



US Army Corps
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U.S. Army Corps of Engineers
Walla Walla District

Lower Snake River Programmatic Sediment Management Plan, Final Environmental Impact Statement

Appendix N - Fingerprinting Sediment Sources

August 2014



Fingerprinting Sediment Sources using Neutron Activation Analysis, ICP-MS, and Isotope Analysis in the Lower Snake River Basin



Submitted to:
US Army Corps of Engineers
Programmatic Sediment Management Plan (PSMP)
Walla Walla, Washington

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May 13, 2011

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List of Elements

Symbol	Element/Compound Name
Ag	Silver
Al ₂ O ₃	Aluminum oxide
As	Arsenic
Ba	Barium
Be	Beryllium
Bi	Bismuth
C	Carbon
CaO	Calcium oxide
Ce	Cerium
Co	Cobalt
Cr	Chromium
Cs	Cesium
Cu	Copper
C/N Ratio	Molar ratio of carbon over nitrogen
Dy	Dysprosium
Er	Erbium
Eu	Europium
Fe ₂ O ₃	Iron oxide
Ga	Gallium
Gd	Gadolinium
Ge	Germanium
Hf	Hafnium
Ho	Holmium
In	Indium
K ₂ O	Potassium oxide
La	Lanthanum
Lu	Lutetium
MgO	Magnesium oxide
MnO	Manganese oxide
Mo	Molybdenum
N	Nitrogen
Na ₂ O	Sodium oxide
Nb	Niobium
Nd	Neodymium
Ni	Nickel
P ₂ O ₅	Phosphorus oxide
Pb	Lead
Rb	Rubidium
Sb	Antimony
Sc	Scandium
SiO ₂	Silicon oxide
Sm	Samarium
Sn	Tin

Sr	Strontium
Ta	Tantalum
Tb	Terbium
Th	Thorium
Ti	Titanium
TiO ₂	Titanium oxide
Tm	Thulium
U	Uranium
V	Vanadium
W	Tungsten
Y	Yttrium
Yb	Ytterbium
Zn	Zinc
Zr	Zirconium
$\delta^{13}\text{C}$	Ratio of isotope carbon-13
$\delta^{15}\text{N}$	Ratio of isotope nitrogen-15

List of Acronyms

BMP	Best Management Practice
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
FUS-ICP	Fusion – Inductively Coupled Plasma
HSPF	Hydrologic Simulation Program – Fortran
ICP-MS	Inductively Coupled Plasma – Mass Spectrometry
LOI	Loss on Ignition
NAA	Neutron Activation Analysis
NRCS	National Resource Conservation Service
RUSLE2	Revised Universal Soil Loss Equation 2
SDFA	Stepwise Discriminant Function Analysis
SSURGO	Soil Survey Geographic Database
STATSGO	State Soil Geographic Database
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
WEPP	Water Erosion Prediction Project
WRP	Wetlands Reserve Program
XRF	X-Ray Fluorescence

Executive Summary

Fingerprinting analysis and grain size analysis were conducted on sediments in the Snake and Clearwater River watersheds for the primary purpose of identifying sediment sources contributing to the dredging requirements in and near the Ports of Clarkson, Washington and Lewiston, Idaho. Reservoir sediments from cores obtained by the USGS were combined with sampling of potential upstream sediment sources on the Asotin, Clearwater, Grande Ronde, Hells Canyon, Potlatch, and Salmon watersheds. A total of 92 stream bank, stream bed, and agricultural areas were sampled in the summer and fall of 2010. Employing a series of statistical techniques, we found that four parameters were shown to be diagnostic of all potential sediment sources considered ($d^{15}\text{N}$, Fe_2O_3 , MnO and Cs). Coupled with physical grain size data from sediment cores and potential upland sources, we concluded that:

- Sediments near the confluence of the Snake and Clearwater Rivers likely originated from upstream non-agricultural lands in the Salmon and upper Clearwater Rivers.
- Sediments in the Clearwater arm just upstream of the confluence were also predominantly from upstream non-agricultural lands.
- Sediments downstream of Silcott Island on the Snake River could be linked to agricultural sources.

While these statistical relationships are not definitive, a considerable amount of sediment characterization and statistical analysis provides a reasonable description of the situation described in Lower Granite Reservoir.

1.0 Introduction

Sediment fingerprinting is the terminology used to identify the origin of sediment sources within a watershed by characterizing a number of diagnostic physical and chemical properties. Sediment fingerprinting can be used to define sediment sources and transfers with drainage basins based on the assumptions that 1) the potential catchment sediment sources can be distinguished on the basis of their physical, geochemical and biogenic properties or fingerprints and 2) a relative comparison of the sediment fingerprints can be made with values obtained from the original source materials (Collins and Walling, 2002; Middleton et al, 2003). Approaches for fingerprinting include radionuclides, mineral magnetism, sediment mineralogy, heavy mineralogy, clay mineralogy, major and trace metal geochemistry, and grain size and shape analysis (Perry and Taylor, 2007). In this study fingerprinting will be used to identify sediment sources for the Lower Granite Reservoir, but initially a brief look back at sediment accumulation potential from previous work.

Despite being extensively studied since the 1930's (Eakin and Brown 1939), reservoir sedimentation continues to be a serious problem in many parts of the world including the United States (Fan and Morris 1992; Dunbar et al. 1999). Nationwide, a study by Crowder (1987) indicated that 0.22% of the nation's water storage capacity is lost annually to sediment damages. Of this amount, an average of 24% of the lost volume is due to soil erosion from cropland although a considerable amount of regional variation existed in the data. The total annual cost of erosion and sedimentation in the United States was estimated to be approximately \$44 billion back in 1995 (Pimentel et al. 1995). Problems associated with reservoir sedimentation include loss of several important functions including flood control capacity, firm yield, port and transportation utility, and aquatic habitat. All reservoirs exhibit some effects of sedimentation (Morris and Fan 1998) however excessive upstream sedimentation can significantly reduce the design life of downstream reservoirs or require increased frequencies of maintenance practices such as dredging (Vanoni 2006).

A number of studies have attempted to assess the economic impacts of controlling erosion (Crowder 1987; Enters 1998). Palmieri et al. (2001) proposed a framework for assessing the economic feasibility of sediment management strategies which permitted the life of dams to be prolonged indefinitely. Hansen and Hellerstein (2007) found that for 2,111 U.S. watersheds, a one-ton reduction in soil erosion provided benefits ranging from \$0 to \$1.38. Using the

Hydrologic Simulation Program-Fortran (HSPF) model, Moltz et al. (2010) examined six BMP scenarios for sediment control in a New Mexico watershed. Ranging in cost from \$1M to over \$66M, they found that sediment loss measured at the basin outlet could be reduced by 3,785 to 4,522 tons/year.

Since agricultural activities are often linked to excessive erosion rates, many studies have focused on cost-effective reduction strategies in rural watersheds. For example, in the early 1980's, a USDA study estimated that many wheat growing areas in the Snake/Clearwater had erosion rates in excess of 25 tons/ha/year (Lee 1984) so agricultural best management practices (BMPs) could effectively be used to reduce soil loss. A key to this is the measurement or prediction of sediment yield versus soil loss. Large quantitative differences may exist between upland soil erosion and downstream sediment delivery (Trimble and Crosson, 2000). Upland erosion may be deposited at other locations in the field, along fencerows, or along streams as alluvium never reaching the water course. Determining the sediment delivery ratio at the watershed scale remains a challenging area of erosion research (Vente et al. 2007).

Reservoir sedimentation is a reoccurring phenomenon near the confluence of the Snake and Clearwater Rivers at the Idaho/Washington state line. The US Army Corps of Engineers (USACE) is authorized by Congress to maintain the federal navigation channel near the Port of Lewiston, Idaho to a width of 250-feet and a depth of 14-feet. Because upstream sediment settles near the confluence of the two streams, the USACE must periodically dredge the navigation channel and the Ports of Lewiston and Clarkston. One possible alternative for reducing the frequency of dredging is to reduce or eliminate upstream sources of sediment in the basin. These sources include those from forests, rangeland, roads, agriculture, urbanization, landslides, and stream banks (TetraTech 2008). Assuming the Hells Canyon Dam complex on the Snake River mainstem and Dworshak Reservoir on the North Fork of the Clearwater effectively trap upstream sediments, the area of concern would be approximately 32,000 square miles. Moreover, since approximately 14 percent of the area (4,400 sq. mi.) is classified as agricultural lands, and agricultural lands are often tied to erosion sources, in addition to other contributing sources, a detailed investigation of agricultural erosion and yield is warranted.

The overall purpose of this work is to assess the feasibility of identifying the origins of sediment that ultimately finds its way into the navigation channel near the Port of Lewiston, Idaho and the Port of Clarkson, Washington. By using a methodology commonly referred to as

“fingerprinting,” the identification of sediment at its source, the study will examine fine-grained sediment samples from the major tributaries contributing to the Lower Granite Reservoir (Asotin, Clearwater, Grande Ronde, Hells Canyon, Salmon, and Potlatch basins). Understanding the sources of sediments will ultimately help assess whether or not a strategic plan to reduce sediment erosion at its origination is feasible. In addition to addressing sediments at their source the specific objectives are to provide the United States Army Corps of Engineers (USACE) with:

- Analytical results in Excel Spreadsheets
- A written report that includes:
 - A literature search of other studies that have used similar techniques
 - Description of methods used
 - A discussion of the results
 - An evaluation regarding the applicability of this technique for identifying sediment sources within the Snake River watershed
 - Suggestions for future fingerprinting studies in the basin.

2.0 Background

In the initial Phase I study report titled “Evaluation of Sediment Yield Reduction Potential in Agricultural and Mixed-Use Watersheds of the Lower Snake River Basin,” the State of Washington Water Research Center and its research partners at the University of Idaho were tasked with identifying potential quantities of sediment that could be transported to the Lower Granite Reservoir. This draft report was submitted to USACE on November 24, 2010 (Boll et al. 2010). To this end it is pertinent to briefly revisit some of the initial findings to demonstrate the need to trace the origin of this sediment deposition.

Of particular importance in this project is quantifying the relative sediment distribution of the soil delivered to the Lower Snake River Dams. Since the majority of the sediment deposited in the Snake River is sand it is particularly important to assess the fraction of sand delivered by each watershed to the Snake River from the agricultural areas. From basic erosion mechanics it is well understood that the larger particles (i.e. sands) have a faster settling velocity than the finer particles (i.e. clays and silts) and therefore sands will tend to deposit preferentially in a water column sooner than silts and clays. Hillslopes having a large toe slope will tend to have deposition which will result in an ‘enrichment’ in the proportion of silts and clays and a decrease in the proportion of sands. The proportion of sand in steep hillslopes which do not experience deposition should theoretically never be greater than the fraction of sand in the detached sediment. Knowing this it is then reasonable to assume that the portion of sand in the eroded sediment will be no greater than the fraction of sand in the original soil. Using this assumption we estimated the maximum percent sand in the eroded sediment as the average sand content of the agricultural soils in the watershed. Figure 1 shows the distribution of percent sand in all of the agricultural watersheds in the Lower Snake River Basin. As illustrated in the figure, nearly all agricultural soils in the major contributed agricultural watersheds are composed of less than 20% sand. Figure 2 shows that the sand content of the surface soil horizons in all agricultural regions are less than the sand content for the non-agricultural regions. It is also important to remember that the sand content in these figures are for the surface soils. Most forested soils are covered with an ash layer and the soil horizons beneath this ash layer are typically much deeper. Agricultural soils in the study area are typically much deeper and rather than the sand content increasing with depth, the clay content will more often increase with depth below the soil surface.

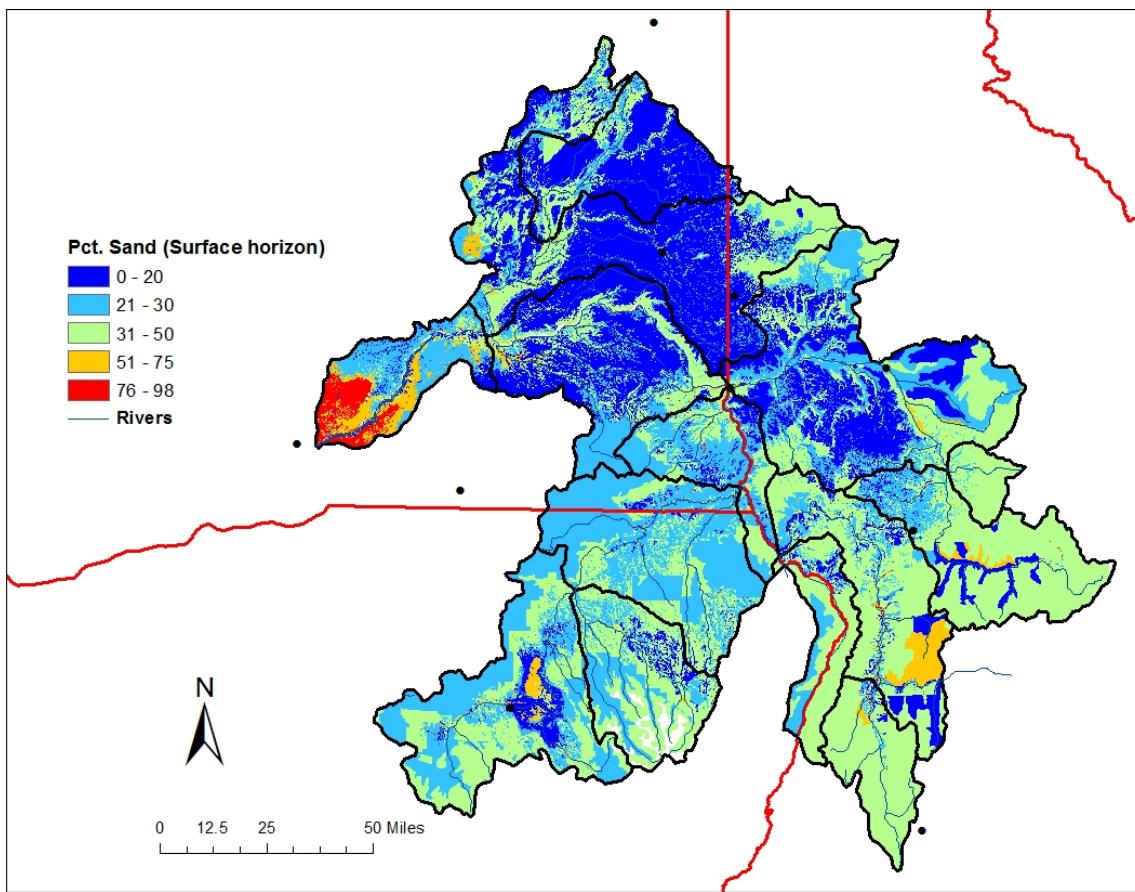


Figure 1. Percent sand content in the surface soil horizon taken from the SSURGO and STATSGO databases.

By assuming that the proportion of sand in the sediment delivered to the outlet does not decrease due to preferential deposition, Table 1 shows the total sand delivered from agricultural areas from each of the major watersheds in the Lower Snake River Basin. This is likely an overestimate of the actual sand delivered to the outlet since sand will tend to settle out more rapidly than the silt and clay fractions as it moves to the watershed outlet. We estimated the likely over-prediction of sediment using the Water Erosion Prediction Project (WEPP) model at typical slopes within the low, intermediate, and high precipitation zones. The deposition of sediment is more likely on toe slopes below steep sections of the hillslope. We used the WEPP model to predict the erosion and deposition for a three piece hillslope where the upslope, mid slope and toe slope steepness were 5%, 35%, and 5% respectively. Each segment length was set at 328 ft

(100 m). The 30 year simulation was based on a Palouse soil with a reduced tillage operation and a winter wheat, spring barley, pea rotation and a high precipitation climate (Moscow, ID). The sand content of the original soil was 9%. The sand content in the soil delivered to the outlet of the hillslope was reduced by half this at 5.4%. This reduction in sand content was similar for a range of soil types and cropping practices. Overall it is clear that the agricultural areas contribute mostly silts and clays to the Snake River.

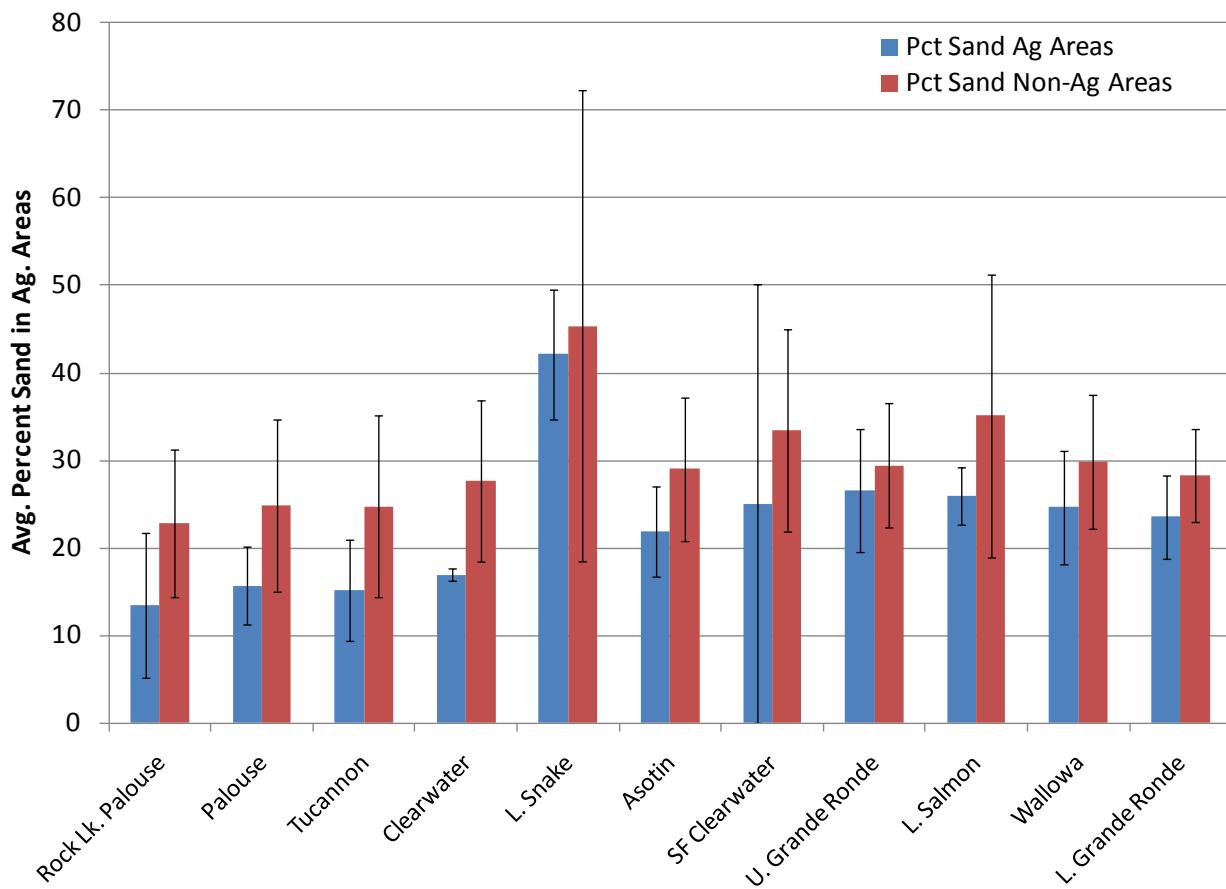


Figure 2. Average percent sand content of the surface soil horizon for both agricultural and non-agricultural areas of the major watersheds in the Lower Snake River Basin.
Error bars on each column represent one standard deviation (Boll et al. 2010).

Table 1. Maximum total sand delivered from agricultural areas within study area
(preferential sand deposition neglected).

Name	HUC ID	Area (mi ²)	Total Sediment Yield (million tons/yr)	Mean % Sand	Total Sand (million tons/yr)
Palouse (ID, WA)	17060108	2351	0.09	15.72	1.4E-02
Clearwater (ID, WA)	17060306	2319	0.07	16.93	1.1E-02
Lower Snake-Tucannon (WA)	17060107	1461	0.04	15.15	6.1E-03
Rock (ID, WA)	17060109	973	0.04	13.49	5.5E-03
South Fork Clearwater (ID)	17060305	1174	0.01	25.03	2.6E-03
Lower Snake (WA)	17060110	734	0.01	42.12	4.3E-03
Lower Snake-Asotin (ID, WA, OR)	17060103	713	0.01	21.86	1.2E-03
Lower Salmon (ID)	17060209	1232	0.00	25.98	6.2E-04
Upper Grande Ronde (OR)	17060104	1636	0.00	26.58	5.6E-04
Wallowa (OR)	17060105	935	0.00	24.69	2.1E-04
Lower Grande Ronde (OR, WA)	17060106	1506	0.00	23.55	1.6E-04
Little Salmon (ID)	17060210	589	0.00	35.19	5.3E-05
Middle Fork Clearwater (ID)	17060304	204	0.00	35.31	4.4E-05
Hells Canyon (ID, OR)	17060101	532	0.00	35.96	2.7E-05

The data in this report used for fingerprinting was generated from sediment cores taken from the Lower Granite Reservoir pool, including the upper reaches of the reservoir above the confluence of the Snake and Clearwater Rivers by the USGS in combination with sediment samples collected from major tributaries to the reservoir by the WSU team. Subbasins of interest include the Clearwater River upstream from the Potlatch River, the Grande Ronde River, Potlatch River, Salmon River, and the Snake River above Hell's Canyon. Samples of the stream bed, stream bank, and agricultural soils were taken. The tributary samples were collected twice, once in the summer of 2010 and once in the fall of 2010. Testing included neutron activation (NAA), inductively coupled plasma-mass spectrometry, and fusion (ICP-MS, and FUS-ICP), and carbon and nitrogen isotope analysis.

3.0 Fingerprinting Study Area

The geographic area for this fingerprinting study includes major tributaries to the Lower Granite Reservoir that flow through the states of Washington, Oregon and Idaho. The sub-basins selected include the Clearwater River upstream from the Potlatch River confluence, Potlatch River, Asotin Creek, Grande Ronde River, Salmon River, and the Snake River above Hell's Canyon. Agricultural soil, river bank sediment and river bed sediment samples were collected from each of these sub-basins to develop respective fingerprint signatures for each location. Sediment cores collected in the Lower Granite Reservoir, including the upper reaches above the confluence of the Snake and Clearwater Rivers, were provided by USACE to characterize fingerprint signatures inherent to the sediments accumulating above the Lower Granite Dam. Figure 3 provides a general overview of study area where the cores and sediment samples were collected.

