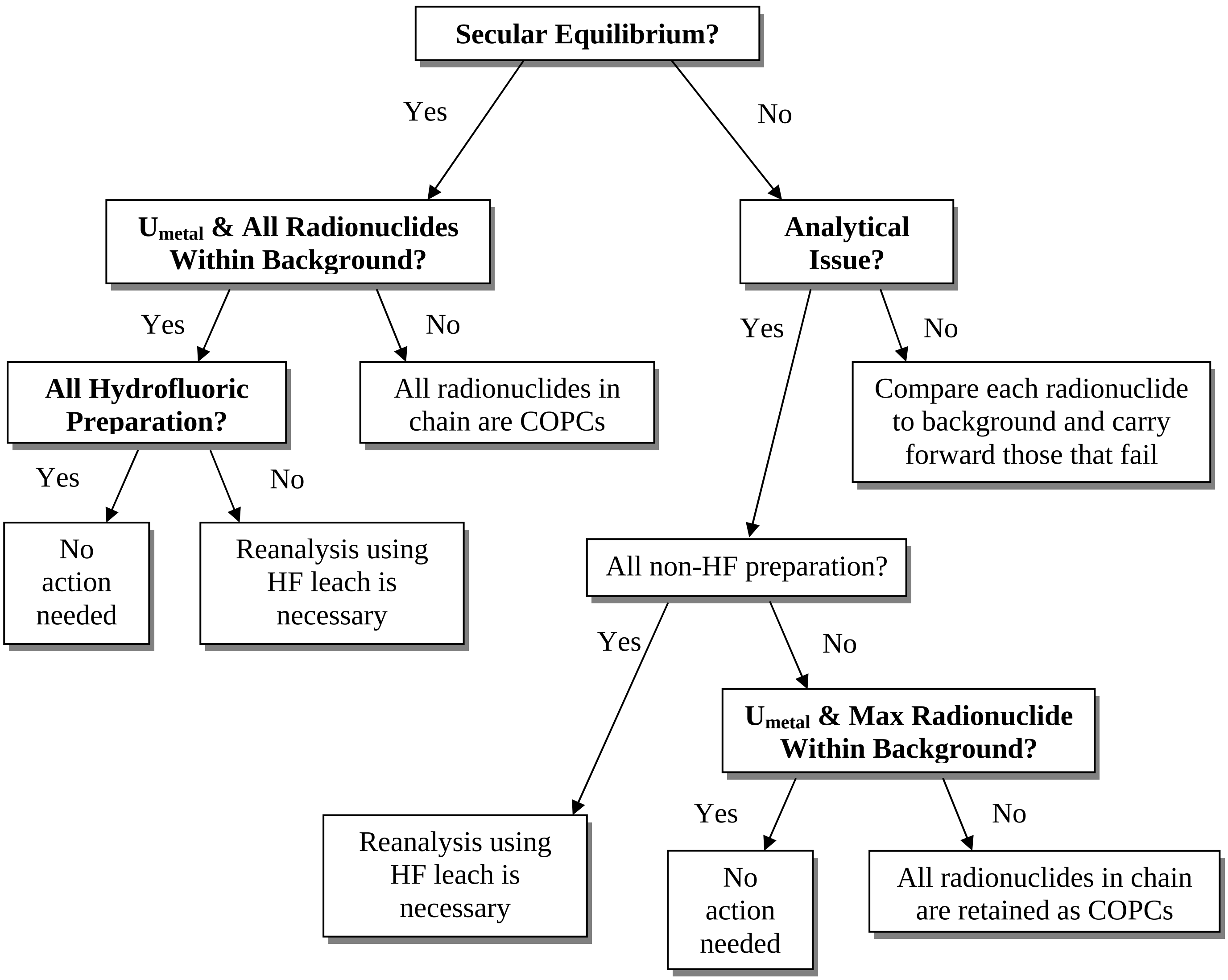
Ramboll Environ

Figure C2−40B. Lognormal Q−Q Plots
U−238





APPENDIX D
NDEP FLOWCHART FOR RADIONUCLIDE DATA SET USABILITY



COPCs indicates "chemicals of potential concern".
U_{metal} denotes metallic uranium.

Figure 1. Flowchart describing the decision framework for radionuclide historical dataset usability for Sites within the BMI Complex and Common Areas, Henderson, NV.