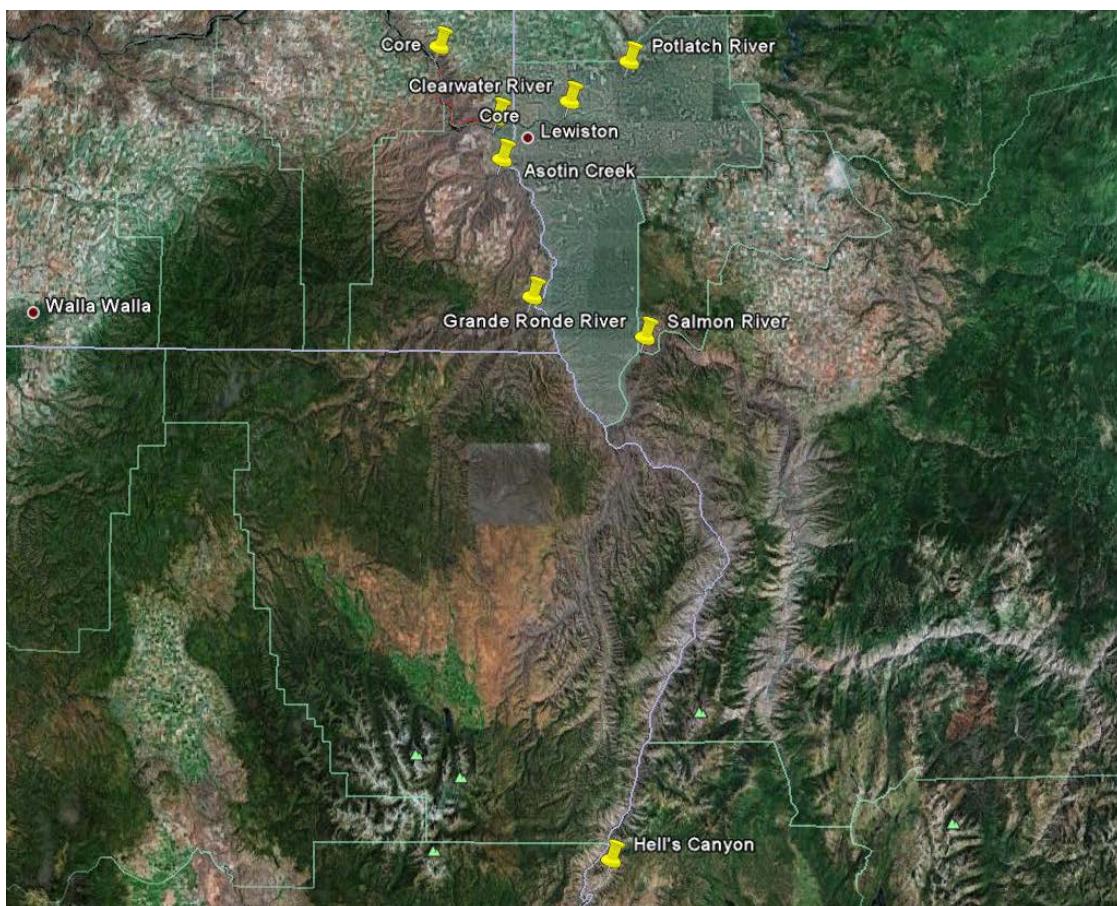


Figure 3. Sediment fingerprint study area.

3.1 Field Site Descriptions and GPS Coordinates of Sample Locations

Since a primary goal of the project was to assess the sources of sediment settling out in the Ports of Clarkson and Lewiston, the watersheds of interest were upstream of the Snake/Clearwater confluence. Brief descriptions of the candidate watersheds are provided below.

3.1.1 Potlatch River Watershed

The Potlatch River basin is part of the Clearwater River subbasin. Total area of the Potlatch Basin is 1540 km² (590 mi²). The upper watershed is predominately forestland of mixed ownership. The southern part of the watershed is the easternmost extension of the Palouse prairie and is dissected by deep canyonlands of the lower tributary drainages. Land use is predominantly dryland agriculture intermixed with areas of rural residential development. Dechert (2004) used RUSLE2 model to predict surface erosion from the agricultural segments of the watershed. The study area covered 736 km² (284 mi²) of land situated in the lower Potlatch River basin. Six subbasins (Big Bear, Cedar, Little Bear, Little Potlatch, Middle Potlatch, and Pine Creek) are located in the lower watershed as part of the Northwestern Wheat and Range Region. Teasdale and Barber (2005) estimated ephemeral gully erosion in the Potlatch River watershed at less than 0.5 tons/acre.

The sampling plan was designed to capture representative conditions within this basin and consisted of one agricultural, one stream bank, and five stream bed samples. Figure 4 illustrates the sample sites with the yellow marker representing the location of agricultural soil sample, the green marker representing the river bank sample location, and the blue marker representing the stream bed sample locations. Table 2 contains the GPS coordinates of the individual locations. Figure 5 presents the agricultural site, Figure 6 depicts the river bank location, and Figure 7 shows a typical stream bed location within the Potlatch River watershed.

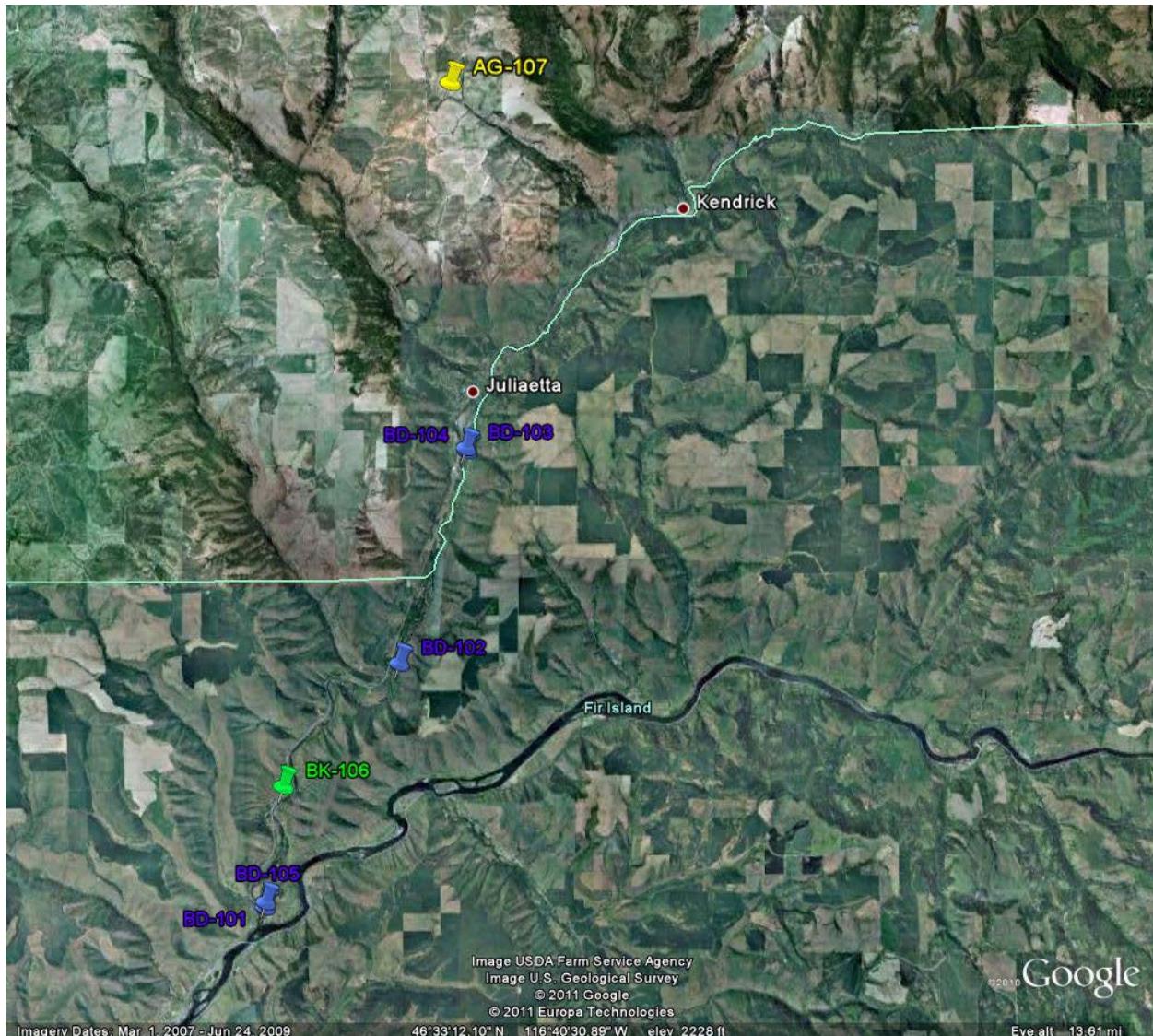


Figure 4. Sample sites in the Potlatch River basin.

Table 2. Potlatch River sample locations for summer (-a) and fall (-b) collection periods.

Sample Name	Latitude (N)	Longitude (W)
Summer sampling event		
BD-101-a	46°28.508'	116°46.019'
BD-102-a	46°31.365'	116°43.719'
BD-103-a	46°33.873'	116°42.578'
BD-104-a	46°33.840'	116°42.567'
BD-105-a	46°28.565'	116°46.009'
BK-106-a	46°29.930'	116°45.686'
AG-107-a	46°38.034'	116°42.780'
Fall sampling event		
BD-101-b	46°28.499'	116°46.023'
BD-102-b	46°31.364'	116°43.716'
BD-103-b	46°33.998'	116°42.509'
BD-104-b	46°33.873'	116°42.578'
BD-105-b	46°28.574'	116°45.001'
BK-106-b	46°29.931'	116°45.688'
AG-107-b	46°38.034'	116°42.780'



Figure 5. Field condition of Potlatch River agricultural sample #107.



Figure 6. Field condition of Potlatch River bank sample #106.



Figure 7. Field condition of Potlatch River stream bed sample #105.

3.1.2 Asotin Creek Watershed

The Asotin Creek watershed is a subbasin of the Snake River basin below Hell's Canyon Dam. The watershed contains 47% agricultural/urban land, including grassland and cropland at lower elevations. The National Resource Conservation Service (NRCS) analysis of cropland found that the geographic area had no areas of highly erodible cropland and no areas of highly erodible or non-highly erodible cropland with excessive erosion above the tolerable soil erosion rate, except for some areas in the lower elevations of the Lower Snake-Asotin watershed (NRCS 2000). Nevertheless, this 325 square mile watershed has considerable agriculture acreage and is contains ESA-listed stocks of summer steelhead, bull trout, and spring Chinook, along with resident rainbow trout. As a result, it was considered as a potential source of stream bed and stream bank sediment.

The sampling plan was designed to capture representative conditions within this basin and consisted of one agricultural, two stream bank, and five stream bed samples. Figure 8 illustrates the sample sites with the yellow marker representing the location of agricultural soil

sample, the green marker representing the river bank sample location, and the blue marker representing the stream bed sample locations. Table 3 contains the GPS coordinates of the individual locations. Figure 9 presents the agricultural site, Figure 10 depicts a typical river bank location, and Figure 11 shows a typical stream bed location within the Asotin Creek watershed.

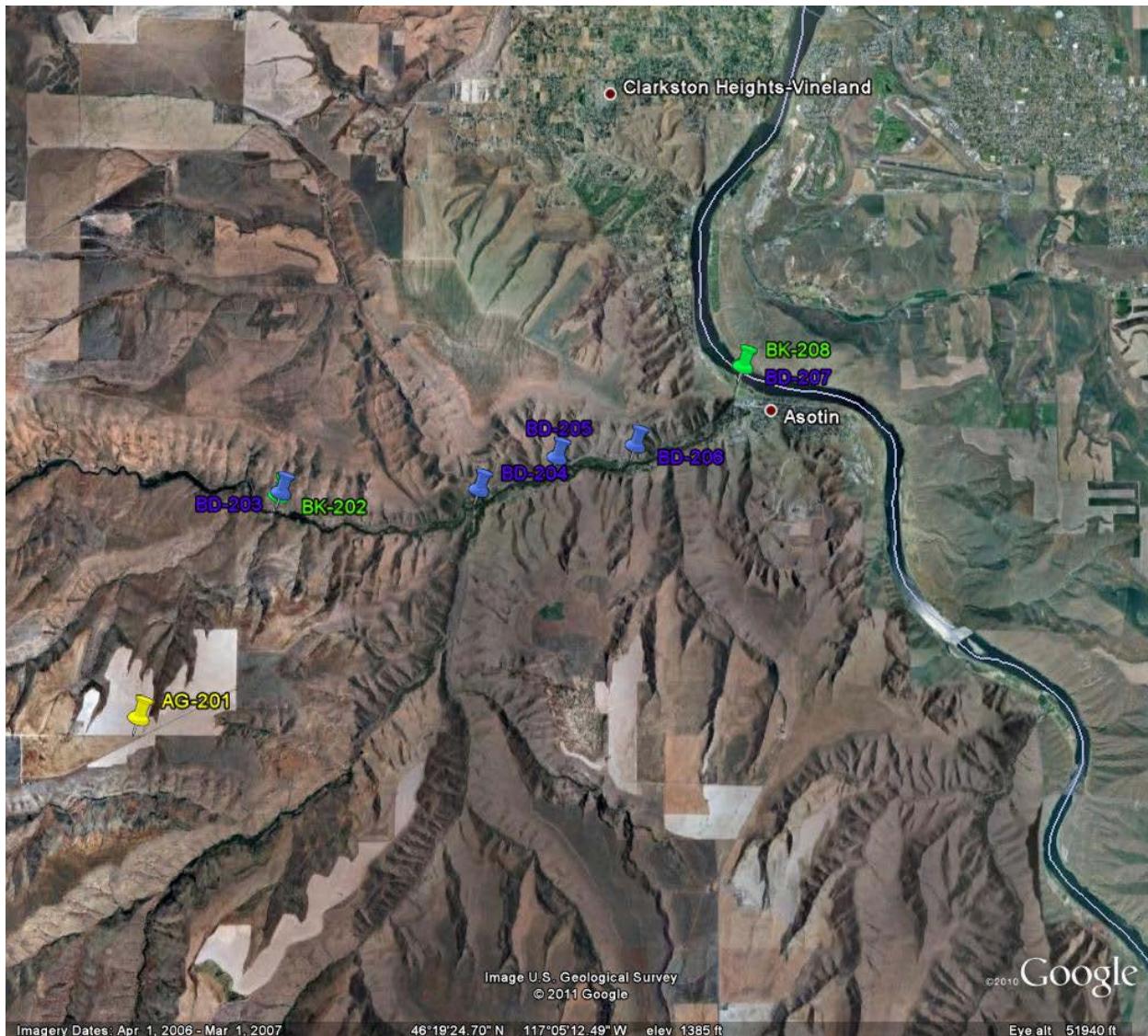


Figure 8. Sample sites in the Asotin Creek basin.

Table 3. Asotin Creek sample locations for summer (-a) and fall (-b) collection periods.

Sample Name	Latitude (N)	Longitude (W)
Summer sampling event		
AG-201-a	46°17.662'	117°10.508'
BK-202-a	46°19.490'	117°08.931'
BD-203-a	46°19.512'	117°08.905'
BD-204-a	46°19.542'	117°06.520'
BD-205-a	46°19.814'	117°05.574'
BD-206-a	46°19.917'	117°04.619'
BD-207-a	46°20.594'	117°03.303'
BK-208-a	46°20.591'	117°03.299'
Fall sampling event		
AG-201-b	46°17.661'	117°10.440'
BK-202-b	46°19.490'	117°08.931'
BD-203-b	46°19.512'	117°08.905'
BD-204-b	46°19.541'	117°06.524'
BD-205-b	46°19.186'	117°05.577'
BD-206-b	46°19.910'	117°04.604'
BD-207-b	46°20.586'	117°03.311'
BK-208-b	46°20.586'	117°03.311'



Figure 9. Asotin Creek agricultural sample #201.



Figure 10. Field condition of Asotin Creek bank sample #208.



Figure 11. Field condition of Asotin Creek bed sample #207.

3.1.3 Clearwater River Watershed

Land ownership in this subbasin is 62% federal, 1% Nez Perce Tribe, 3% State of Idaho, and 33% private. Agricultural land use occurs in the Middle Fork Clearwater (18%), South Fork Clearwater (23%), and Clearwater (57%). Agriculture consists primarily of wheat-barley rotations and rangeland. The South Fork Clearwater and Clearwater River watersheds have Highly Erodible Lands according to NRCS (1997). The surface erosion hazard is classified as high in Middle Fork Clearwater and Clearwater watersheds, and moderate to high in the South Fork Clearwater watershed (see Table 19 in TetraTech 2006). In 1998, 540 stream segments were 303(d) listed for sediment (70% in Lower Clearwater, 19% in Middle Fork Clearwater, and 9% in South Fork Clearwater). Surface erosion was estimated by Boll et al. (2001) for agricultural areas within the basin. The major contributors of human-caused sediment in the Clearwater drainage are the mainstem water bodies; lower (57.35 t/yr), middle (99.49 t/yr), and upper Red River (82.49 t/yr), lower American River (55.27 t/yr), East Fork American River

(50.39 t/yr), and Meadow Creek (83.96 t/yr). Cougar Creek and Buffalo Gulch produce slightly less sediment than these other water bodies.

Sampling was performed at one agricultural, two stream bank, and five stream bed locations. Figure 12 illustrates the sample sites with the yellow marker representing the location of agricultural soil sample, the green marker representing the river bank sample location, and the blue marker representing the stream bed sample locations. Table 4 contains the GPS coordinates of the individual locations. Figure 13 presents the agricultural site, Figure 14 depicts a typical river bank location, and Figure 15 shows a typical stream bed location within the Clearwater River watershed.

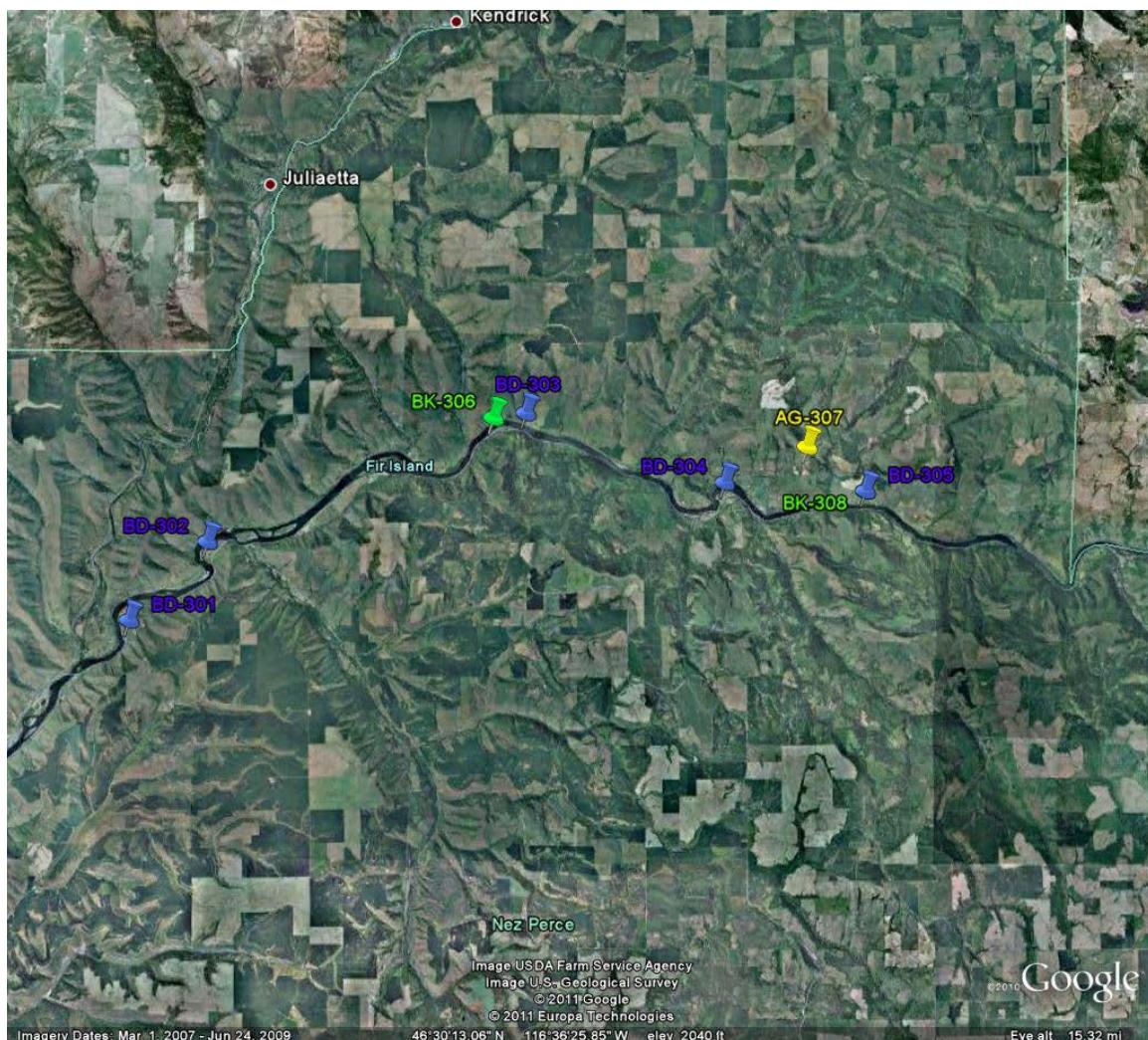


Figure 12. Sample sites in the Clearwater River basin.

Table 4. Clearwater River sample locations for summer (-a) and fall (-b) collection periods.

Sample Name	Latitude (N)	Longitude (W)
Summer sampling event		
BD-301-a	46°28.786'	116°45.185'
BD-302-a	46°29.816'	116°43.708'
BD-303-a	46°31.499'	116°37.604'
BD-304-a	46°30.573'	116°33.804'
BD-305-a	46°30.452'	116°31.136'
BK-306-a	46°31.441'	116°38.217'
AG-307-a	46°31.037'	116°32.253'
BK-308-a	46°30.452'	116°31.136'
Fall sampling event		
BD-301-b	46°28.828'	116°45.193'
BD-302-b	46°29.798'	116°43.752'
BD-303-b	46°31.511'	116°37.589
BD-304-b	46°30.566'	116°33.828'
BD-305-b	46°30.456'	116°31.043'
BK-306-b	46°31.443'	116°38.216'
AG-307-b	46°31.037'	116°32.253'
BK-308-b	46°30.452'	116°31.136'



Figure 13. Field condition of Clearwater River agricultural sample #307.



Figure 14. Field condition of Clearwater River bank sample #308.



Figure 15. Field condition of Clearwater River bed sample #304.

3.1.4 Grande Ronde River Watershed

This 4,130 square mile Oregon subbasin has on average 17% agriculture/urban, with 22% in Upper Grande Ronde, 17% in Wallowa, and 11% in Lower Grande Ronde. The river is roughly 182 miles long with the watershed elevation ranging from approximately 7,425 feet to 830 feet at the Snake River confluence. Private ownership occurs at lower elevations, comprising about half of the subbasin. Cropland erosion may be present, but it is not the major source for sediment originating in the subbasin (Nowak, 2004). Hydrologic disturbance is high in Upper Grande Ronde. Surface erosion hazard and sediment delivery hazard are high in all watersheds in this subbasin. Upper Grande Ronde and Wallowa watersheds have some highly erodible cropland. Several stream segments (20 in the Grande Ronde subbasin, two in the Lower Grande Ronde, and four in the Wallowa) were on 303(d) list for sediment in 1998 (Nowak, 2004). Practices that improve vegetative conditions are high priorities for improving water quality in the subbasin. Agricultural improvements have been achieved through CRP, CREP and WRP. In

addition to reducing streambank erosion, creation of wetlands and filter strips for drainage from agricultural areas is important.

Sampling was performed at one agricultural, three stream bank, and five stream bed locations. Figure 16 illustrates the sample sites with the yellow marker representing the location of agricultural soil sample, the green marker representing the river bank sample location, and the blue marker representing the stream bed sample locations. Table 5 contains the GPS coordinates of the individual locations. Figure 17 presents the agricultural site, Figure 18 depicts a typical river bank location, and Figure 19 shows a typical stream bed location within the Grande Ronde River watershed.

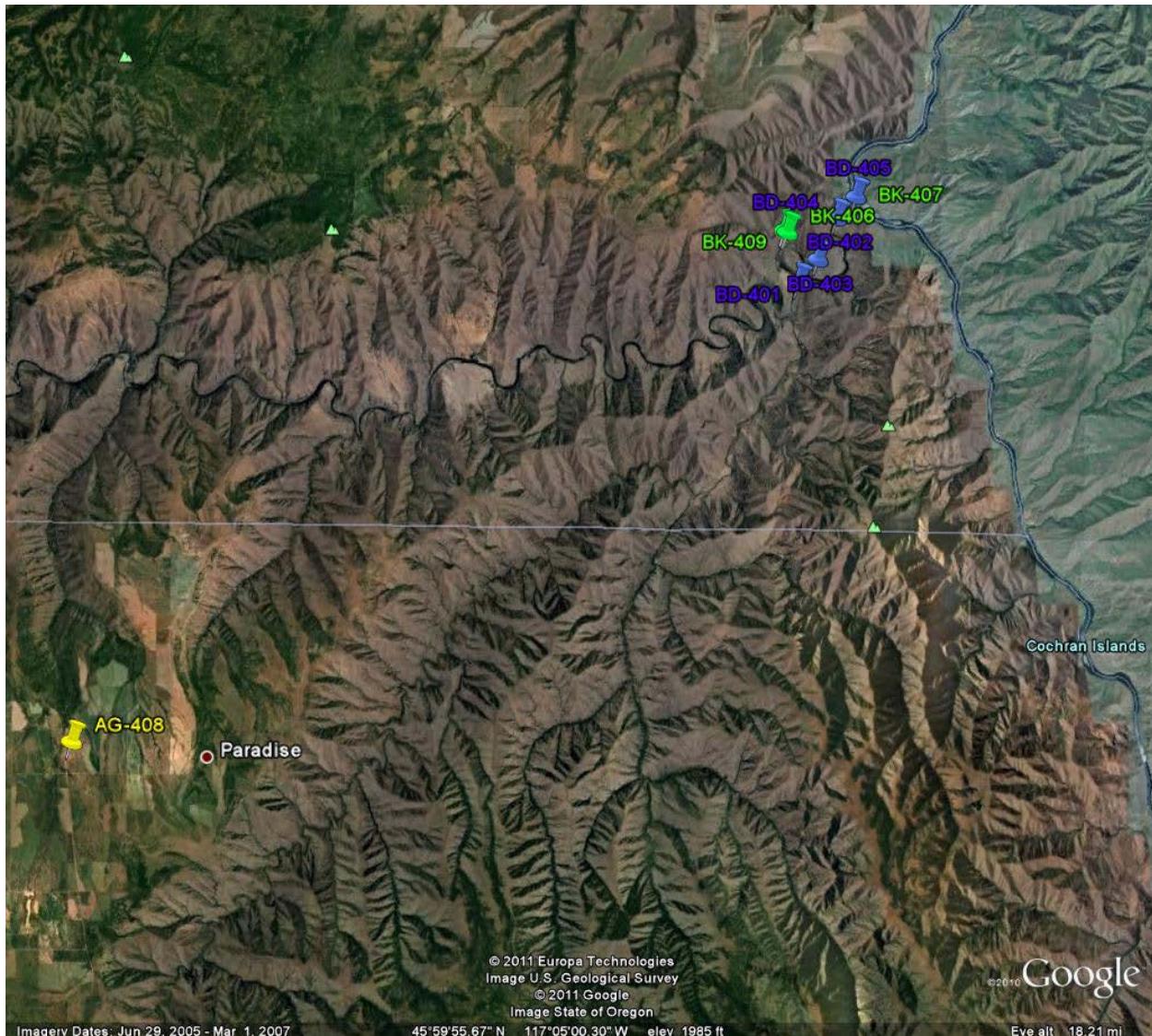


Figure 16. Sample sites in the Grande Ronde River basin.

Table 5. Grande Ronde River sample locations for summer (-a) and fall (-b) collection periods.

Sample Name	Latitude (N)	Longitude (W)
Summer sampling event		
BD-401-a	46°03.420'	117°00.252'
BD-402-a	46°04.246'	117°00.569'
BD-403-a	46°03.789'	116°59.814'
BD-404-a	46°04.437'	116°59.386'
BD-405-a	46°04.771'	116°58.956'
BK-406-a	46°04.212'	117°00.509'
BK-407-a	46°04.771'	116°58.956'
AG-408-a	45°56.296'	117°16.305'
BK-409-a	46°04.246'	117°00.564'
Fall sampling event		
BD-401-b	46°03.421'	117°00.259'
BD-402-b	46°04.232'	117°00.564'
BD-403-b	46°03.749'	116°59.818'
BD-404-b	46°04.435'	116°59.386'
BD-405-b	46°04.766'	116°58.972'
BK-406-b	46°04.211'	117°00.506'
BK-407-b	46°04.766'	116°58.972'
AG-408-b	45°56.296'	117°16.305'
BK-409-b	46°04.246'	117°00.565'



Figure 17. Field condition of Grande Ronde River agriculture sample #408.



Figure 18. Field condition of Grande Ronde River bank sample.



Figure 19. Field condition of Grande Ronde River bed sample.

3.1.5 Hell's Canyon (Snake River) Watershed

This subbasin consists of main stem of the Snake River in the Hells Canyon reach below Idaho Power's Hells Canyon Dam (river mile 247), Imnaha, and Lower Snake near Asotin, Washington. Hydrologic disturbance is high in the Lower Snake – Asotin watershed. For the Asotin, a review of the Asotin County Conservation District Subbasin Plan shows the changes in stream channel and riparian areas, gully erosion, and other man-made changes. The subbasin plan addresses these issues. Surface soil erosion and sediment delivery hazards are high in the entire subbasin.

Sampling was performed at one agricultural, two stream bank, and five stream bed locations. Figure 20 illustrates the sample sites with the yellow marker representing the location of agricultural soil sample, the green marker representing the river bank sample location, and the blue marker representing the stream bed sample locations. Table 6 contains the GPS coordinates of the individual locations. Figure 21 presents the agricultural site, Figure 22 depicts a typical

river bank location, and Figure 23 shows a typical stream bed location within the Clearwater River watershed.

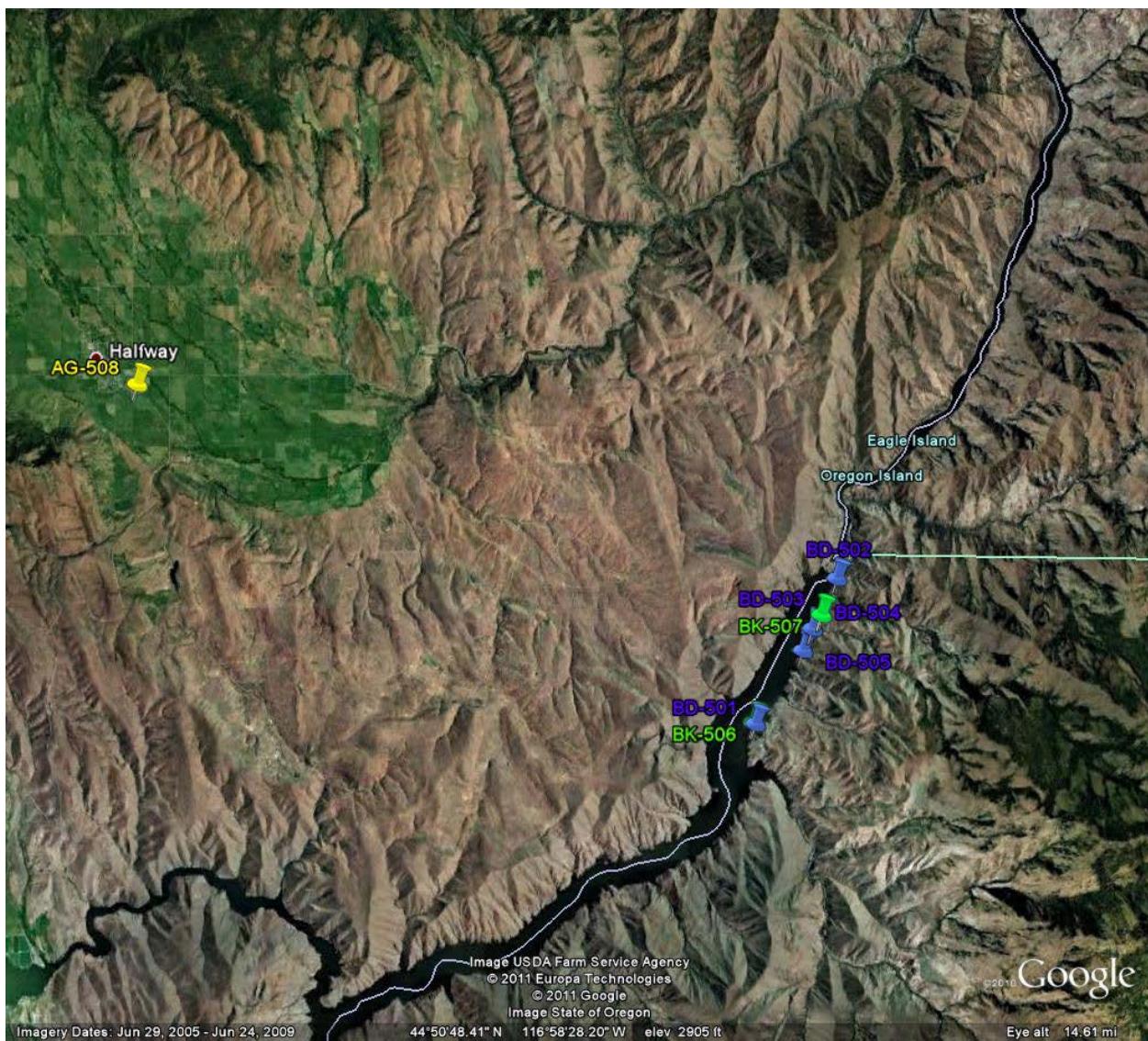


Figure 20. Sample sites in the Hell's Canyon (Snake River) basin.

Table 6. Hell's Canyon (Snake River) sample locations for summer (-a) and fall (-b) collection periods.

Sample Name	Latitude (N)	Longitude (W)
Summer sampling event		
BD-501-a	44°48.127'	116°55.491'
BD-502-a	44°49.928'	116°54.065'
BD-503-a	44°49.473'	116°54.321'
BD-504-a	44°49.305'	116°54.491'
BD-505-a	44°49.035'	116°54.658'
BK-506-a	44°48.144'	116°55.506'
BK-507-a	44°49.482'	116°54.334'
AG-508-a	45°56.296'	117°16.305'
Fall sampling event		
BD-501-b	44°48.134'	116°55.522'
BD-502-b	44°49.823'	116°54.153'
BD-503-b	44°49.491'	116°54.345'
BD-504-b	44°49.307	116°55.508'
BD-505-b	44°49.034'	116°54.660'
BK-506-b	44°48.142'	116°55.508'
BK-507-b	44°49.484'	116°54.333'
AG-508-b	45°56.296'	117°16.305'



Figure 21. Field condition of Hell's Canyon (Snake River) agricultural sample #508.



Figure 22. Field condition of Hell's Canyon (Snake River) bank sample #506.



Figure 23. Field condition of Hell's Canyon (Snake River) bed sample #505.

3.1.6 Salmon River Watershed

The Salmon River flows for 425 miles through central Idaho and drains 14,000 square miles while dropping more than 7,000 feet from its headwaters (near Galena Summit) before discharging into the Snake River. The upper Salmon River watershed (above Challis, Idaho) and its tributaries have several stream segments 303(d) listed for sediment. However, the TMDL assessment attributes surface fines primarily to legacy affects of past grazing and road development, mining activities, and bank erosion (IDEQ, 2003).

Sampling was performed at one stream bank and five stream bed locations. Figure 24 illustrates the sample sites with the green marker representing the river bank sample location and the blue marker representing the stream bed sample locations. Table 7 contains the GPS coordinates of the individual locations. Figure 25 depicts a typical river bank location and Figure 26 shows a typical stream bed location within the Clearwater River watershed.

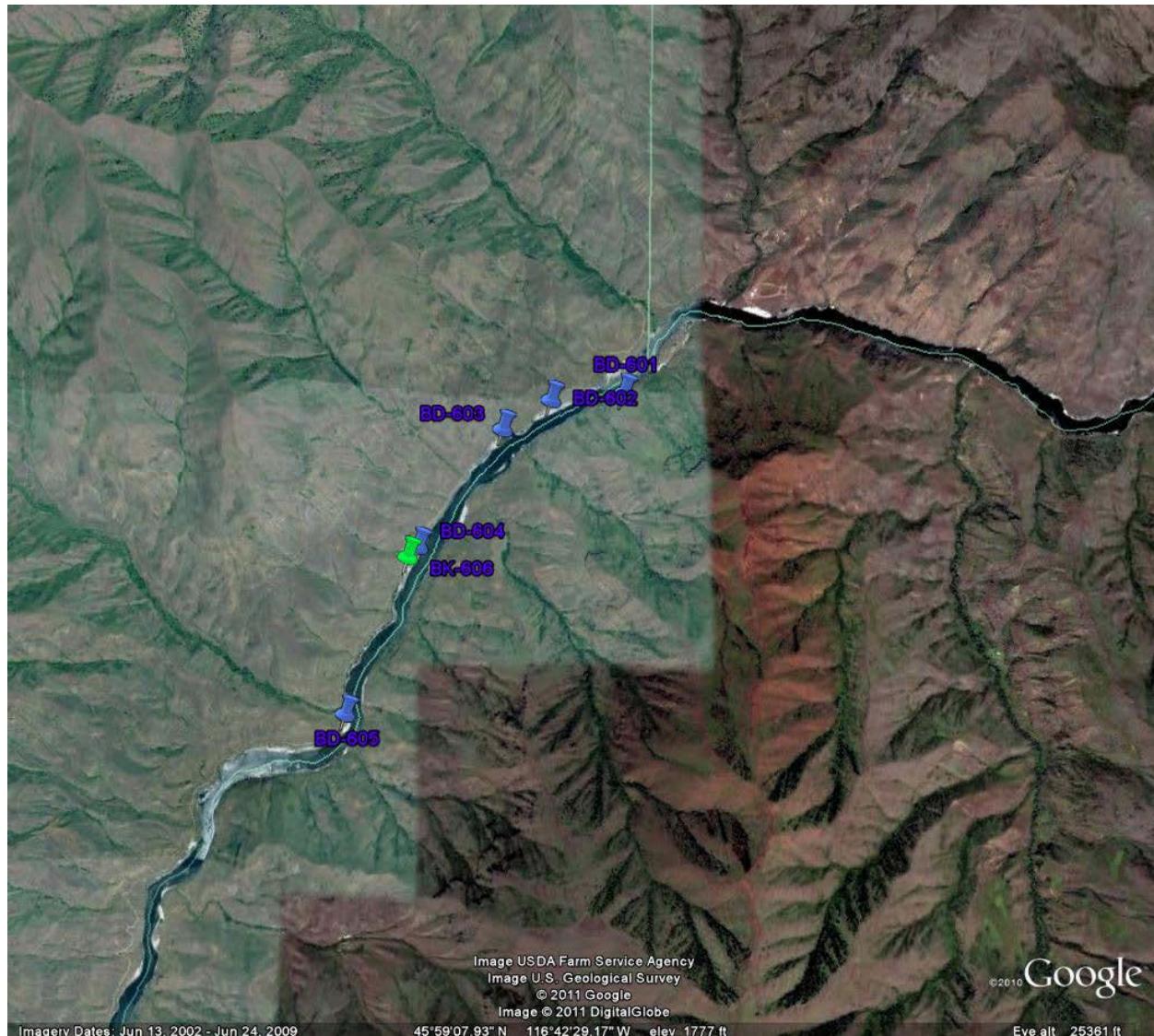


Figure 24. Sample sites in the Salmon River basin.

Table 7. Salmon River sample locations for summer (-a) and fall (-b) collection periods.

Sample Name	Latitude (N)	Longitude (W)
Summer sampling event		
BD-601-a	45°59.575'	116°42.291'
BD-602-a	45°59.553'	116°42.707'
BD-603-a	45°59.437'	116°42.985'
BD-604-a	45°58.969'	116°43.473'
BD-605-a	45°58.301'	116°43.894'
BK-606-a	45°58.929'	116°43.532'
Fall sampling event		
BD-601-b	45°59.696'	116°42.312
BD-602-b	45°59.576'	116°42.644'
BD-603-b	45°59.429'	116°42.981
BD-604-b	45°58.973'	116°43.491'
BD-605-b	45°58.303'	116°43.845'
BK-606-b	45°58.973'	116°43.491'



Figure 25. Field condition of Salmon River bank sample.



Figure 26. Field condition of Salmon River bed sample.

3.1.7 Reservoir and near-confluence Sediment Cores

At the request of the USACE, the U.S. Geological Survey (USGS) collected sediment cores in Lower Granite Reservoir as well as the lower Clearwater and the Snake River just upstream of the Clearwater confluence. Typically, the USGS collected samples at three locations along each cross section. The general location of these samples is shown in Figure 27. After retrieving the sediment samples, the USGS split the samples into segments and set aside representative samples for the WSU team to analyze. Table 8 presents the locations and depths of the sediment cores we received. Cores 19-71 are in Lower Granite pool beginning just upstream of the dam and extending to its confluence with the Clearwater River. Cores 72-90 are on the Snake River mainstem above the Clearwater River and below Southway Bridge. These locations are shown in Figure 28. Cores 1-18 are located on the Clearwater mainstem immediately upstream of the Snake River confluence and downstream of Memorial Bridge. These are shown in Figure 29.

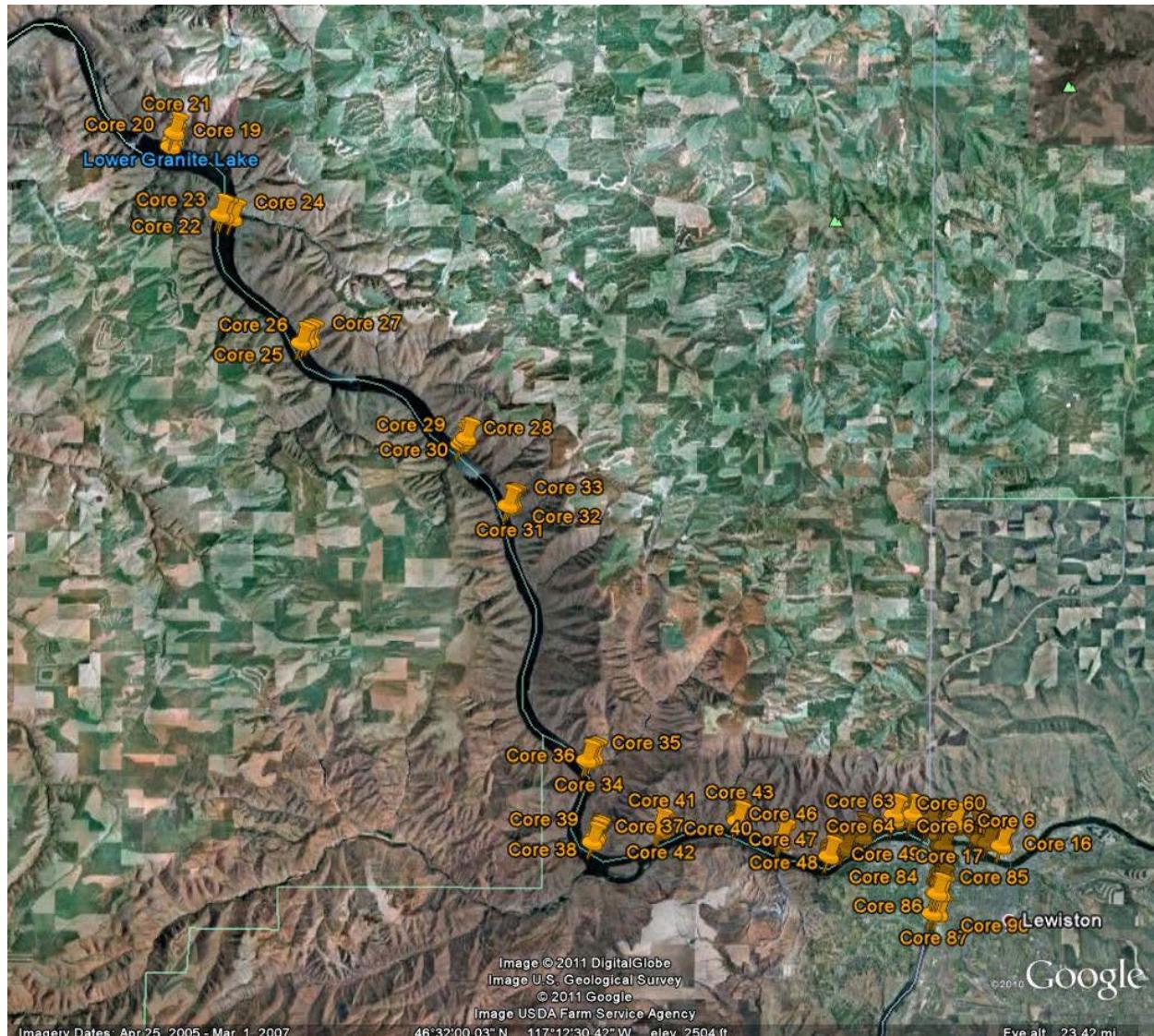


Figure 27. Locations of sediment core samples in Snake and Clearwater Rivers.

Table 8. Sediment core sample locations and depths.

Range	Core	River Mile (mi)	Depth (cm)		Range	Core	River Mile (mi)	Depth (cm)
1	19	108.31	7 - 17		11	49	136.29	7 - 14
	19	108.31	72 - 82			49	136.29	35 - 45
	19	108.31	177 - 187			49	136.29	91 - 96
	20	108.31	15 - 55			49	136.29	103 - 113
	20	108.31	162 - 175			50	136.29	25 - 35
	20	108.31	234 - 250			50	136.29	67 - 77
	21	108.31	17 - 21			52	136.29	7 - 17
2	22	111.24	7 - 27		12	52	136.29	96 - 106
	22	111.24	99 - 119			54	136.69	7 - 17
	22	111.24	165 - 171.5			54	136.69	108 - 114
	23	111.24	7 - 11		14	60	138.07	11 - 20
	23	111.24	57 - 77			60	138.07	55 - 70
	23	111.24	138 - 158			62	138.52	76-81
3	25	114.92	27 - 34		15	62	138.52	100 - 107
	26	114.92	7 - 20			63	138.52	15 - 25
	26	114.92	67 - 77			65	138.94	50 - 57
	26	114.92	127 - 137		16	65	138.94	71 - 78
	27	114.92	7 - 27			65	138.94	91 - 96
	27	114.92	97 - 117			66	138.94	15 - 25
	27	114.92	157 - 177			70	139.29	9 - 18
	27	114.92	247 - 264			70	139.29	30 - 35
4	28	119.56	20 - 35		17	70	139.29	43 - 47
	28	119.56	60 - 75			70	139.29	54 - 62
	28	119.56	75 - 85			71	139.29	7 - 17
	29	119.56	15 - 30			71	139.29	48 - 52
	29	119.56	50 - 60			71	139.29	95 - 105
	5	31	121.42	18 - 28		71-A	139.29	18 - 22

	31	121.42	87 - 98			71-A	139.29	36 - 38
	31	121.42	143 - 154		18	73	139.43	0 - 2
	32	121.42	16 - 30		21	81	140.51	0 - 3
	32	121.42	40 - 50			87	141.21	0 - 19
6	34	128.27	13 - 23		23	88	141.21	0 - 3
	34	128.27	71 - 81			89	141.21	0 - 3
	34	128.27	127 - 137			1	0.28	14 - 20
	34	128.27	149 - 159			2	0.28	67 - 71
	34	128.27	178 - 188			2	0.28	87-91
	35-B	128.77	0 - 2		24	2	0.28	112 - 117
	36	128.27	0 - 3			3	0.28	7 - 17
	37	130.44	0 - 4			3	0.28	33 - 43
	37-B	130.44	6 - 10			3	0.28	67 - 77
	38-A	130.44	10-15			3	0.28	95 - 100
7	38-A	130.44	38 - 41		25	3	0.28	128 - 134
	38-A	130.44	45 - 50			4	0.41	18-22
	38	130.44	2 - 5			5	0.41	7 - 12
	38	130.44	18 - 20			5	0.41	24 - 30
	38	130.44	66 - 69			5	0.41	46 - 50
	38	130.44	165 - 168		26	9	0.92	24 - 28
	39	130.44	6 - 9			9	0.92	45 - 48
	39	130.44	5 - 10		27	10	1.16	6 - 9
	39	130.44	21 - 26			10	1.16	13 - 17
	39	130.44	26 - 32			10	1.16	31 - 34
	39	130.44	41 - 47			10	1.16	47 - 50
	39	130.44	93 - 97			10	1.16	55 - 58
	39	130.44	142 - 150			10	1.16	70-74
	40	132.05	55-64			10	1.16	73 - 76
8	40	132.05	105 - 113			10	1.16	83 - 86
	40	132.05	128 - 132			10	1.16	99 - 102

	40	132.05	146 - 150			10	1.16	106 - 109
9	43	133.98	8 - 12			11	1.16	0 - 3
	43	133.98	21 - 26			12	1.16	4 - 7
	43	133.98	45 - 51			12	1.16	19 - 22
	46	135.15	40 - 47			12	1.16	22 - 26
10	46	135.15	103 - 108		28	12	1.16	32 - 35
	47	135.15	0 - 2			13	1.36	0 - 4
	47	135.15	57 - 65			14	1.36	7 - 17
	47	135.15	115 - 120			15	1.36	7 - 15
						15	1.36	27 - 37
					29	16	1.66	0 - 3
						17	1.66	0 - 3
						18	1.66	0 - 3



Figure 28. Sediment core sample locations on the Snake River above the Snake River and Clearwater River confluence.



Figure 29. Sediment core sample locations on the Clearwater River above the Snake River and Clearwater River confluence.

4.0 Materials and Methods

4.1 Sample collection

Soil and sediment samples representative of agricultural soils, river bank sediments and river bed sediments were collected from the six selected sub-basins for physicochemical analysis. Five (5) agricultural soil samples, 12 bank samples and 30 bed sediment samples were collected between June 1, 2010 and June 23, 2010 (identified as source A in the original data attached in Appendix A1-1b). Bed samples were considered more important as it was assumed that this material most closely related the sediments that had been recently transported downstream. Sample locations were selected based on aerial photographs, visual analysis of typical characteristics, and access (permission and safety). The source sample collection was repeated between September 18, 2010 and October 7, 2010, which included collecting the same number of samples at the same site locations (identified as source B in the original data attached in Appendixes). As previously indicated, a handheld global positioning system (GPS) device was used to record the coordinates for each sampling site (Section 3 and Appendix A1-1b). The sediment core samples collected from the Lower Granite Reservoir comprised 122 samples that represented depths ranging from 0 to 104 inches (0 to 264 cm) (river mile for each core location are shown in Appendix A1-1a).

The upland agricultural soil samples were collected from the upper 0 to 0.8 inches (0 to 2 cm) depth, representative of the soil particles that are the most likely to erode. Each location was sampled using a small stainless steel spade. At the recommendation of other researchers conducting fingerprint studies, a different spade was used for each watershed to avoid possible cross contamination. Between field trips, the spades were thoroughly cleaned. Bank and bed samples were collected by scraping soil from bank faces of actively eroding locations, identified in the catchment area and from the bed faces that are potentially erodible under the current river flow regime. Sediment core samples were collected using a sediment core sampler. All samples were placed into 500 mL wide mouth brown colored jars, kept in a cooler and shipped to the laboratory as soon as possible.

4.2 Laboratory analysis

Laboratory analysis of core and surface sediment samples were conducted using physical and chemical analyses. For the physical analysis, grain size distributions of dried sediment and soil samples were measured using a range of sieves with sizes from 425, 212, 150 and 75 µm (#40, #70, #100, and #200 sieves) following the procedure in accordance to ASTM D-422 (American Society for testing and materials). Grain size analysis was conducted on 51 core samples, 46 Source A samples, and 46 Source B samples. Table 9 summarizes the grain size distribution data for the agricultural samples. Results of the sieving are provided Appendices A1-1d (core samples), A1-1e (Source A trip) and A1-1f (Source B trip). Soil classification tables define medium sand diameters of 250 to 500 µm which is essentially the sediment captured on the #70 and #40 sieves. Very fine sand has a diameter of 50 to 100 µm which is between sieves #100 and #200.

Table 9. Summary of agricultural grain size samples.

Sample ID	Data	40	70	100	200	Pan
AG-107-a	Mass (g)	6.35	6.29	2.53	4.68	29.49
	Percentage	12.87%	12.75%	5.13%	9.49%	59.77%
AG-107-b	Mass (g)	16.24	7.33	2.79	4.67	18.95
	Percentage	32.49%	14.67%	5.58%	9.34%	37.92%
AG-201-a	Mass (g)	2.54	7.56	3.29	5.68	35.18
	Percentage	4.68%	13.94%	6.06%	10.47%	64.85%
AG-201-b	Mass (g)	8.5	8.33	3.21	5.44	24.05
	Percentage	17.16%	16.82%	6.48%	10.98%	48.56%
AG-307-b	Mass (g)	3.33	24.12	12.21	8.72	1.4
	Percentage	6.69%	48.45%	24.53%	17.52%	2.81%
AG-408-a	Mass (g)	14.63	7.61	2.41	4.74	19.8
	Percentage	29.74%	15.47%	4.90%	9.64%	40.25%
AG-408-b	Mass (g)	26.06	6.56	1.64	3.48	10.1
	Percentage	54.47%	13.71%	3.43%	7.27%	21.11%
AG-508-a	Mass (g)	21.01	7.68	3.77	6.83	10.85
	Percentage	41.90%	15.32%	7.52%	13.62%	21.64%
AG-508-b	Mass (g)	17.92	9.38	4.11	7.56	9.96
	Percentage	36.62%	19.17%	8.40%	15.45%	20.36%
	Total Mass (g)	116.6	84.86	35.96	51.80	159.78
Average	Percentage	25.97%	18.90%	8.01%	11.54%	35.59%

Table 10 and Table 11 illustrate the grain size percentages at individual core locations in the Lower Granite Pool behind COSTCO and at the mouth of Clearwater River (Core #3). The location of Core #3 is shown in Figure 29. Core #3 results show significant differences between layers with the 67-77 cm deep layer (drying #117) having a high fines content (61.63%). Layers above and below this seam are considerably more sandy.

Table 10. Grain size distribution for Core #65 location on Snake River behind COSTCO.

Drying #	Data	40	70	100	200	Pan
138	Mass (g)	7.01	26.93	1.64	0.31	0.03
	Percentage	19.52%	74.97%	4.57%	0.86%	0.08%
139	Mass (g)	2.69	44.95	6.26	0.79	0.12
	Percentage	4.91%	82.01%	11.42%	1.44%	0.22%
140	Mass (g)	5.01	109.6	15.18	3.06	0.35
	Percentage	3.76%	82.28%	11.40%	2.30%	0.26%
Average	Total Mass (g)	14.71	181.48	23.08	4.16	0.50
	Percentage	6.57%	81.04%	10.31%	1.86%	0.22%

Table 11. Grain size distribution for Core #3 location on Clearwater River at confluence.

Drying #	Data	40	70	100	200	Pan
115	Mass (g)	0.11	3.47	10.46	27.17	8.23
	Percentage	0.22%	7.02%	21.16%	54.96%	16.65%
116	Mass (g)	0.05	7.94	24.91	14.95	1.75
	Percentage	0.10%	16.01%	50.22%	30.14%	3.53%
117	Mass (g)	8.74	3.63	1.7	5.14	30.85
	Percentage	17.46%	7.25%	3.40%	10.27%	61.63%
118	Mass (g)	1.06	51.97	26.07	9.55	1.69
	Percentage	1.17%	57.53%	28.86%	10.57%	1.87%
119	Mass (g)	2.22	59.47	23.49	6.04	1.74
	Percentage	2.39%	63.97%	25.27%	6.50%	1.87%
Average	Total Mass (g)	12.18	126.48	86.63	62.85	44.26
	Percentage	3.66%	38.05%	26.06%	18.91%	13.32%

The “fingerprint” signatures exhibited by the agricultural soil, bank sediment and bed sediment samples collected in the tributary watersheds, as well as for the sediment cores from the Lower Granite Reservoir, were characterized by analyzing for 66 physicochemical properties. Table 12 displays these parameters grouped according to the different analytical methods used, which are described in the remainder of this section. Grain size distribution, C and N content/isotope ratios, loss on ignition, major and trace elements, and mineral oxides were quantified to provide a critical assessment of the Lower Snake River Basin. This robust approach was selected, because it is advantageous to consider a wide variety of diagnostic properties to better represent the source materials and reduce the potential for false source-sediment linkages.

Table 12. Summary of physicochemical properties quantified grouped according to analytical method.

Method	Parameter
ASTM D-422	Grain size distribution
Stable isotope analysis	N%, C%, $\delta^{13}\text{C}$, $\delta^{15}\text{N}$
Neutron activation analysis	Sc^{46} , La^{140} , Zn^{65} , As^{76} , Ce^{141} , Sb^{122}
Fusion ICP and ICP-MS	SiO_2 , Al_2O_3 , Fe_2O_3 , MnO , MgO , CaO , Na_2O , K_2O , TiO_2 , P_2O_5 , LOI, Sc, Be, V, Cr, Co, Ni, Cu, Ga, Ge, As, Rb, Sr, Y, Zr, Nb, Mo, Ag, In, Sn, Sb, Cs, Ba, Bi, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, W, Ti, Pb, Th, U

All samples were oven dried at 105 °C until a constant weight was reached prior to analysis by each of the following methods described. Grain size distribution of the dried sediment and soil samples was measured following the standard ASTM D-422 method (American Society for testing and materials). This technique involves differentiating sediment and soil particle size using 425, 212, 150 and 75 μm sieves.

Carbon and nitrogen isotopic analysis was carried out on an elemental analyzer, (ECS 4010, Costech, Analytical, Valencia, CA), at the Washington State University Stable Isotope Core Laboratory (Pullman, WA), with pertinent sample, data, and results listed in Appendix A4. Approximately, 30-350 mg samples, depending on sample C and N content, were weighed into

tin capsules (9x10 mm tin capsules for samples >50mg and 5x9 mm for samples <50mg). Samples were introduced sequentially for on-line combustion using an oxidation furnace at a temperature of 1020 °C to convert the samples into N₂ and CO₂. For carbon and nitrogen isotopic analysis, N₂ and CO₂ were transferred with 99.999% helium carrier gas at a flow rate of 120 mL/min and separated by a 3 m GC column (Costech 051082) maintained at a temperature of 40 °C. The gases were analyzed with a Delta^{PLUS} XP continuous flow isotope ratio mass spectrometer (Thermo Finnigan, Bremen, Germany) according to validated procedures (Brenna et al., 1997; Qi et al., 2003). Total C and N content was determined by determining total CO₂ and N peak areas for the samples as detected by the thermal conductivity detector (TCD) inside the instrument, which were compared to peak areas measured for a suite of external acetanilide calibration standards using Costech's EAS software. A complete suite of quality assurance/quality control (QA/QC) procedures was incorporated into the procedure. Isotopic reference materials were interspersed with samples for calibration, while corn flour (USGS26) and peach leaf (RM1547, NIST) certified reference materials were used as quality control check standards. Contribution of ¹⁷O was corrected by the IRMS software using the Santrock correction (Santrock et al., 1985). Thirteen laboratory duplicate samples were analyzed to assess result variation and precision.

Appendix A3 provides sample, data, and result information for the Nondestructive Neutron Activation Analysis (NAA) performed by the Washington State University Nuclear Radiation Center (Pullman, WA), was used to assess several rare earth and other elements. This facility uses a 1-MW TRIGA III-fueled research reactor with a rectangular fuel box (differentiating it from a conventional TRIGA reactor) as a neutron source. The reactor is fueled with a mixture of 25% enriched and 70% enriched ²³⁵U in a zirconium hydride matrix. Available thermal neutron fluxes range from 1×10^{12} to $8 \times 10^{12} \text{ n cm}^{-2} \text{ s}^{-1}$ in water-cooled positions and $\sim 10^{13} \text{ n cm}^{-2} \text{ s}^{-1}$ in a thimble position. Approximately 10 mg of each sample was weighed into a 2/5 dram poly vial and 1 mL nanopure water was added to prevent any dusting that would release airborne particulates from the sample. The 2/5 dram vial was heat sealed and washed using acetone and Milli Q water and subsequently placed inside a 2 dram poly vial, heat sealed and washed. The prepared sample was then irradiated for 15 minutes and allowed to cool for 2

days before analysis. Analysis was performed on a Canberra HPGe gamma spectroscopy (GEM40P HPGe).

Major and minor elements and oxide minerals were analyzed by Activation Laboratories Ltd. (Ancaster, Ontario, Canada) using the 8-REE Assay Package. Briefly, samples were ground using a ball mill to 95%-200 mesh to ensure complete fusion of resistant minerals. Afterwards the samples were digested using lithium metaborate/tetraborate fusion at 1000 °C and subsequently re-dissolved in 5% HNO₃. Fusion ICP and ICP-MS was performed using a Varian 735 ICP OES and Perkin Elmer Sciex Elan 6000, with sample, data and results shown in Appendix A2. A robust QA/QC protocol was followed for this analysis that included the use of rhodium (Rh) and iridium (Ir) internal standards, 20 certified reference materials for calibration and validation during analysis, method blanks and duplicate samples.

4.3 Statistical Analysis

Statistical Analysis Software (SAS) was used to perform statistical analysis using the results found for the various sub-basin and reservoir samples. Statistical tests performed included determining the square of correlation coefficient (R^2), chi-square test, Kruskal–Wallis *H*-test, stepwise discriminant function analysis (SDFA), and cluster analysis. All of these methods are well-known and have been used previously to describe sediment fingerprint properties (Collins and Walling 2002, Olivares-Rieumont et al. 2005, Mukundan et al. 2010).

Correlation coefficients were calculated to analyze relationships between the various physicochemical variables considered. Before proceeding with more rigorous statistical analysis, univariate plot procedures in SAS were conducted to determine whether the variables were normally distributed. It was determined that the different variables primarily did not follow a normal distribution, which invalidated the use of standard parametric statistics.

The Kruskal–Wallis *H*-test was used as a basis for recognizing and eliminating redundant fingerprinting properties. This statistical method is the non-parametric analogue of one-way ANOVA tests and has a power efficiency of approximately 95.5%, making it suitable for use in association with the relatively small source material sets collected from each study catchment (Collins and Walling 2000). The null hypothesis, which states no significant difference exists between the source locations for the different physicochemical parameters, is rejected when the *H*-test statistic reaches a critical threshold. A greater inter-category difference generates a larger

H -test statistic, making it more likely to exceed the critical H_0 value. Following analysis, parameters exceeding the critical H_0 value are retained for use in further statistical testing, while those below the critical H_0 value are eliminated from further consideration.

Based on the data set of discriminating fingerprinting properties retained, a stepwise discriminant function analysis (SDFA) was used as a stepwise selection algorithm to further refine the list of physicochemical properties that can be used to characterize unique diagnostic parameters for the various locations (Collins and Walling, 2002). In addition, cluster analysis was used to group “like” fingerprint properties that passed stepwise discriminant function analysis for further classification of the samples, wherein each cluster is as homogeneous as possible with respect to the clustering variables. The method selected in this study was the average distance method, which uses the average distance (linkage) between data points or clusters to create groups. Essentially, data points with the smallest distances between them are grouped together. Then the data with the next smallest difference is added progressively to form a nested set of clusters that ultimately illustrate the relationships between each observation.

5.0 Results

5.1 Data Quality

The results obtained via fusion ICP and ICP-MS analysis exhibited excellent data quality. Six random samples were selected at random to be analyzed in duplicate to provide a measure of precision associated with laboratory procedures (e.g., instrument stability, consistency in sample preparation and analysis). After eliminating instances when values were below instrument detection limits (this excluded 3 of the 57 parameters from consideration), the percent difference between the respective duplicate samples was calculated and averaged for the six samples. Taking the average of these values, the overall percent difference between all parameters for all samples was only 2.49%. In general, if <10% difference is observed between replicates the quality of the data is considered strong, and if it is >10% it needs to be evaluated using critical judgment. Considering the parameters individually, none exceeded a 10% difference. While four elements (As, Be, Cr and Zn) displayed percent differences between 9% and 10%, 22 parameters exhibited values between 1% and 3% and an additional 19 parameters revealed <1% difference between samples. Meanwhile, percent differences between measured and certified values for the reference materials demonstrated similar precision.

Although the 13 duplicate samples considered exhibited greater variability, the resultant data was still strong. The average percent difference for $\delta^{13}\text{C}$ was 3.4%, while the C content value was just over 10% after an anomalous outlier was removed. After removing instances of very low measured values (4 cases for $\delta^{15}\text{N}$ and 1 case for percent N content), the percent differences were 13.5% and 8.5% for $\delta^{15}\text{N}$ and N content, respectively. Removal of the cases was deemed prudent, because the $\delta^{15}\text{N}$ and N content values were all fairly low, which correspondingly tends to lead to greater percent differences (for instance, values for duplicate samples of 1.02 and 0.63 are not that different, but still generate a percent difference of 62%). Overall, these values are acceptable and demonstrate good data quality for these parameters.

The NAA procedure yielded unexpected results. This method generally possesses the capability of analyzing a wide range of elements; however, the samples evaluated here only consistently identified the presence of La^{140} and Sc^{46} , with occasional detection of As^{76} , Ce^{141} , Sb^{122} and Zn^{65} .

It is not clear why the NAA method did not identify as many elements as expected. The literature identifies a variety of limitations that can impede NAA evaluation. Sensitivity of this analytical technique depends on sample size, sample positioning, length of irradiation and available neutron flux, as well as the nuclear parameters of the element in question (e.g., half-life, isotope abundance, neutron cross section and gamma-ray abundance) (El-Abbady et al., 1999; Skoog et al., 1998; Witkowska et al., 2005). Although often overlooked as an important factor, the matrix composition reportedly can play a critical role in NAA accuracy (El-Abbady et al., 1999; El-Taher, 2006). A number of elements (e.g., Al, Mg, Mn, Ti, V) can also be difficult to detect either due to methodological adjustments that are typically impractical (Pinte et al., 1998) or through spectral or nuclear reaction interferences (Bedard and Linge, 2010; El-Taher, 2006). Although no definitive conclusion can be made, these limitations may have contributed to the unanticipated results, either alone or in combination.

5.2 Overview of Data

The raw data obtained for this study can be found in Appendices A5-5a, A5-5b, and A5-5j. The processed data are in Appendices A5-5c through A5-5i. The amount of information is immense and it is impractical to summarize it all. Thus, this section will provide a brief overview of the data.

Table 13 summarizes the mean values for the respective physicochemical parameters and associated coefficient of variation (CV) as determined for the sediment core samples collected from Lower Granite Reservoir, grouped according to depths of 0-10 cm, 10-30 cm and 30-268 cm. The mean $\delta^{13}\text{C}$, C%, $\delta^{15}\text{N}$ and N% values are similar to those reported elsewhere (Meyers and Teranes 2001). However, $\delta^{13}\text{C}$, C%, $\delta^{15}\text{N}$, N% and C/N varied to a certain extent through the sediment profile and from site to site. A decrease in C% and N% can sometimes be related to a reduction of fine-grained sediment, because relatively less organic C and N will exist due to diminished amounts of organic matter. Streambank sediments also tend to be degraded in respect to C and N, which correspondingly leads to enriched $\delta^{15}\text{N}$ values (Meyers and Teranes 2001). This results from the fact that surface organic matter tends to mimic its plant origins (i.e., $\delta^{15}\text{N} = \pm 2\text{\textperthousand}$, C/N = 20 to 50), and as ^{14}N is preferentially mineralized by microbial populations an enriched $\delta^{15}\text{N}$ signature develops over time.

Table 13. Mean values and coefficient of variation values for physicochemical properties exhibited by sediments collected in Lower Granite Reservoir.

Physicochemical parameter	0-10 cm (n=21)		10-30 cm (n=27)		30-264 cm (n=17)	
		CV %		CV %		CV %
$\delta^{13}\text{C}$	-24.67	6.8	-24.65	8.16	-24.45	7.88
C%	2.31	202.6	2.31	112.55	1.41	150.74
$\delta^{15}\text{N}$	4.05	44.3	3.68	30.34	3.87	26.81
N%	0.14	140.0	0.16	106.75	0.11	147.35
C/N (molar ratio)	14.66	54.7	14.04	26.80	13.94	19.32
SiO_2 %	68.78	10.0	64.42	13.48	66.35	10.99
Al_2O_3 %	11.94	8.1	12.81	6.18	12.96	4.62
Fe_2O_3 %	3.98	30.3	4.92	35.34	4.85	31.23
MnO %	0.07	38.5	0.08	45.81	0.08	38.66
MgO %	1.22	32.3	1.48	30.05	1.45	24.33
CaO %	2.64	13.5	2.92	13.30	3.01	13.36
Na_2O %	2.57	15.9	2.51	17.70	2.63	19.83
K_2O %	2.39	13.1	2.25	13.61	2.19	16.51
TiO_2 %	0.64	31.7	0.77	36.45	0.78	30.29
P_2O_5 %	0.14	57.5	0.18	49.70	0.16	50.20
LOI %	4.53	116.1	6.97	89.65	4.92	113.38
Sc^{46} (mg/kg d wt)	11.5	46.6	16.0	33.02	18.2	40.28
La^{140} (mg/kg d wt)	44.1	69.2	45.0	70.60	44.3	80.63
Sc (mg/kg d wt)	9.81	25.7	12.30	33.52	12.29	30.13
V (mg/kg d wt)	87.81	27.3	107.81	35.15	109.76	29.77
Co (mg/kg d wt)	152.86	44.0	103.89	60.58	124.06	48.47
Ga (mg/kg d wt)	14.71	14.1	16.63	12.83	16.53	12.85
Rb (mg/kg d wt)	68.00	15.6	70.59	11.94	65.71	10.97
Sr (mg/kg d wt)	331.14	12.0	327.59	16.34	340.53	18.09
Y (mg/kg d wt)	19.38	35.4	23.52	41.88	22.24	38.57
Zr (mg/kg d wt)	168.71	38.7	161.63	24.91	164.59	20.66
Nb (mg/kg d wt)	10.05	48.8	10.74	44.40	9.94	33.26
Cs (mg/kg d wt)	2.27	50.6	2.89	53.41	2.32	51.99
Ba (mg/kg d wt)	816.95	11.2	784.85	12.11	783.29	12.19
La (mg/kg d wt)	28.17	39.1	30.63	33.96	39.54	84.96

Ce (mg/kg d wt)	54.02	39.3	58.40	34.06	72.42	74.53
Pr (mg/kg d wt)	6.20	37.2	7.08	34.63	8.35	67.01
Nd (mg/kg d wt)	23.17	36.6	26.99	35.32	31.01	62.65
Sm (mg/kg d wt)	4.51	37.2	5.50	38.63	6.10	60.46
Eu (mg/kg d wt)	1.03	25.2	1.23	30.48	1.47	67.60
Gd (mg/kg d wt)	3.87	37.2	4.78	41.77	5.44	67.06
Tb (mg/kg d wt)	0.62	38.2	0.75	42.28	0.86	70.69
Dy (mg/kg d wt)	3.49	36.5	4.28	41.22	4.95	70.64
Ho (mg/kg d wt)	0.68	36.2	0.84	41.93	0.95	69.95
Er (mg/kg d wt)	2.01	34.1	2.39	40.74	2.74	66.58
Tm (mg/kg d wt)	0.30	35.9	0.36	40.94	0.40	63.21
Yb (mg/kg d wt)	2.00	34.8	2.39	40.81	2.60	58.93
Lu (mg/kg d wt)	0.33	34.9	0.39	40.52	0.43	57.10
Hf (mg/kg d wt)	4.09	37.6	3.86	26.70	3.92	21.26
Ta (mg/kg d wt)	0.81	48.9	0.89	41.65	0.81	30.76
W (mg/kg d wt)	1132.43	48.1	675.11	71.08	831.94	52.03
Th (mg/kg d wt)	7.73	41.6	7.89	35.94	10.22	82.96
U (mg/kg d wt)	2.73	66.8	4.77	86.46	3.02	86.66

Spatial variability and general trends were found for some physicochemical parameters and not for others. Figure 30 and 31 demonstrate distribution patterns for SiO_2 , Al_2O_3 , Fe_2O_3 and CaO , and V and Co , respectively, arranging values by sediment core identification number from the upper reaches of Lower Granite Reservoir to above the dam. The mineral oxides shown in Figure 30, which are less effected by aquatic chemistry processes (e.g. pH, Eh, adsorption/desorption and complexation with natural organic matter), exhibited consistent values throughout the reservoir and underwent little change relative to distance from the source sites. On the contrary, the distribution patterns of other parameters (e.g., Co, V), which are more influences by biogeochemical transformations in aquatic environments, varied greatly. Variations included both increasing and decreasing trends moving downstream, while others fluctuated with no clear trend. This behavior is demonstrated in Figure 31.

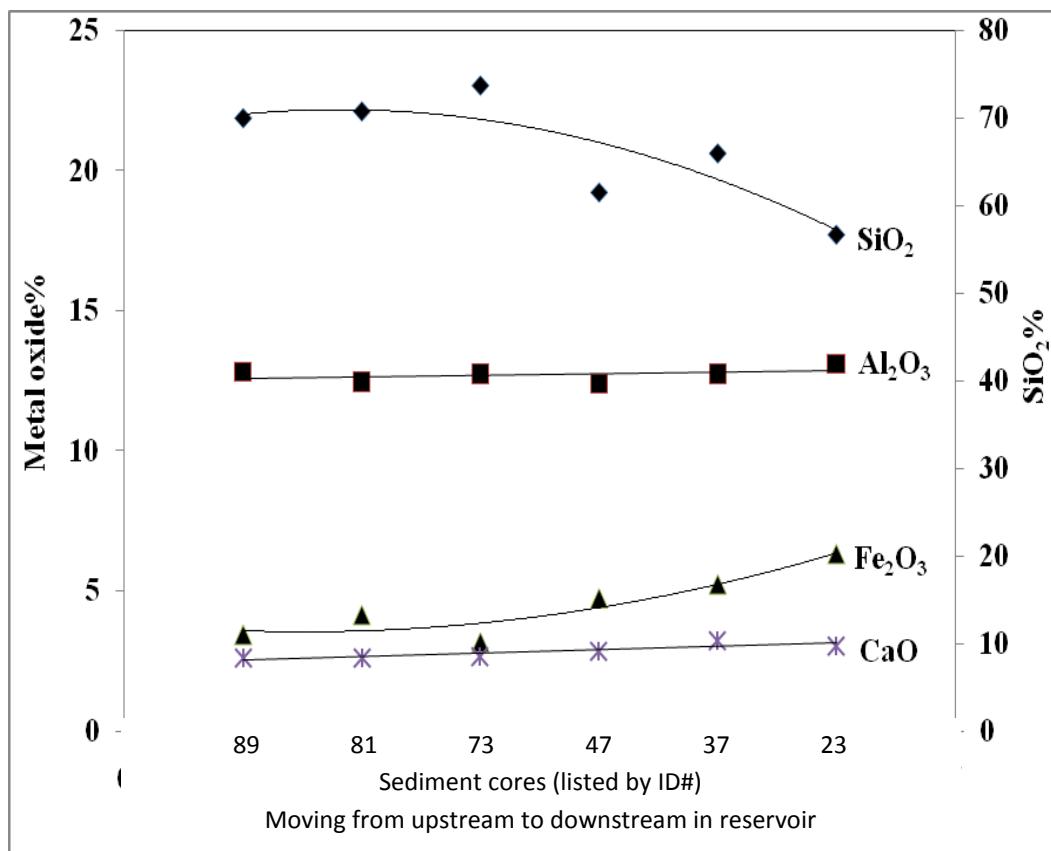


Figure 30. Distribution pattern of SiO_2 , Al_2O_3 , Fe_2O_3 and CaO in the sediment samples collected at the sites of 89, 81, 73, 47, 37 and 23.

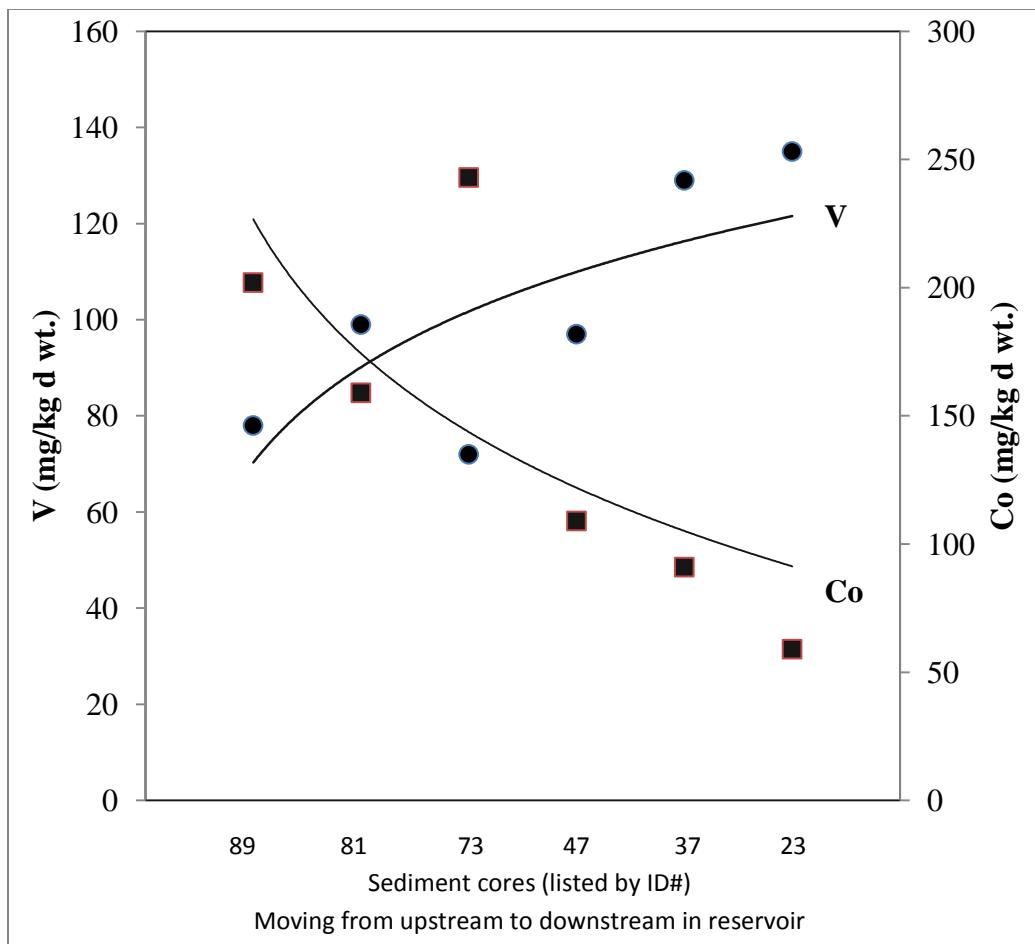


Figure 31. Distribution pattern of vanadium and cobalt in the sediment samples collected at the sites of 89, 81, 73, 47, 37 and 23.

Some of spatial patterns may not only be a function of chemistry, but also hydrology. For instance, as larger particle size fractions tend to settle out of the water column earlier than finer grain sizes, the resultant distribution will have a corresponding impact on the spatial patterns for the constituents based on their association with different sediment particle sizes. Diagram 1 outlines various factors that can influence the distribution of metals in aquatic and sediment environments.

Table 14 summarizes the R^2 correlation values of some major metal oxides (e.g. Al_2O_3 , Fe_2O_3 , MgO , K_2O and TiO_2) with some trace metals and rare elements. The data show that Fe_2O_3 , compared to other metal oxides, has considerable affinity for trace metals and rare elements in the sediment.

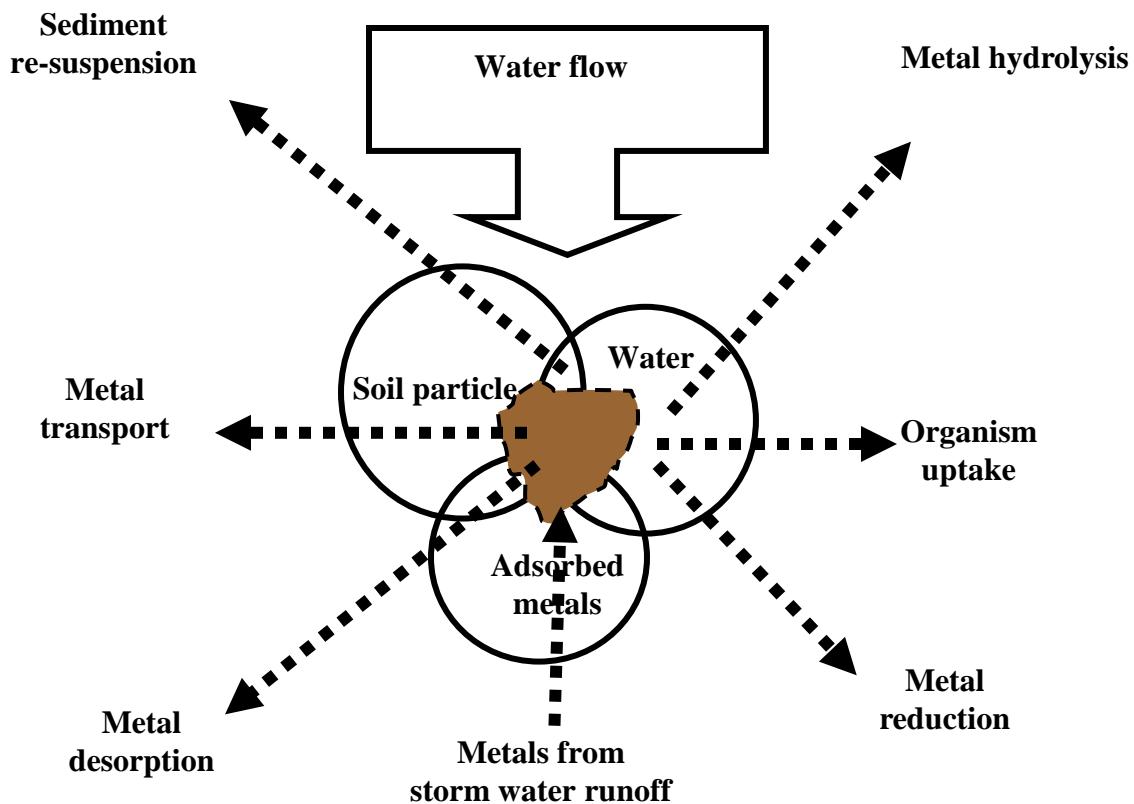


Diagram 1. Factors influencing the fate of metals in aquatic environment.

Table 14. R^2 correlation values of major metal oxides with some trace metals and rare elements.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	K ₂ O	TiO ₂	Co	Ga	Rb	Sr	Y	Zr	Nb	Ba	La	Ce	Nd	Sm	Gd	Dy	Hf	W
SiO ₂	1																					
Al ₂ O ₃	-0.41	1																				
Fe ₂ O ₃	-0.94	0.46	1																			
MgO	-0.82	0.40	0.88	1																		
K ₂ O	-0.83	0.57	0.47	-0.69	1																	
TiO ₂	-0.25	0.46	-0.81	0.85	-0.91	1																
Co	0.76	-0.07	-0.92	0.78	-0.89	-0.76	1															
Ga	-0.89	-0.27	0.96	0.71	-0.83	0.78	-0.61	1														
Rb	-0.05	0.51	0.95	0.89	-0.90	-0.39	-0.08	-0.01	1													
Sr	0.88	0.41	0.88	0.88	-0.90	-0.74	0.74	-0.74	-0.23	1												
Y	-0.92	0.28	0.99	-0.72	0.67	0.94	-0.74	0.80	-0.15	-0.78	1											
Zr	-0.46	0.48	0.97	0.72	-0.80	0.76	-0.53	0.37	-0.37	-0.33	0.70	1										
Nb	-0.72	0.47	-0.78	-0.10	0.39	0.72	-0.74	0.51	0.23	-0.65	0.70	0.50	1									
Ba	0.94	-0.30	-0.92	-0.78	0.77	-0.89	0.78	-0.83	0.08	0.89	0.78	-0.57	-0.65	1								
La	-0.67	0.09	0.61	0.64	-0.87	0.56	-0.49	0.77	0.10	-0.62	0.63	0.30	0.34	-0.73	1							
Ce	-0.69	0.12	0.63	0.66	-0.59	0.59	-0.51	0.77	0.06	-0.62	0.66	0.35	0.36	-0.75	0.66	1						
Nd	-0.73	0.15	0.68	0.68	-0.67	0.67	-0.56	0.82	0.01	-0.67	0.70	0.42	0.40	-0.81	0.70	0.99	1					
Sm	-0.75	0.18	0.71	0.70	-0.72	0.72	-0.61	0.85	0.01	-0.71	0.79	0.44	0.46	-0.85	0.74	0.98	0.99	1				
Gd	-0.82	0.21	0.76	0.74	-0.73	0.72	-0.63	0.87	-0.74	-0.74	0.79	0.42	0.47	-0.86	0.74	0.98	0.99	1.00	1			
Dy	-0.80	0.13	0.70	0.68	-0.72	0.71	-0.62	0.87	-0.73	-0.73	0.76	0.39	0.45	-0.84	0.72	0.98	0.99	0.99	1.00	1		
Hf	-0.80	0.20	0.77	0.74	-0.72	0.88	-0.62	0.51	-0.49	-0.49	0.80	0.94	0.67	-0.68	0.47	0.33	0.37	0.46	0.45	0.55	1	
W	-0.82	0.18	0.76	0.74	0.75	-0.81	0.98	-0.72	0.82	0.82	-0.80	-0.49	-0.73	0.86	-0.79	-0.58	-0.61	-0.68	-0.71	-0.76	-0.61	1

In order to link the fingerprint signatures for the respective sediments to the potential sediment sources, it is important to have a robust description of the physicochemical parameters associated with the different tributary sub-basins. Tables 15 and 16 summarize the mean values for the respective physicochemical parameters and associated coefficient of variation (CV) for the samples collected from the Clearwater River and Potlatch River, and Asotin Creek, Grande Ronde River, Salmon River and the Snake River above Hell’s Canyon, respectively. These tables also show the *H*-values obtained for each parameter using the Kruskal–Wallis *H*-test, and the parameters are sorted based upon this statistical criteria.

The Kruskal-Wallis *H*-tests statistics for the samples collected from Potlatch and Clearwater regions (Table 15) indicated that there were 23 fingerprinting properties exceeding the critical value (H_0 -value = 5.78), with these parameters exhibiting *H*-values ranging from 5.9 to 11.3. These 23 fingerprinting properties yielded ρ values below the 0.05 significance value, indicating the power of using them to discriminate between sources. Twenty-five (25) other parameters were determined to be not significant as diagnostic indicators, and were thus removed from further consideration at this point. In comparison, there were 26 fingerprinting properties from the samples collected from Asotin, Grande Ronde, Salmon and Hell’s Canyon regions that exceeded the Kruskal-Wallis *H*-test critical value of 12.59, with *H*-values ranging from 13.7 to 26.4 (Table 16). Twenty-two (22) other parameters did not survive the elimination process and were removed at this stage.

Table 15. Parameter means, CV and *H*-values determined using the Kruskal–Wallis *H*-test for the Potlatch River and Clearwater River regions.

Physicochemical parameter	Ag (n=2)	CV %	BK (n=4)	CV %	BD (n=10)	CV %	* <i>H</i> -value
Co (mg/kg d wt)	37	34.4	118.25	57.92	130.5	70.98	11.3
W (mg/kg d wt)	193.5	76.37	776.5	71.46	904	80.72	11.0
$\delta^{15}\text{N}$	6.61	8.77	3.08	62.49	2.61	71.32	10.3
MgO %	1.03	4.83	1.76	32.21	1.59	37.03	9.6
LOI %	9.08	22.05	4.77	58.24	3.73	93.58	9.6
SiO ₂ %	62.97	6.91	63.53	12.42	66.65	12.38	8.8
Sr (mg/kg d wt)	251	10.14	330.75	14.61	374	7.56	8.7
CaO %	1.94	8.4	3.45	24.55	3.32	21.54	8.6
C%	2.33	14.79	0.93	59.76	0.64	114.48	8.5
N%	0.19	18.65	0.06	50.68	0.05	110.37	8.3
Na ₂ O %	1.84	15.03	2.49	17.63	2.68	11.08	7.9
$\delta^{13}\text{C}$	-26.63	0.03	-26.65	4.04	-25.35	4.64	7.4
Fe ₂ O ₃ %	5.52	23.98	7.11	59.68	5.66	50.64	7.4
K ₂ O %	1.88	17.3	1.95	22.25	2.05	22.08	7.4
TiO ₂ %	1.04	16.21	1.09	47.17	1	50.61	7.4
V (mg/kg d wt)	115.5	26.33	151.25	59.07	129.5	63.89	7.4
Sc (mg/kg d wt)	14	20.2	15.25	45.55	14	50.51	7.3
Ga (mg/kg d wt)	18	7.86	17.75	8.45	17.5	12.12	7.2
P ₂ O ₅ %	0.22	16.44	0.18	47.24	0.17	49.91	7.1
Cs (mg/kg d wt)	3.35	6.33	2.38	33.75	1.8	23.57	7.1
MnO %	0.12	0.59	0.1	62.8	0.09	52.75	6.6
Sc ⁴⁶ (mg/kg d wt)	19	-	19.8	58.37	15.5	50.18	6.1
Rb (mg/kg d wt)	75	11.31	63.75	11.76	62.5	7.92	6

Al ₂ O ₃ %	13.51	3.66	13.1	3.32	13.42	8.43	5.9
Th (mg/kg d wt)	11.45	16.67	12.45	62.02	13.65	19.17	5.2
Eu (mg/kg d wt)	1.65	1.29	1.48	18.65	1.55	21.9	4.8
La ¹⁴⁰ (mg/kg d wt)	54	15.71	51	94.97	29.5	21.57	4.5
La (mg/kg d wt)	44.25	17.1	45.78	51.9	51.55	10.84	4.5
Ce (mg/kg d wt)	87.15	13.55	91.9	50.13	100.35	7.96	4.5
Pr (mg/kg d wt)	9.62	12.94	9.87	48.84	10.95	4.52	3.9
Nd (mg/kg d wt)	36.65	9.07	37.7	45.38	40.95	2.59	3.5
Ta (mg/kg d wt)	1.15	18.45	0.9	18.14	0.9	15.71	3.2
Ba (mg/kg d wt)	695.5	5.19	707.25	14.72	777.5	10.46	3.0
C/N (molar ratio)	14.13	3.91	16.67	24.96	15.11	11.18	2.8
Nb (mg/kg d wt)	13.5	15.71	11.5	15.06	12.5	16.97	1.8
Hf (mg/kg d wt)	7.6	18.61	6.78	39.39	7.05	3.01	1.5
Zr (mg/kg d wt)	293.5	20.48	266.5	36.71	275.5	2.82	1.4
Sm (mg/kg d wt)	7.3	3.87	7.4	39.68	7.8	7.25	1.4
U (mg/kg d wt)	3	14.14	2.58	31.13	2.75	18	1.2
Lu (mg/kg d wt)	0.57	2.48	0.5	30.37	0.5	14.14	0.9
Gd (mg/kg d wt)	6.6	2.14	6.3	34.53	6.7	14.78	0.4
Tm (mg/kg d wt)	0.51	1.4	0.45	31.38	0.47	10.64	0.4
Tb (mg/kg d wt)	1	0	1	33.67	1	14.14	0.3
Dy (mg/kg d wt)	5.9	0	5.55	30.67	5.65	16.27	0.3
Er (mg/kg d wt)	3.35	2.11	3.08	30.08	3.15	15.71	0.3
Y (mg/kg d wt)	33.5	2.11	28.75	31.67	31	13.69	0.2
Yb (mg/kg d wt)	3.3	4.29	3	28.02	3	9.43	0.1
Ho (mg/kg d wt)	1.15	6.15	1.05	32.53	1.1	12.86	0.0

*Critical H_0 -value = 5.78. CV % = Coefficient of variation.

Ag = Agricultural soil sample, BK = Bank soil sample, BD = Bed soil sample.

Table 16. Parameter means, CV and *H*-values determined using the Kruskal–Wallis *H*-test for the Asotin Creek, Grande Ronde River, Salmon River and Hell's Canyon regions.

Physicochemical parameter	Ag (n=3)	CV %	BK (n=9)	CV %	BD (n=20)	CV %	*H-value
$\delta^{13}\text{C}$	-26.63	5.45	-24.42	16.25	-21.3	43.66	26.4
N%	0.32	89.78	0.05	23.48	0.06	108.59	24.2
CaO %	3.11	40.35	3.44	31.91	6.85	16.22	23.5
C%	3.84	87.99	0.52	61.17	0.77	93.24	22.7
LOI %	11.08	48.42	3.15	6.7	31.79	78.9	22.3
MgO %	1.67	31.62	1.98	17.14	2.91	0.97	21.9
Co (mg/kg d wt)	36.33	11.46	98.67	50.5	32.2	58.6	21.7
V (mg/kg d wt)	159.33	30.81	276.33	215.5	1.64	53.1	21.5
W (mg/kg d wt)	142.67	59.24	579.33	230	77.47	89.5	21.5
Fe ₂ O ₃ %	6.83	19.17	8.53	11.2	11.31	10.75	21.2
MnO %	0.14	31.33	0.12	32.37	0.16	19.96	20.8
Sc (mg/kg d wt)	17	31.13	23.33	21	13.47	46.7	20.6
Rb (mg/kg d wt)	56	41.76	39	60.5	15.19	45.4	20.6
K ₂ O %	1.6	32.39	1.64	0.86	1.06	41.36	19.9
$\delta^{15}\text{N}$	6.31	15.52	6.49	32.38	5.17	48.96	18.4
Ba (mg/kg d wt)	595.33	30.68	688.33	650	3.05	23.8	18.4
Na ₂ O %	2.21	14.59	2.36	8.99	2.79	4.32	18.1
TiO ₂ %	1.22	13.92	1.48	11.8	1.85	25.8	18.1
SiO ₂ %	57.02	16.17	58.52	4.99	53.35	3.46	17.7
La ¹⁴⁰ (mg/kg d wt)	106.5	88.31	26.5	13.34	29.5	59.92	17.7
Al ₂ O ₃ %	13.96	7.11	15.25	14.1	14.55	6.08	17.5
Sr (mg/kg d wt)	274	3.16	407.67	286.5	12.09	11.9	16.9
Cs (mg/kg d wt)	2.63	50.43	1.33	3.15	42.65	33.2	16.9

Ho (mg/kg d wt)	1	17.32	1.03	1.1	12.86	31.7	16.4
Ga (mg/kg d wt)	17.67	6.54	19.33	20.5	10.35	15.5	16.0
P ₂ O ₅ %	0.25	48.72	0.16	44.19	0.26	21.76	13.7
Yb (mg/kg d wt)	2.8	18.56	2.77	3.05	6.96	28.2	12.1
U (mg/kg d wt)	2.2	47.46	1.63	2.15	16.44	38.1	10.7
Dy (mg/kg d wt)	5.07	16.55	5.2	5.6	7.58	31.8	10.2
Tm (mg/kg d wt)	0.42	18.01	0.42	0.47	12.04	28.5	10.2
Th (mg/kg d wt)	8.1	63.59	6.83	7.95	16.9	47.7	9.3
Tb (mg/kg d wt)	0.9	19.25	0.87	0.95	7.44	31.7	9.2
Er (mg/kg d wt)	2.83	19.44	2.9	3.1	9.12	30.4	9.2
Sc ⁴⁶ (mg/kg d wt)	47.3	43.52	29	68.27	33	17.14	8.9
Y (mg/kg d wt)	26.67	18.5	27.33	29	4.88	27.8	8.6
Eu (mg/kg d wt)	1.44	11.85	1.63	1.61	0.88	30.2	7.9
Lu (mg/kg d wt)	0.46	20.35	0.45	0.52	9.61	27.5	7.9
Gd (mg/kg d wt)	5.47	20.15	5.47	5.85	6.04	29.8	7.3
Hf (mg/kg d wt)	5.63	48.3	6.33	6.2	20.53	33.5	7.3
Zr (mg/kg d wt)	215	46.2	246.33	237.5	21.73	29.1	7.0
C/N (molar ratio)	14.11	11.04	10.57	40.6	19.39	31.1	5.8
Ta (mg/kg d wt)	0.9	38.49	0.77	1	14.14	33.8	4.5
Nb (mg/kg d wt)	10.33	36.64	10	12.5	5.66	32	4.4
Pr (mg/kg d wt)	7.23	42.38	6.48	7.18	10.24	28.7	4.2
La (mg/kg d wt)	31.8	50.39	30.43	31.3	16.72	38.7	3.8
Ce (mg/kg d wt)	68.83	50.09	57.83	62.95	15.84	33.7	3.2
Sm (mg/kg d wt)	5.9	29.41	5.53	6.2	0	25.4	2.9
Nd (mg/kg d wt)	28.2	37.53	25.6	28.65	7.65	25.5	2.7

*Critical H_0 -value = 12.59. CV % = Coefficient of variation.

Ag = Agricultural soil sample, BK = Bank soil sample, BD = Bed soil sample.

The data given in these tables indicate that $\delta^{13}\text{C}$, C%, N% and C/N values obtained in this study are similar to those reported by Fox and Papanicolaou (2007), while $\delta^{15}\text{N}$ values were generally higher. This may be due to the enrichment of $\delta^{15}\text{N}$ in these samples, which is controlled by the amount of organic matter derived from decaying vegetation and plant roots. The agricultural soils were found to be characterized by lower values of $\delta^{13}\text{C}$ than bank and bed samples, but with higher C%, $\delta^{15}\text{N}$ and N% values than the bank and bed samples. The same trend of $\delta^{15}\text{N}$ measured for the samples from soil and bank was reported by (Mukundan et al. 2010). Figure 32 presents a multivariate plot of $\delta^{15}\text{N}$ and C/N values measured for the samples collected from agriculture soil, river bank and bed samples. It appears that agriculture soil tends to be similar regardless of from which sub-basin it originates, but that bank and bed sediments display a more random distribution of this relationship.

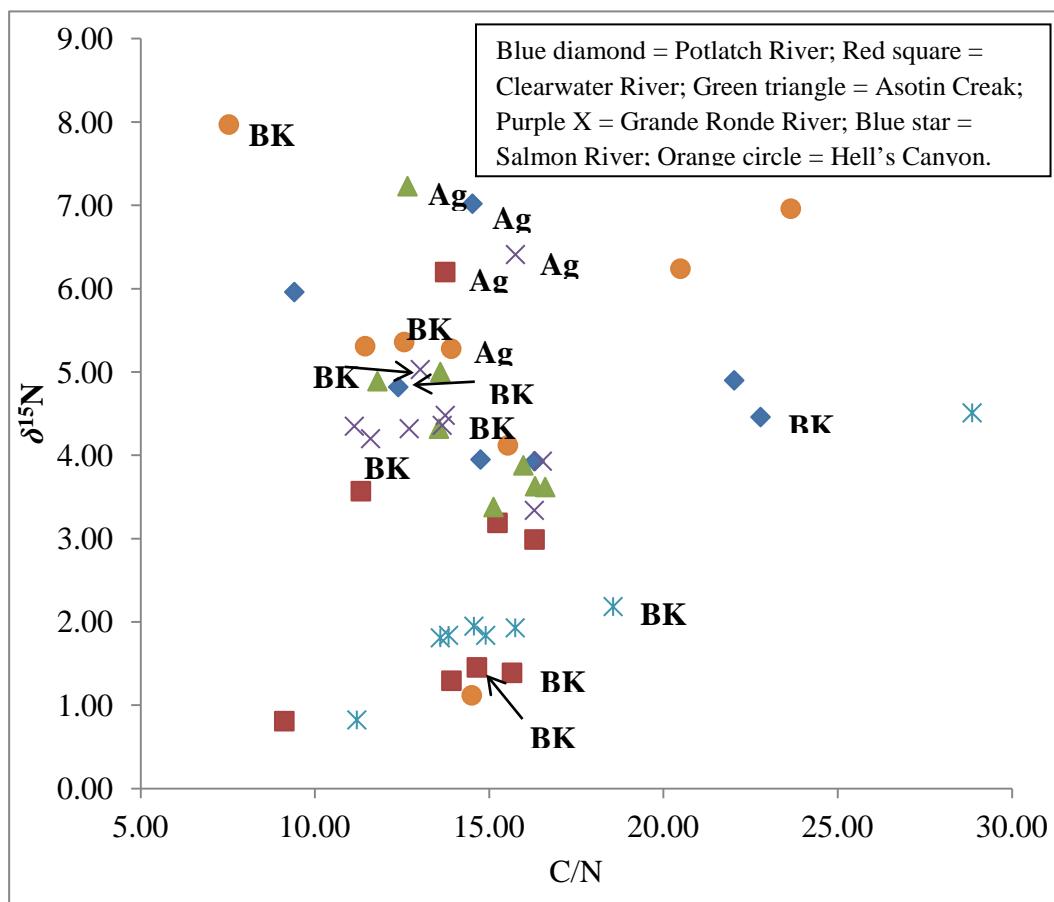


Figure 32. $\delta^{15}\text{N}$ versus C/N atomic ratios for the agricultural soils and bed and bank sediments for all of the tributary sub-basins.

Table 17 shows the results using SDFA to identify the fingerprinting properties derived from the source samples from the Potlatch and Clearwater Rivers that serve as the best tracers, and to assess the percentage of the source samples classified correctly by each individual fingerprinting property that passed the Kruskal-Wallis *H*-test. The results listed in Table 17 indicate that 8 fingerprinting properties can be used to correctly classify samples into categories. The percentages of the source samples classified correctly range from 69.4% to 44.8%, in which MnO is the most powerful individual fingerprint property, whereas MgO is the weakest individual fingerprint property. In comparison, 10 fingerprinting properties measured for the samples collected from the Asotin, Grande Ronde, Salmon and Hell’s Canyon regions classify sediments into the correct categories (Table 18). Relatively lower percentages for correct classification were obtained for these tributary sub-basins, ranging from 38.6% to 15.5%. N% is the most powerful individual fingerprint property, and LO is the weakest individual fingerprint property, correctly distinguishing only 15.5% of the source samples.

Table 17. The composite fingerprinting property data for discriminating sediment sources using SAS stepwise DFA of the properties passed the Kruskal–Wallis *H*-test for the samples collected from the Potlatch River and Clearwater River regions.

Step	Variables	Wilks' Lambda	Partial R-Square	% Source sample classified correctly
1	MnO	0.070530	0.6944	69.4
2	Fe ₂ O ₃	0.0054827	0.6607	66.1
3	δ ¹⁵ N	0.039700	0.6065	60.7
4	TiO ₂	0.016160	0.5929	59.3
5	Cs	0.41838	0.5816	58.2
6	K ₂ O	0.0011522	0.5708	57.1
7	Sc	0.0026843	0.5104	51.0
8	MgO	0.23077	0.4484	44.8

Table 18. The composite fingerprinting property data for discriminating sediment sources using SAS stepwise DFA of the properties passed the Kruskal–Wallis *H*-test for the samples collected from the Asotin Creek, Grande Ronde River, Salmon River and Hell’s Canyon regions.

Steps	Variables	Wilks' Lambda	Partial R-Square	% Source sample classified correctly
1	N%	0.61409	0.3859	38.6
2	MnO	0.17650	0.3133	31.3
3	Cs	0.43777	0.2871	28.7
4	SiO ₂	0.10724	0.2770	27.7
5	$\delta^{13}\text{C}$	0.11160	0.2298	23.0
6	C%	0.085486	0.1787	17.9
7	$\delta^{15}\text{N}$	0.36158	0.1740	17.5
8	W	0.14833	0.1596	16.0
9	Fe ₂ O ₃	0.25702	0.1592	15.9
10	LOI%	0.30568	0.1546	15.5

6.0 Discussion

The grain size data analysis results indicate the fractions settling out near the Port of Clarkston are predominantly fine to medium sand or larger with just over 87.5% having a grain size greater than 212 μm . The range for fine sand is 125-250 μm so much of the sediment is in the upper 1/3 of the fine range or higher. This is atypical of our agricultural samples where more than 55% passed through the 212 μm mesh. Given that our samples represented field conditions where larger sizes would likely settle or be trapped in BMPs prior to actually reaching the stream, it is likely the sediment delivery even has a smaller grain size distribution. This suggests that there are other sources of sediment not related to the agricultural areas although clearly the total number of samples is limited. It is also possible that preferential settling of agricultural soils has resulted in only the coarser materials in the Port areas. Therefore the chemical nature of the sediments must be explored.

The layering phenomenon seen in Core #3 was examined in relationship to flow variation and transport of sediments down the river. Figure 33 illustrates the average annual flow variations seen in the lower Clearwater (USGS 13342500). The variation is larger than the annual average values indicate. Figure 34 shows average monthly values since January 2007. Although 2008 and 2009 are close on an annual basis, the peak flow in 2008 is nearly 25% larger indicating a difference in transport capacity.

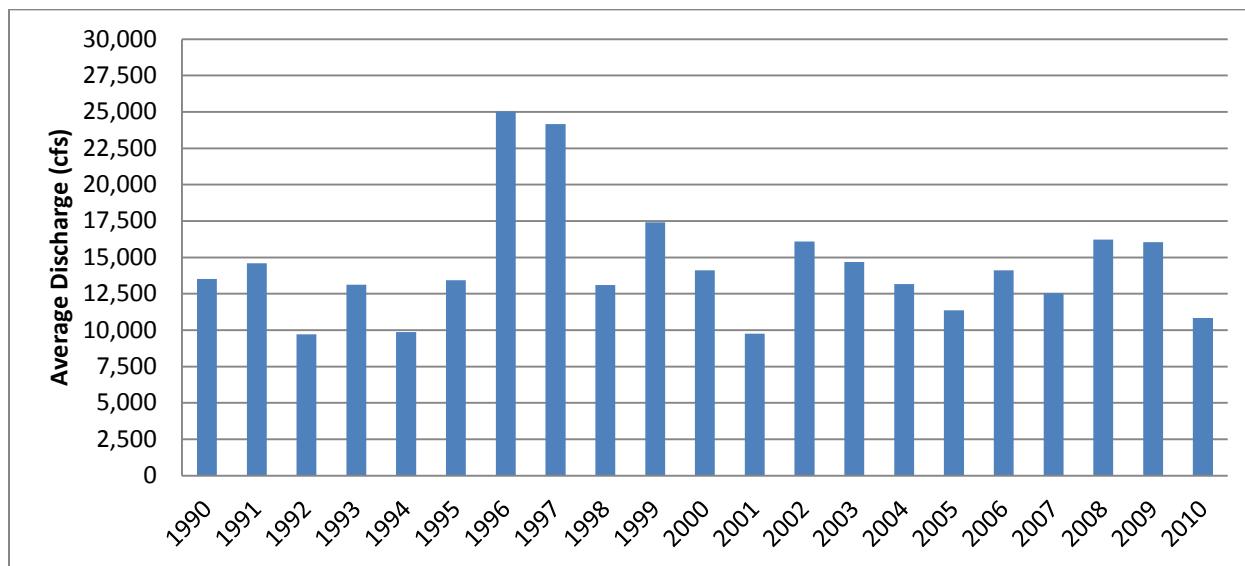


Figure 33. Average annual discharge at USGS gage on Clearwater at Spaulding (13342500).

While estimates of sediment travel times have been made, definitive calculation of sediment flux is extremely difficult. Moreover, similar flow variations in the Snake River make the hydraulics of this near-confluence area very complex. While we were unable to categorically state that the layering was caused by flow variations, we have demonstrated the plausibility of such discrepancies in the core sediment columns.

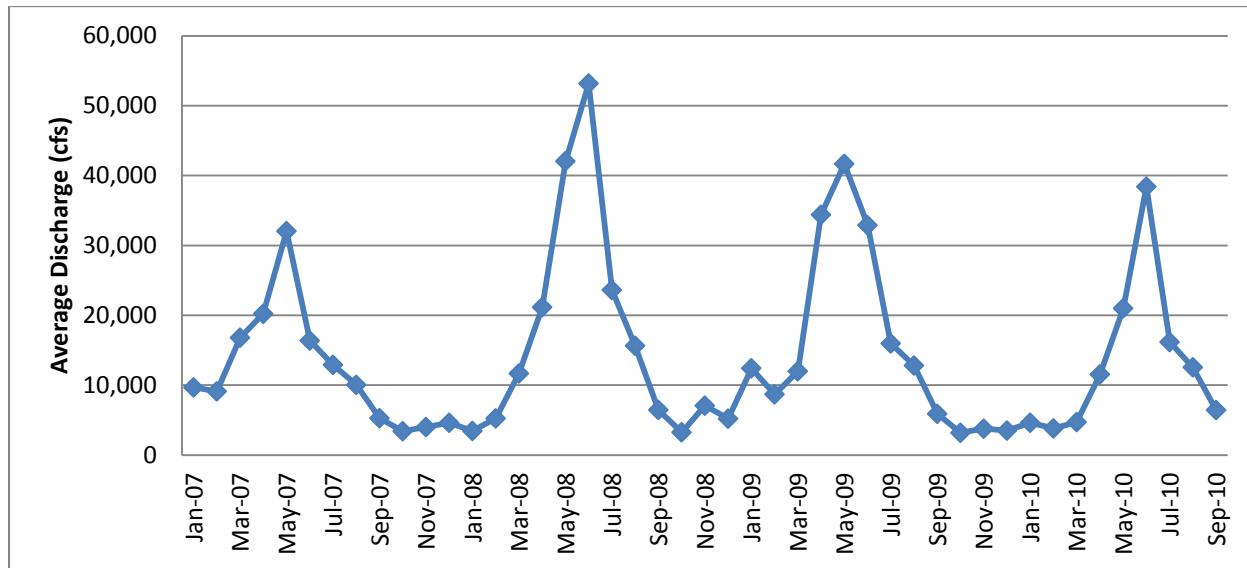


Figure 34. Average monthly discharge at USGS gage on Clearwater at Spaulding (13342500).

The physicochemical data obtained and the subsequent systematic statistical analysis conducted ultimately generated a cluster analysis diagram that can be used to link potential sediment sources to the sediments accumulating in the Lower Granite Reservoir (Figure 35). Ultimately, four parameters were shown to be diagnostic of all potential sediment sources considered ($d^{15}\text{N}$, Fe_2O_3 , MnO and Cs). Cluster analysis diagrams of this type can be difficult to interpret, so the following discussion will summarize the results moving from the top of the diagram to the bottom. For the sake of this discussion, two major divisions are identified as I and II, with all of I being considered together in the next level of division as A and II forming two lower divisions of B and C. Sub-level A is then broken down to additional sub-levels of 1 and 2, B into sub-levels of 3 and 4 and C being represented in total as sub-level 5. These sub-levels will be clear when looking at Figure 35 and will allow for references to be made to different portions of the diagram.

The cores in sub-level #1 of the diagram were all collected in the portions of the Lower Granite Reservoir that extend above the confluence of the Clearwater and Snake Rivers with the exception of one that was from right at the confluence (cores from the Clearwater River stretch have core ID# 1 to 18, those from the upper Snake River stretch have core ID# 75-90 and those immediately at the confluence have core ID# 68-71). This close grouping indicates similarities exhibited between these core samples from the upper reaches of the reservoir, even though the distinct portions are fed by different catchment areas (i.e., Clearwater River vs. upper Snake River). The remaining samples in cluster #1 are all from either the bed or bank samples from the Clearwater or Salmon Rivers. The South Fork Clearwater subbasin TMDL identifies several stream reaches with significant eroding bank problems which could potentially supply the sediment seen in the cores (IDEQ, 2004). Both of these tributary sub-basins have large forested areas subjected to forest-fires as well as regions subject to logging and roads. Thus, the relationship determined by cluster analysis may be explained by the hypothesis that the sediments in the upper portions of the reservoir originated from erosion processes resulting from forest-fires in the Clearwater and Salmon River watersheds, and that these sediments tend to be larger and settle out sooner as water flows downstream.

Cluster #2, which together with cluster #1 comprises cluster A, represents sediment cores from either the same portions of the reservoir described above or just below the confluence of the Clearwater and Snake Rivers (i.e., between the Red Wolf Crossing Bridge in Clarkston and the confluence). This finding corresponds with the description of the forest-fires, as these cores were collected not far below the confluence and in the same basic settling zone.

Proceeding to cluster #3, it can be seen that this sub-level now relates to the upper levels B and II, which are very distinct from the samples discussed to this point. Cluster #3 represents sediment cores collected right above the dam, and no samples from the tributary sub-basins are included in this grouping. However, the next closest relationship is with cluster #4, which includes core samples collected downstream of the Red Wolf Crossing Bridge and most of the agricultural samples. This association makes sense, as it would be expected that finer sediments that would arise from agricultural activity would travel further downstream and settle out closer to the dam. Cluster #5 includes the bed and bank samples from Asotin Creek, the Grande Ronde River, Potlatch River and the Snake River above Hell's Canyon, with no close relationship with any of the sediment cores. Cluster #5 (i.e., cluster C) has a distant relationship with clusters #3

and #4 (i.e., cluster B), but there is no indication that these potential sediment source locations are contributing to sediment accumulation behind Lower Granite Dam.

Although it is important to note that these are statistical relationships that are not definitive, a considerable amount of sediment characterization and statistical analysis allows for the following possible description of the situation in Lower Granite Reservoir. First, the sediments found in the upper reaches of the reservoir are considerably different than those in the lower reaches (divided between the major cluster divisions I and II, respectively). Second, these two sediment groupings display similar fingerprint signatures to disparate potential sediment sources. In the case of the sediments in the upper reservoir, it appears that coarser sediments originating from the upper Clearwater River and Salmon River predominate. It is possible that these sediments are generated by erosion processes that result from forest-fires in these tributary sub-basins. On the other hand, the sediments that accumulate closer to the dam seem to be derived from agricultural activity that occurs in all of the tributary sub-basins.

Name of Observation or Cluster

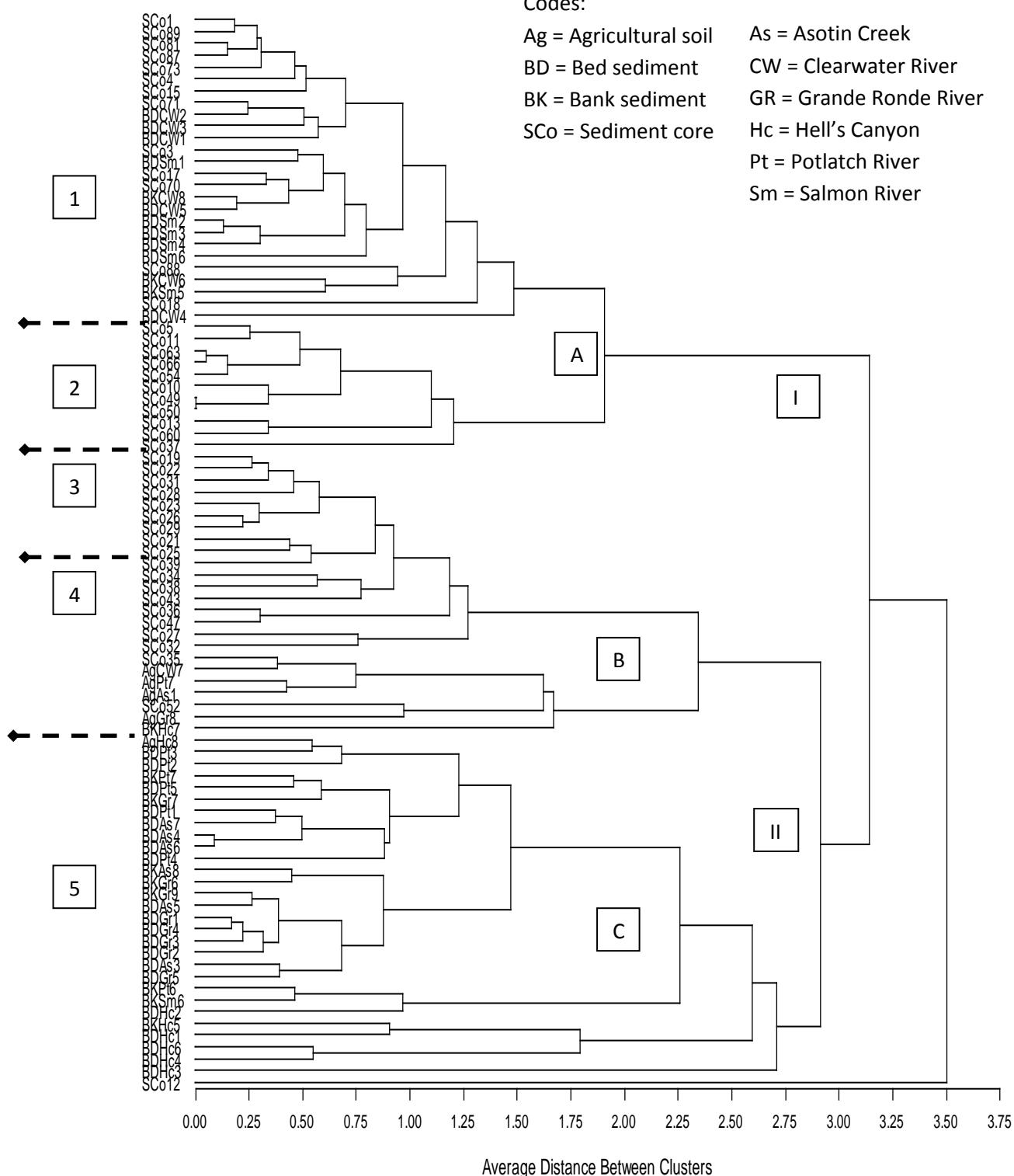


Figure 35. Cluster analysis of the selected fingerprinting properties ($d^{15}\text{N}$, Fe_2O_3 , MnO and Cs) determined using stepwise discriminant function analysis for the surface sediment samples (0-10 cm and 10-30cm depths) and source samples from the tributary sub-basins.

7.0 Conclusions and Recommendations

Fingerprinting analysis and grain size analysis were conducted on sediments in the Snake and Clearwater River watersheds for the primary purpose of identifying sediment sources contributing to the dredging requirements in and near the Ports of Clarkson, Washington and Lewiston, Idaho. Employing a series of statistical techniques, we found that four parameters were shown to be diagnostic of all potential sediment sources considered ($d^{15}\text{N}$, Fe_2O_3 , MnO and Cs). Coupled with physical grain size data from sediment cores and potential upland sources, we concluded that:

- Sediments near the confluence of the Snake and Clearwater Rivers likely originated from upstream non-agricultural lands in the Salmon and upper Clearwater Rivers.
- Sediments in the Clearwater arm just upstream of the confluence were also predominantly from upstream non-agricultural lands.
- Sediments downstream of Silcott Island on the Snake River could be linked to agricultural sources.

While these statistical relationships are not definitive, a considerable amount of sediment characterization and statistical analysis provides a reasonable description of the situation described in Lower Granite Reservoir.

Future studies should include more upstream sample locations including a wide variety of forest fire sites, stream bank sites, and stream flow. Direct monitoring of forest fire runoff should also be considered. ICP-MS and isotope analysis of sediments should be sufficient on any future cores taken from the dredge area.

Given that climate change models and data trends point to additional forest fires in the upstream region, the impact of fire-derived sediments may increase over time. However, since there may be no practical solution to controlling sediment erosion, the actual dredge frequency may be expected to increase. Investigating possible post-fire remediation practices may be beneficial in this respect.

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APPENDICES

Appendix #A1 WSU Sample Data and Grain Size Analysis

1a. Core Data Summary

Core Data Overview	
136	Core Samples Received
6	Core Sample Duplicates
142	Total Core Samples
238	Total Samples (Core, Source A, and Source B)

Core Data										
Range	Core	River Mile	Depth (cm)	Container	Drying #	(g) sediment in ICP-MS/XRF Bottle	(g) sediment in NAA Bottle	Sieved	Notes	
1	19	108.31	7 - 17	250-ml glass	42	8.2	7.6			
	19	108.31	72 - 82	250-ml glass	41	8.6	8.1			
	19	108.31	177 - 187	250-ml glass	40	10.9	10			
	20	108.31	15 - 55	500-ml glass	39	7.3	6.9			
	20	108.31	162 - 175	500-ml glass	38	7.6	8.3			
	20	108.31	234 - 250	500-ml glass	37	9.2	9			
	21	108.31	17 - 21	500-ml glass	36	8.1	8.3			
2	22	111.24	7 - 27	500-ml glass	35	10.2	10.9			
	22	111.24	99 - 119	500-ml glass	33	10.3	8.5			
	22	111.24	165 - 171.5	500-ml glass	34	6.8	8.5			
	23	111.24	7 - 11	250-ml glass	175	6.08	7.41			
	23	111.24	57 - 77	500-ml glass	32	10.6	10.4			
	23	111.24	138 - 158	500-ml glass	31	7.9	8.6			
3	25	114.92	27 - 34	500-ml glass	27	7.6	6.7			
	26	114.92	7 - 20	250-ml glass	30	9.1	8.6			
	26	114.92	67 - 77	250-ml glass	29	6.4	7.7			
	26	114.92	127 - 137	250-ml glass	28	7.6	7.6			

	27	114.92	7 - 27	500-ml glass	26	6.3	5.9		
	27	114.92	97 - 117	500-ml glass	25	8.1	9.5		
	27	114.92	157 - 177	500-ml glass	24	9.4	8.9		
	27	114.92	247 - 264	500-ml glass	23	7.3	8.7		
4	28	119.56	20 - 35	500-ml glass	22	7	6.4		
	28	119.56	60 - 75	500-ml glass	21	8.2	7.6		
	28	119.56	75 - 85	500-ml glass	20	8	9		
	29	119.56	15 - 30	500-ml glass	19	14.1	12.2		
	29	119.56	50 - 60	500-ml glass	18	8.5	6.8		
5	31	121.42	18 - 28	500-ml glass	14	13.5	14.7		
	31	121.42	87 - 98	500-ml glass	15	9.2	8.9		
	31	121.42	143 - 154	500-ml glass	16	7.3	7.3		
	32	121.42	16 - 30	500-ml glass	17	8.6	7.5		
	32	121.42	40 - 50	500-ml glass	9	6.3	7.6		
6	34	128.27	13 - 23	500-ml glass	10	8.5	7.5		
	34	128.27	71 - 81	500-ml glass	11	17.6	17.6		
	34	128.27	127 - 137	500-ml glass	1	6.8	7.6		
	34	128.27	149 - 159	500-ml glass	12	9	8.4		
	34	128.27	178 - 188	500-ml glass	13	18.1	14.3		
	35-B	128.77	0 - 2	125-ml PP	174	5.88	5.44		
	36	128.27	0 - 3	125-ml PP	173	14.19	11.58		2 Replicates- 173a&b. 173a excluded
7	37	130.44	0 - 4	125-ml PP	172	14.46	15.48		
	37-B	130.44	6 - 10	250-ml glass	8	14.5	15.5		
	38-A	130.44	10-15	250-ml glass	7	8.7	7.7		
	38-A	130.44	38 - 41	250-ml glass	6	11.6	7.7		
	38-A	130.44	45 - 50	250-ml glass	5	9.1	8.7		
	38	130.44	2 - 5	Zip-lock bag	171	9.5	7.4		
	38	130.44	18 - 20	Zip-lock bag	170	2.6	0.9		No leftover sample
	38	130.44	66 - 69	Zip-lock bag	169	8.4	10		
	38	130.44	165 - 168	Zip-lock bag	168	9.3	8.8		
	39	130.44	6 - 9	Zip-lock bag	181	9.7	11.7		
	39	130.44	5 - 10	250-ml glass	4	8.4	10.3		
	39	130.44	21 - 26	500-ml glass	3	14.6	16.8		
	39	130.44	26 - 32	Zip-lock bag	166	9.5	9.1		

	39	130.44	41 - 47	500-ml glass	2	7	7.5		
	39	130.44	93 - 97	Zip-lock bag	164	8.8	9.3		
	39	130.44	142 - 150	Zip-lock bag	163	13	10.7		
8	40	132.05	55-64	Zip-lock bag	178	13.2	11.8		
	40	132.05	105 - 113	Zip-lock bag	162	8.6	9.6		
	40	132.05	128 - 132	Zip-lock bag	161	10.8	9.4		
	40	132.05	146 - 150	Zip-lock bag	160	8.6	8.7		
9	43	133.98	8 - 12	Zip-lock bag	159	3.6	3.3		
	43	133.98	21 - 26	Zip-lock bag	158	12.2	10		
	43	133.98	45 - 51	Zip-lock bag	157	9.3	9.7		
10	46	135.15	40 - 47	Zip-lock bag	156	17.9	19.5	x	
	46	135.15	103 - 108	Zip-lock bag	182	16.49	14.49		
	47	135.15	0 - 2	Zip-lock bag	155	4.3	3.7		Very small sample
	47	135.15	57 - 65	Zip-lock bag	154	14.28	16.42		
	47	135.15	115 - 120	Zip-lock bag	153	18.3	14.2		
11	49	136.29	7 - 14	500-ml PP	152	15.4	14.2		
	49	136.29	35 - 45	500-ml PP	151	11.7	11.4		
	49	136.29	91 - 96	500-ml PP	150	11.61	14.25		
	49	136.29	103 - 113	500-ml PP	149	9.1	10.9		
	50	136.29	25 - 35	500-ml PP	148	19.7	18.4		
	50	136.29	67 - 77	500-ml PP	147	14.06	14.28		
	52	136.29	7 - 17	500-ml PP	146	9.03	10.34		
	52	136.29	96 - 106	500-ml PP	145	9.5	8.6		
12	54	136.69	7 - 17	500-ml PP	144	18.9	19.1		
	54	136.69	108 - 114	500-ml PP	143	16.83	16.71		
14	60	138.07	11 - 20	500-ml PP	142	17.1	17.8		
	60	138.07	55 - 70	500-ml PP	167	17.8	17.7		
15	62	138.52	76-81	Zip-lock bag	176	18.1	14.5		
	62	138.52	100 - 107	Zip-lock bag	165	18.16	17.59		
	63	138.52	15 - 25	500-ml PP	141	18.18	21.83		
16	65	138.94	50 - 57	Zip-lock bag	140	17.89	17.2	x	
	65	138.94	71 - 78	Zip-lock bag	139	18	15.57	x	
	65	138.94	91 - 96	Zip-lock bag	138	17.66	16.96	x	
	66	138.94	15 - 25	500-ml PP	137	16.8	17.9	x	
17	70	139.29	9 - 18	500-ml PP	136	17.66	19.1	x	

	70	139.29	30 - 35	500-ml PP	135	18.53	15.86	x	
	70	139.29	43 - 47	500-ml PP	134	19.5	16.05	x	
	70	139.29	54 - 62	500-ml PP	133	14.13	12.81	x	
	71	139.29	7 - 17	500-ml PP	132	17.5	17.5	x	
	71	139.29	48 - 52	500-ml PP	131	11.28	9.93	x	
	71	139.29	95 - 105	500-ml PP	130	11.88	11.79	x	
	71-A	139.29	18 - 22	Zip-lock bag	129	14.1	12.1	x	
	71-A	139.29	36 - 38	Zip-lock bag	128	12.5	10.6	x	
	18	73	139.43	0 - 2	500-ml PP	127	11.9	11.9	x
21	81	140.51	0 - 3	500-ml PP	126	12.3	12.4	x	
	87	141.21	0 - 19	500-ml PP	125	18	17.3	x	
	88	141.21	0 - 3	500-ml PP	124	13.3	10.8	x	
23	89	141.21	0 - 3	500-ml PP	123	12.54	12.34	x	
	1	0.28	14 - 20	500-ml PP	122	18.18	14.24	x	
	2	0.28	67 - 71	Zip-lock bag	121	15.04	16.1	x	
	2	0.28	87-91	Zip-lock bag	180	8.6	9.4	x	
	2	0.28	112 - 117	Zip-lock bag	120	12.1	12.3	x	
	3	0.28	7 - 17	500-ml PP	119	16.4	15.1	x	XRF Tested
	3	0.28	33 - 43	500-ml PP	118	20.5	20.6	x	XRF Tested
	3	0.28	67 - 77	500-ml PP	117	10.4	9.6	x	XRF Tested
	3	0.28	95 - 100	500-ml PP	116	15.84	14.99	x	XRF Tested
24	3	0.28	128 - 134	500-ml PP	115	14.64	15.05	x	XRF Tested
	4	0.41	18-22	Zip-lock bag	179	18.03	13.09	x	XRF Tested
	5	0.41	7 - 12	500-ml PP	114	19.4	20.7	x	XRF Tested
	5	0.41	24 - 30	500-ml PP	113	21.8	16.9	x	XRF Tested
	5	0.41	46 - 50	500-ml PP	112	14.7	12.4	x	XRF Tested
	9	0.92	24 - 28	Zip-lock bag	111	11.7	10.1		XRF Tested
	9	0.92	45 - 48	Zip-lock bag	110	9.9	11.1		XRF Tested
	10	1.16	6 - 9	125-ml PP	109	9.7	10.1		
	10	1.16	13 - 17	Zip-lock bag	108	19.9	17.8		
27	10	1.16	31 - 34	125-ml PP	107	10.2	8		
	10	1.16	47 - 50	125-ml PP	106	8.6	6.91		
	10	1.16	55 - 58	125-ml PP	105	10.8	10.1		
	10	1.16	70-74	125-ml PP	177	11.1	9.1		
	10	1.16	73 - 76	125-ml PP	104	8.99	6.65		

	10	1.16	83 - 86	125-ml PP	103	8.6	8.8		
	10	1.16	99 - 102	125-ml PP	102	5.7	5.22		
	10	1.16	106 - 109	125-ml PP	101	10.3	10.3		
	11	1.16	0 - 3	500-ml PP	100	13.08	11.97		
	12	1.16	4 - 7	125-ml PP	99	16.4	14.2		
	12	1.16	19 - 22	125-ml PP	98	16.38	11.7		
	12	1.16	22 - 26	Zip-lock bag	97	10.5	9.7		
	12	1.16	32 - 35	125-ml PP	96	10.2	9.8		
28	13	1.36	0 - 4	500-ml PP	95	14.1	14.7		
	14	1.36	7 - 17	500-ml PP	94	18.86	22.74		
	15	1.36	7 - 15	500-ml PP	93	18.61	18.82		
	15	1.36	27 - 37	500-ml PP	92	15.88	17.81		
29	16	1.66	0 - 3	500-ml PP	91	2.99	2.65		Very small sample
	17	1.66	0 - 3	500-ml PP	90	6.4	5.2		
	18	1.66	0 - 3	500-ml PP	89	11.71	11.24		

Core Duplicates									
Range	Core	River Mile	Depth (cm)	Container	Drying #	(g) sediment in ICP-MS/XRF Bottle	(g) sediment in NAA Bottle	Seived	Notes
5	32	121.42	40 - 50	500-ml glass	183	4.9	2.5		Duplicate of 9
	31	121.42	87 - 98	500-ml glass	184	6.7	9		Duplicate of 15
29	18	1.66	0 - 3	500-ml PP	185	6.4	4.8		Duplicate of 89
17	71	139.29	48 - 52	500-ml PP	186	7.6	7.9		Duplicate of 131
15	62	138.52	100 - 107	Zip-lock bag	187	14.2	13		Duplicate of 165
21	81	140.51	0 - 3	500-ml PP	188	11.1	6.8		Duplicate of 126

1b. Source A Data Summary

Source A Data Overview	
46	Collected Source A Samples
2	Source A Sample Duplicates
48	Total Source A Samples
238	Total Samples (Core, Source A, and Source B)

Source A Data								
Location Sample #	Latitude (N)	Longitude (W)	Type of Sample	Container	Drying #	Sieved	Sample ID	Notes
#1 Potlatch River 6/1/2010								
1	46°28.508'	116°46.019'	Bed	Plastic Bag	88	x	BD-101-a	
2	46°31.365'	116°43.719'	Bed	Plastic Bag	87	x	BD-102-a	
3	46°33.873'	116°42.578'	Bed	Plastic Bag	86	x	BD-103-a	
4	46°33.840'	116°42.567'	Bed	Plastic Bag	85	x	BD-104-a	
5	46°28.565'	116°46.009'	Bed	Plastic Bag	84	x	BD-105-a	
6	46°29.930'	116°45.686'	Bank	Plastic Bag	83	x	BK-106-a	
7	46°38.034'	116°42.780'	Agriculture	Plastic Bag	82	x	AG-107-a	
#2 Asotin Creek 6/2/2010								
1	46°17.662'	117°10.508'	Agriculture	Plastic Bag	81	x	AG-201-a	
2	46°19.490'	117°08.931'	Bank	Plastic Bag	80	x	BK-202-a	Flooded Bank
3	46°19.512'	117°08.905'	Bed	Plastic Bag	79	x	BD-203-a	
4	46°19.542'	117°06.520'	Bed	Plastic Bag	78	x	BD-204-a	
5	46°19.814'	117°05.574'	Bed	Plastic Bag	77	x	BD-205-a	
6	46°19.917'	117°04.619'	Bed	Plastic Bag	76	x	BD-206-a	
7	46°20.594'	117°03.303'	Bed	Plastic Bag	75	x	BD-207-a	
8	46°20.591'	117°03.299'	Bank	Plastic Bag	74	x	BK-208-a	
#3 Clearwater 6/3/2010								
1	46°28.786'	116°45.185'	Bed	Plastic Bag	73	x	BD-301-a	XRF Tested at WSU
2	46°29.816'	116°43.708'	Bed	Plastic Bag	72	x	BD-302-a	XRF Tested at WSU

3	46°31.499'	116°37.604'	Bed	Plastic Bag	71	x	BD-303-a	XRF Tested at WSU
4	46°30.573'	116°33.804'	Bed	Plastic Bag	70	x	BD-304-a	XRF Tested at WSU
5	46°30.452'	116°31.136'	Bed	Plastic Bag	69	x	BD-305-a	XRF Tested at WSU
6	46°31.441'	116°38.217'	Bank	Plastic Bag	68	x	BK-306-a	XRF Tested at WSU
7	46°31.037'	116°32.253'	Agriculture	Plastic Bag	67		AG-307-a	XRF Tested at WSU
8	46°30.452'	116°31.136'	Bank	Plastic Bag	66	x	BK-308-a	XRF Tested at WSU

#4 Grande Ronde 6/11/2010

1	46°03.420'	117°00.252'	Bed	Plastic Bag	65	x	BD-401-a	
2	46°04.246'	117°00.569'	Bed	Plastic Bag	64	x	BD-402-a	
3	46°03.789'	116°59.814'	Bed	Plastic Bag	63	x	BD-403-a	
4	46°04.437'	116°59.386'	Bed	Plastic Bag	62	x	BD-404-a	
5	46°04.771'	116°58.956'	Bed	Plastic Bag	61	x	BD-405-a	
6	46°04.212'	117°00.509'	Bank	Plastic Bag	60	x	BK-406-a	
7	46°04.771'	116°58.956'	Bank	Plastic Bag	59	x	BK-407-a	
8	45°56.296'	117°16.305'	Agriculture	Plastic Bag	58	x	AG-408-a	
9	46°04.246'	117°00.564'	Bank	Plastic Bag	57	x	BK-409-a	

#5 Hell's Canyon 6/12/2010

1	44°48.127'	116°55.491'	Bed	Plastic Bag	56	x	BD-501-a	
2	44°49.928'	116°54.065'	Bed	Plastic Bag	55	x	BD-502-a	
3	44°49.473'	116°54.321'	Bed	Plastic Bag	54	x	BD-503-a	
4	44°49.305'	116°54.491'	Bed	Plastic Bag	53	x	BD-504-a	
5	44°49.035'	116°54.658'	Bed	Plastic Bag	52	x	BD-505-a	
6	44°48.144'	116°55.506'	Bank	Plastic Bag	51	x	BK-506-a	
7	44°49.482'	116°54.334'	Bank	Plastic Bag	50	x	BK-507-a	
8	45°56.296'	117°16.305'	Agriculture	Plastic Bag	49	x	AG-508-a	

#6 Salmon River 6/23/2010

1	45°59.575'	116°42.291'	Bed	Plastic Bag	43	x	BD-601-a	XRF Tested at WSU
2	45°59.553'	116°42.707'	Bed	Plastic Bag	44	x	BD-602-a	XRF Tested at WSU
3	45°59.437'	116°42.985'	Bed	Plastic Bag	45	x	BD-603-a	XRF Tested at WSU
4	45°58.969'	116°43.473'	Bed	Plastic Bag	46	x	BD-604-a	XRF Tested at WSU
5	45°58.301'	116°43.894'	Bed	Plastic Bag	47	x	BD-605-a	XRF Tested at WSU
6	45°58.929'	116°43.532'	Bank	Plastic Bag	48	x	BK-606-a	XRF Tested at WSU

Source A Duplicates								
Location Sample#	Latitude (N)	Longitude (W)	Type of Sample	Container	Drying #		Sample ID	Notes
5	46°30.452'	116°31.136'	Bed	Plastic Bag	189	x	BD-305-a-Duplicate	Duplicate of 69
6	46°29.930'	116°45.686'	Bank	Plastic Bag	190	x	BK-106-a-Duplicate	Duplicate of 83

1c. Source B Data Summary

Source B Data Overview								
Location Sample#	Latitude (N)	Longitude (W)	Type of Sample	Container	Drying #	Sieved	Sample ID	Notes
#1 Potlatch River 6/1/2010								
1	46°28.499'	116°46.023'	Bed	Plastic Bag	191	x	BD-101-b	
2	46°31.364'	116°43.716'	Bed	Plastic Bag	192	x	BD-102-b	
3	46°33.998'	116°42.509'	Bed	Plastic Bag	193	x	BD-103-b	
4	46°33.873'	116°42.578'	Bed	Plastic Bag	194	x	BD-104-b	
5	46°28.574'	116°45.001'	Bed	Plastic Bag	195	x	BD-105-b	
6	46°29.931'	116°45.688'	Bank	Plastic Bag	196	x	BK-106-b	
7	46°38.034'	116°42.780'	Agricultural	Plastic Bag	197	x	AG-107-b	
#2 Asotin Creek 6/2/2010								
1	46°17.661'	117°10.440'	Agricultural	Plastic Bag	198	x	AG-201-b	
2	46°19.490'	117°08.931'	Bank	Plastic Bag	199	x	BK-202-b	
3	46°19.512'	117°08.905'	Bed	Plastic Bag	200	x	BD-203-b	
4	46°19.541'	117°06.524'	Bed	Plastic Bag	201	x	BD-204-b	
5	46°19.186'	117°05.577'	Bed	Plastic Bag	202	x	BD-205-b	
6	46°19.910'	117°04.604'	Bed	Plastic Bag	203	x	BD-206-b	
7	46°20.586'	117°03.311'	Bed	Plastic Bag	204	x	BD-207-b	
8	46°20.586'	117°03.311'	Bank	Plastic Bag	205	x	BK-208-b	
#3 Clearwater 6/3/2010								
1	46°28.828'	116°45.193'	Bed	Plastic Bag	206	x	BD-301-b	
2	46°29.798'	116°43.752'	Bed	Plastic Bag	207	x	BD-302-b	
3	46°31.511'	116°37.589	Bed	Plastic Bag	208	x	BD-303-b	
4	46°30.566'	116°33.828'	Bed	Plastic Bag	209	x	BD-304-b	
5	46°30.456'	116°31.043'	Bed	Plastic Bag	210	x	BD-305-b	
6	46°31.443'	116°38.216'	Bank	Plastic Bag	211	x	BK-306-b	
7	46°31.037'	116°32.253'	Agriculture	Plastic Bag	212	x	AG-307-b	
8	46°30.452'	116°31.136'	Bank	Plastic Bag	213	x	BK-308-b	
#4 Grande Ronde 6/11/2010								

1	46°03.421'	117°00.259'	Bed	Plastic Bag	214	x	BD-401-b	
2	46°04.232'	117°00.564'	Bed	Plastic Bag	215	x	BD-402-b	
3	46°03.749'	116°59.818'	Bed	Plastic Bag	216	x	BD-403-b	
4	46°04.435'	116°59.386'	Bed	Plastic Bag	217	x	BD-404-b	
5	46°04.766'	116°58.972'	Bed	Plastic Bag	218	x	BD-405-b	
6	46°04.211'	117°00.506'	Bank	Plastic Bag	219	x	BK-406-b	
7	46°04.766'	116°58.972'	Bank	Plastic Bag	220	x	BK-407-b	
8	45°56.296'	117°16.305'	Agricultural	Plastic Bag	221	x	AG-408-b	
9	46°04.246'	117°00.565'	Bank	Plastic Bag	222	x	BK-409-b	

#5 Hell's Canyon 6/12/2010

1	44°48.134'	116°55.522'	Bed	Plastic Bag	223	x	BD-501-b	
2	44°49.823'	116°54.153'	Bed	Plastic Bag	224	x	BD-502-b	
3	44°49.491'	116°54.345'	Bed	Plastic Bag	225	x	BD-503-b	
4	44°49.307	116°55.508'	Bed	Plastic Bag	226	x	BD-504-b	
5	44°49.034'	116°54.660'	Bed	Plastic Bag	227	x	BD-505-b	
6	44°48.142'	116°55.508'	Bank	Plastic Bag	228	x	BK-506-b	
7	44°49.484'	116°54.333'	Bank	Plastic Bag	229	x	BK-507-b	
8	45°56.296'	117°16.305'	Agricultural	Plastic Bag	230	x	AG-508-b	

#6 Salmon River 6/23/2010

1	45°59.696'	116°42.312	Bed	Plastic Bag	231	x	BD-601-b	
2	45°59.576'	116°42.644'	Bed	Plastic Bag	232	x	BD-602-b	
3	45°59.429'	116°42.981	Bed	Plastic Bag	233	x	BD-603-b	
4	45°58.973'	116°43.491'	Bed	Plastic Bag	234	x	BD-604-b	
5	45°58.303'	116°43.845'	Bed	Plastic Bag	235	x	BD-605-b	
6	45°58.973'	116°43.491'	Bank	Plastic Bag	236	x	BK-606-b	

Source B Duplicates									
Location	Sample #	Latitude (N)	Longitude (W)	Type of Sample	Container	Drying #		Sample ID	Notes
5	46.30.456'	116.31.043'	Bed	Plastic Bag	237			BD-305-b-Duplicate	Duplicate of 210
6	46.29.931'	116.45.688'	Bank	Plastic Bag	238			BK-106-b-Duplicate	Duplicate of 196

1d. Core Sieve Data

Core Information									
Core #	Drying #	Data	40	70	100	200	Pan	Total Mass Before	Total Mass After
65	140	Mass (g)	5.01	109.6	15.18	3.06	0.35	133.65	133.2
		Percentage	3.76%	82.28%	11.40%	2.30%	0.26%		
65	139	Mass (g)	2.69	44.95	6.26	0.79	0.12	54.96	54.81
		Percentage	4.91%	82.01%	11.42%	1.44%	0.22%		
65	138	Mass (g)	7.01	26.93	1.64	0.31	0.03	36	35.92
		Percentage	19.52%	74.97%	4.57%	0.86%	0.08%		
66	137	Mass (g)	15.36	101.83	5.76	2.38	0.49	125.9	125.82
		Percentage	12.21%	80.93%	4.58%	1.89%	0.39%		
70	136	Mass (g)	13.35	141.76	36.05	8.29	2.01	202.13	201.46
		Percentage	6.63%	70.37%	17.89%	4.11%	1.00%		
70	135	Mass (g)	2.3	47.42	22.01	4.67	1.23	78.06	77.63
		Percentage	2.96%	61.08%	28.35%	6.02%	1.58%		
70	134	Mass (g)	0.86	13.68	12.72	3.24	0.24	30.9	30.74
		Percentage	2.80%	44.50%	41.38%	10.54%	0.78%		
70	133	Mass (g)	0.56	21.28	10.81	3.66	1.04	37.55	37.35
		Percentage	1.50%	56.97%	28.94%	9.80%	2.78%		
71	132	Mass (g)	1.15	60.7	32.26	5.7	0.8	100.95	100.61
		Percentage	1.14%	60.33%	32.06%	5.67%	0.80%		
71	131	Mass (g)	1.78	3.83	2.94	3.37	24.05	36.39	35.97
		Percentage	4.95%	10.65%	8.17%	9.37%	66.86%		
71	130	Mass (g)	4.58	3.31	1.85	7.46	45.04	62.76	62.24
		Percentage	7.36%	5.32%	2.97%	11.99%	72.37%		
71-A	129	Mass (g)	0.19	17.12	11.29	2.68	0.35	32.77	31.63
		Percentage	0.60%	54.13%	35.69%	8.47%	1.11%		
71-A	128	Mass (g)	0.1	3.73	3.4	1.36	0.12	9.91	8.71
		Percentage	1.15%	42.82%	39.04%	15.61%	1.38%		
73	127	Mass (g)	11.21	135.66	15.22	13.24	0.67	178.55	176
		Percentage	6.37%	77.08%	8.65%	7.52%	0.38%		
81	126	Mass (g)	3.51	23.77	3.4	0.6	0	31.38	31.28
		Percentage	11.22%	75.99%	10.87%	1.92%	0.00%		
87	125	Mass (g)	26.28	21.59	2.91	4.47	0.25	55.63	55.5
		Percentage	47.35%	38.90%	5.24%	8.05%	0.45%		
88	124	Mass (g)	0.70%	4.67	5.86	3.69	0.03	15.03	14.95
		Percentage	0.05%	31.24%	39.20%	24.68%	0.20%		
89	123	Mass (g)	0.61	15.44	6.43	7.05	0.59	30.24	30.12
		Percentage	2.03%	51.26%	21.35%	23.41%	1.96%		
1	122	Mass (g)	9.36	53.59	4.59	0.73	0.16	68.58	68.43
		Percentage	13.68%	78.31%	6.71%	1.07%	0.23%		
2	121	Mass (g)	1.16	36.54	10.81	3.13	0.99	53.01	52.63
		Percentage	2.20%	69.43%	20.54%	5.95%	1.88%		
2	120	Mass (g)	0.39	12.82	43.69	25.04	3.6	86	85.54
		Percentage	0.46%	14.99%	51.08%	29.27%	4.21%		

3	119	Mass (g)	2.22	59.47	23.49	6.04	1.74	94.15	92.96
		Percentage	2.39%	63.97%	25.27%	6.50%	1.87%		
3	118	Mass (g)	1.06	51.97	26.07	9.55	1.69	90.84	90.34
		Percentage	1.17%	57.53%	28.86%	10.57%	1.87%		
3	117	Mass (g)	8.74	3.63	1.7	5.14	30.85	50.51	50.06
		Percentage	17.46%	7.25%	3.40%	10.27%	61.63%		
3	116	Mass (g)	0.05	7.94	24.91	14.95	1.75	50.28	49.6
		Percentage	0.10%	16.01%	50.22%	30.14%	3.53%		
3	115	Mass (g)	0.11	3.47	10.46	27.17	8.23	50.15	49.44
		Percentage	0.22%	7.02%	21.16%	54.96%	16.65%		
5	114	Mass (g)	4.89	39.05	4.82	0.9	0.3	50.16	49.96
		Percentage	9.79%	78.16%	9.65%	1.80%	0.60%		
5	113	Mass (g)	10.5	37.07	2.6	0.14	0.04	50.51	50.35
		Percentage	20.85%	73.62%	5.16%	0.28%	0.08%		
5	112	Mass (g)	1.49	16.8	4.01	1.03	0.2	23.8	23.53
		Percentage	6.33%	71.40%	17.04%	4.38%	0.85%		
2	180	Mass (g)	0.87	1.69	0.93	3.35	16.91	23.97	23.75
		Percentage	3.66%	7.12%	3.92%	14.11%	71.20%		
4	179	Mass (g)	5.06	22.03	0.78	0.15	0.03	28.23	28.05
		Percentage	18.04%	78.54%	2.78%	0.53%	0.11%		
46	156	Mass (g)	0.1	8.62	30.55	10.39	0.9	50.65	50.56
		Percentage	0.04%	3.29%	11.67%	3.97%	0.34%		
39	181	Mass (g)	0.2	0.76	1.12	5.46	4.85	12.51	12.39
		Percentage	1.61%	6.13%	9.04%	44.07%	39.14%		
10	108	Mass (g)	33.75	32.9	2.95	0.91	0.09	70.85	70.6
		Percentage	47.80%	46.60%	4.18%	1.29%	0.13%		
40	178	Mass (g)	0.1	3.25	40.03	53.64	2.07	99.24	99.09
		Percentage	0.10%	3.28%	40.40%	54.13%	2.09%		
50	148	Mass (g)	1.81	101.98	19.13	2.1	0.17	125.55	125.19
		Percentage	1.45%	81.46%	15.28%	1.68%	0.14%		
20	39	Mass (g)	7.44	5.58	2.01	5.18	60.77	81.63	80.98
		Percentage	9.19%	6.89%	2.48%	6.40%	75.04%		
21	36	Mass (g)	1.38	1.26	0.53	3.32	15.16	21.99	21.65
		Percentage	6.37%	5.82%	2.45%	15.33%	70.02%		
22	35	Mass (g)	5.04	2.7	0.94	2.55	25.84	37.73	37.07
		Percentage	13.60%	7.28%	2.54%	6.88%	69.71%		
23	175	Mass (g)	0.63	1.05	0.52	1.59	12.27	16.33	16.06
		Percentage	3.92%	6.54%	3.24%	9.90%	76.40%		
25	27	Mass (g)	1.66	1.65	0.59	2	18.4	24.66	24.3
		Percentage	6.83%	6.79%	2.43%	8.23%	75.72%		
30	26	Mass (g)	2.86	2.09	0.87	2.58	20.71	29.63	29.11
		Percentage	9.82%	7.18%	2.99%	8.86%	71.14%		
29	19	Mass (g)	1.22	1.19	0.73	3.52	22.97	30.02	29.63
		Percentage	4.12%	4.02%	2.46%	11.88%	77.52%		
31	14	Mass (g)	1.87	1.42	0.75	5.83	24.98	35.2	34.85
		Percentage	5.37%	4.07%	2.15%	16.73%	71.68%		
32	17	Mass (g)	1.66	2.51	0.96	3.08	12.97	21.74	21.18
		Percentage	7.84%	11.85%	4.53%	14.54%	61.24%		
34	10	Mass (g)	3.16	1.86	1.37	4.95	15.17	26.81	26.51

		Percentage	11.92%	7.02%	5.17%	18.67%	57.22%		
35-B	174	Mass (g)	0.11	1.59	2.43	5.47	8.51	18.4	18.11
		Percentage	0.61%	8.78%	13.42%	30.20%	46.99%		
38-A	7	Mass (g)	1.73	1.18	2.88	3.72	9.59	20.09	19.1
		Percentage	9.06%	6.18%	15.08%	19.48%	50.21%		
38-A	5	Mass (g)	2.12	0.91	0.6	1.27	6.83	12.02	11.73
		Percentage	18.07%	7.76%	5.12%	10.83%	58.23%		
10	109	Mass (g)	13.78	10.43	0.41	0.18	0.01	24.85	24.81
		Percentage	55.54%	42.04%	1.65%	0.73%	0.04%		
11	100	Mass (g)	15.75	19.79	1.76	1.54	0.48	39.44	39.32
		Percentage	40.06%	50.33%	4.48%	3.92%	1.22%		

1e. Source A Sieve Data

Source A Data Collected June 2010									
Drying #	Sample ID	Data	40	70	100	200	Pan	Total Mass Before	Total Mass After
43	BD-601-a	Mass (g)	0.41	22.42	18.95	11.94	0.15	54.31	53.87
		Percentage	0.76%	41.62%	35.18%	22.16%	0.28%		
44	BD-602-a	Mass (g)	4.46	34.02	11.04	3.82	0.15	54.16	53.49
		Percentage	8.34%	63.60%	20.64%	7.14%	0.28%		
45	BD-603-a	Mass (g)	13.18	35.11	3.08	0.39	0.04	52.65	51.8
		Percentage	25.44%	67.78%	5.95%	0.75%	0.08%		
46	BD-604-a	Mass (g)	6.98	36.35	4.28	2.18	0.14	50.58	49.93
		Percentage	13.98%	72.80%	8.57%	4.37%	0.28%		
47	BD-605-a	Mass (g)	5.28	31.22	10.24	3.28	0.1	51.07	50.12
		Percentage	10.53%	62.29%	20.43%	6.54%	0.20%		
48	BK-606-a	Mass (g)	0.37	9.11	14.87	22.34	5.89	53.75	52.58
		Percentage	0.70%	17.33%	28.28%	42.49%	11.20%		
49	AG-508-a	Mass (g)	21.01	7.68	3.77	6.83	10.85	51.01	50.14
		Percentage	41.90%	15.32%	7.52%	13.62%	21.64%		
50	BK-507-a	Mass (g)	29.91	6.9	2.08	3.55	7.26	50.7	49.7
		Percentage	60.18%	13.88%	4.19%	7.14%	14.61%		
51	BK-506-a	Mass (g)	37.08	7.76	1.88	1.93	1.28	50.69	49.93
		Percentage	74.26%	15.54%	3.77%	3.87%	2.56%		
52	BD-505-a	Mass (g)	36.32	8.27	3.14	4.65	4.79	57.77	57.17
		Percentage	63.53%	14.47%	5.49%	8.13%	8.38%		
53	BD-504-a	Mass (g)	42.32	5.14	1.73	2.4	1.21	53.26	52.8
		Percentage	80.15%	9.73%	3.28%	4.55%	2.29%		
54	BD-503-a	Mass (g)	28.81	8.56	3.19	4.63	4.98	50.7	50.17
		Percentage	57.42%	17.06%	6.36%	9.23%	9.93%		
55	BD-502-a	Mass (g)	50.12	1.45	0.28	0.28	0.34	52.64	52.47
		Percentage	95.52%	2.76%	0.53%	0.53%	0.65%		
56	BD-501-a	Mass (g)	40.95	5.18	1.86	1.59	0.68	50.56	50.26
		Percentage	81.48%	10.31%	3.70%	3.16%	1.35%		
57	BK-409-a	Mass (g)	1.42	11.77	8.54	18.71	8.95	50.45	49.39
		Percentage	2.88%	23.83%	17.29%	37.88%	18.12%		
58	AG-408-a	Mass (g)	14.63	7.61	2.41	4.74	19.8	50.32	49.19
		Percentage	29.74%	15.47%	4.90%	9.64%	40.25%		
59	BK-407-a	Mass (g)	0.3	5.28	9.96	23.03	11.18	50.69	49.75
		Percentage	0.60%	10.61%	20.02%	46.29%	22.47%		
60	BK-406-a	Mass (g)	8.65	26.73	10.15	5.32	2.01	54.19	52.86
		Percentage	16.36%	50.57%	19.20%	10.06%	3.80%		
61	BD-405-a	Mass (g)	1.23	4	5.53	11.85	26.48	50.29	49.09
		Percentage	2.51%	8.15%	11.27%	24.14%	53.94%		
62	BD-404-a	Mass (g)	0.31	14.57	15.58	14.83	3.47	50.42	48.76
		Percentage	0.64%	29.88%	31.95%	30.41%	7.12%		
63	BD-403-a	Mass (g)	0.41	17.04	15.16	15.44	4.08	53.56	52.13
		Percentage	0.79%	32.69%	29.08%	29.62%	7.83%		
64	BD-402-a	Mass (g)	0.33	0.65	2.43	18.68	29.09	52.39	51.18

		Percentage	0.64%	1.27%	4.75%	36.50%	56.84%		
65	BD-401-a	Mass (g)	3.05	15.1	12.76	14.71	7.52	54.92	53.14
		Percentage	5.74%	28.42%	24.01%	27.68%	14.15%		
66	BK-308-a	Mass (g)	3.4	22.83	15.3	10.73	2.4	55.06	54.66
		Percentage	6.22%	41.77%	27.99%	19.63%	4.39%		
67	AG-307-a	Mass (g)							
		Percentage							
68	BK-306-a	Mass (g)	2.56	19.52	10.34	11.64	6.45	52.02	50.51
		Percentage	5.07%	38.65%	20.47%	23.04%	12.77%		
69	BD-305-a	Mass (g)	4.73	29.15	11.29	6.98	1.07	53.46	53.22
		Percentage	8.89%	54.77%	21.21%	13.12%	2.01%		
70	BD-304-a	Mass (g)	12.04	28.06	9.48	2.4	0.08	52.41	52.06
		Percentage	23.13%	53.90%	18.21%	4.61%	0.15%		
71	BD-303-a	Mass (g)	7.38	27.24	12.62	5.05	0.63	53.35	52.92
		Percentage	13.95%	51.47%	23.85%	9.54%	1.19%		
72	BD-302-a	Mass (g)	6.85	20.99	12.43	10.67	3.55	54.79	54.49
		Percentage	12.57%	38.52%	22.81%	19.58%	6.51%		
73	BD-301-a	Mass (g)	4	22.55	10.22	13.16	4.36	54.9	54.29
		Percentage	7.37%	41.54%	18.82%	24.24%	8.03%		
74	BK-208-a	Mass (g)	31.42	7.63	2.18	3.02	6.29	51.04	50.54
		Percentage	62.17%	15.10%	4.31%	5.98%	12.45%		
75	BD-207-a	Mass (g)	1.28	1.75	2.3	13.05	32.07	51.2	50.45
		Percentage	2.54%	3.47%	4.56%	25.87%	63.57%		
76	BD-206-a	Mass (g)	4.42	5.69	5.11	12.05	22.68	50.84	49.95
		Percentage	8.85%	11.39%	10.23%	24.12%	45.41%		
77	BD-205-a	Mass (g)	5.35	6.56	6.69	16.4	14.95	50.86	49.95
		Percentage	10.71%	13.13%	13.39%	32.83%	29.93%		
78	BD-204-a	Mass (g)	1.67	2.72	4.65	16.75	24.26	51.12	50.05
		Percentage	3.34%	5.43%	9.29%	33.47%	48.47%		
79	BD-203-a	Mass (g)	1.82	9.59	8.42	14.75	15.09	50.68	49.67
		Percentage	3.66%	19.31%	16.95%	29.70%	30.38%		
80	BK-202-a	Mass (g)	2.18	4.93	4.55	9.52	28.45	50.53	49.63
		Percentage	4.39%	9.93%	9.17%	19.18%	57.32%		
81	AG-201-a	Mass (g)	2.54	7.56	3.29	5.68	35.18	55.06	54.25
		Percentage	4.68%	13.94%	6.06%	10.47%	64.85%		
82	AG-107-a	Mass (g)	6.35	6.29	2.53	4.68	29.49	50.08	49.34
		Percentage	12.87%	12.75%	5.13%	9.49%	59.77%		
83	BK-106-a	Mass (g)	27.42	5.08	2.27	4.63	11.47	51.68	50.87
		Percentage	53.90%	9.99%	4.46%	9.10%	22.55%		
84	BD-105-a	Mass (g)	4.74	8.15	6.12	11.16	20.01	51.38	50.18
		Percentage	9.45%	16.24%	12.20%	22.24%	39.88%		
85	BD-104-a	Mass (g)	1.13	5.94	4.38	6.61	12.59	31.48	30.65
		Percentage	3.69%	19.38%	14.29%	21.57%	41.08%		
86	BD-103-a	Mass (g)	27.63	16.72	2.45	1.6	1.89	51.13	50.29
		Percentage	54.94%	33.25%	4.87%	3.18%	3.76%		
87	BD-102-a	Mass (g)	49.53	3.1	0.05	0.02	0.1	53.07	52.8
		Percentage	93.81%	5.87%	0.09%	0.04%	0.19%		
88	BD-101-a	Mass (g)	1.49	6.41	7.04	16.61	18.09	50.72	49.64
		Percentage	3.00%	12.91%	14.18%	33.46%	36.44%		

1f - Source B Sieve Data

Source B Data Collected September & October 2010									
Drying #	Sample ID	Data	40	70	100	200	Pan	Total Mass Before	Total Mass After
191	BD-101-b	Mass (g)	10.88	40.41	0.82	0.1	0.03	52.39	52.24
		Percentage	20.83%	77.35%	1.57%	0.19%	0.06%		
192	BD-102-b	Mass (g)	42.8	7.52	0.42	0.16	0.2	50.92	51.1
		Percentage	83.76%	14.72%	0.82%	0.31%	0.39%		
193	BD-103-b	Mass (g)	42.11	4.86	0.97	0.97	1.39	50.76	50.3
		Percentage	83.72%	9.66%	1.93%	1.93%	2.76%		
194	BD-104-b	Mass (g)	0.85	1.3	0.72	1.23	1.46	5.95	5.56
		Percentage	15.29%	23.38%	12.95%	22.12%	26.26%		
195	BD-105-b	Mass (g)	7.98	14.79	5.4	5.61	6.11	40.4	39.89
		Percentage	20.01%	37.08%	13.54%	14.06%	15.32%		
196	BK-106-b	Mass (g)	25.92	7.51	2.99	5.16	9.95	52.83	51.53
		Percentage	50.30%	14.57%	5.80%	10.01%	19.31%		
197	AG-107-b	Mass (g)	16.24	7.33	2.79	4.67	18.95	51.29	49.98
		Percentage	32.49%	14.67%	5.58%	9.34%	37.92%		
198	AG-201-b	Mass (g)	8.5	8.33	3.21	5.44	24.05	50.61	49.53
		Percentage	17.16%	16.82%	6.48%	10.98%	48.56%		
199	BK-202-b	Mass (g)	12.64	10.19	7.49	12.96	0.61	54.08	43.89
		Percentage	28.80%	23.22%	17.07%	29.53%	1.39%		
200	BD-203-b	Mass (g)	7.93	13.92	8.1	10.97	8.24	50.05	49.16
		Percentage	16.13%	28.32%	16.48%	22.31%	16.76%		
201	BD-204-b	Mass (g)	2.65	3.88	5.2	17.91	19.15	50.24	48.79
		Percentage	5.43%	7.95%	10.66%	36.71%	39.25%		
202	BD-205-b	Mass (g)	38.52	6.28	1.67	2.41	2.97	52.7	51.85
		Percentage	74.29%	12.11%	3.22%	4.65%	5.73%		
203	BD-206-b	Mass (g)	3.71	2.38	2.08	4.01	3.08	15.64	15.26
		Percentage	24.31%	15.60%	13.63%	26.28%	20.18%		
204	BD-207-b	Mass (g)	47.79	1.35	0.42	0.43	0.41	50.51	50.4
		Percentage	94.82%	2.68%	0.83%	0.85%	0.81%		
205	BK-208-b	Mass (g)	25.92	13.92	4.17	4.72	3.72	53.01	52.45
		Percentage	49.42%	26.54%	7.95%	9.00%	7.09%		
206	BD-301-b	Mass (g)	40.87	9.95	0.75	0.17	0.06	52.45	51.8
		Percentage	78.90%	19.21%	1.45%	0.33%	0.12%		
207	BD-302-b	Mass (g)	33.62	15.11	0.56	0.2	0.11	50.89	49.6
		Percentage	67.78%	30.46%	1.13%	0.40%	0.22%		
208	BD-303-b	Mass (g)	10.01	35.73	2.88	1.28	0.24	50.46	50.14
		Percentage	19.96%	71.26%	5.74%	2.55%	0.48%		
209	BD-304-b	Mass (g)	32.11	17.46	0.39	0.06	0	50.22	50.02
		Percentage	64.19%	34.91%	0.78%	0.12%	0.00%		
210	BD-305-b	Mass (g)	21.64	28.86	1.94	0.48	0.01	53.63	52.93
		Percentage	40.88%	54.52%	3.67%	0.91%	0.02%		
211	BK-306-b	Mass (g)	3.42	18.62	10.39	11.7	5.13	50.46	49.26
		Percentage	6.94%	37.80%	21.09%	23.75%	10.41%		
212	AG-307-b	Mass (g)	3.33	24.12	12.21	8.72	1.4	50.98	49.78

212		Percentage	6.69%	48.45%	24.53%	17.52%	2.81%		
213	BD-308-b	Mass (g)	23.07	7.22	2.64	4.46	12.36	50.99	49.75
213		Percentage	46.37%	14.51%	5.31%	8.96%	24.84%		
214	BD-401-b	Mass (g)	12.57	24.68	7.73	4.55	1	51.53	50.53
214		Percentage	24.88%	48.84%	15.30%	9.00%	1.98%		
215	BD-402-b	Mass (g)	19.3	22.7	6.03	1.89	0.22	50.81	50.14
215		Percentage	38.49%	45.27%	12.03%	3.77%	0.44%		
216	BD-403-b	Mass (g)	13.95	29.99	5.18	1.44	0.06	51.48	50.62
216		Percentage	27.56%	59.25%	10.23%	2.84%	0.12%		
217	BD-404-b	Mass (g)	3.26	31.41	9.87	4.02	0.14	50.24	48.7
217		Percentage	6.69%	64.50%	20.27%	8.25%	0.29%		
218	BD-405-b	Mass (g)	0.77	9.33	13.67	22.65	3.02	50.48	49.44
218		Percentage	1.56%	18.87%	27.65%	45.81%	6.11%		
219	BK-406-b	Mass (g)	20	8.4	4.38	6.85	10	50.62	49.63
219		Percentage	40.30%	16.93%	8.83%	13.80%	20.15%		
220	BK-407-b	Mass (g)	0.63	5.87	11.15	22.22	10.16	51.03	50.03
220		Percentage	1.26%	11.73%	22.29%	44.41%	20.31%		
221	AG-408-b	Mass (g)	26.06	6.56	1.64	3.48	10.1	50.62	47.84
221		Percentage	54.47%	13.71%	3.43%	7.27%	21.11%		
222	BK-409-b	Mass (g)	3.9	10.26	8.65	19.99	8.39	52.32	51.19
222		Percentage	7.62%	20.04%	16.90%	39.05%	16.39%		
223	BD-501-b	Mass (g)	33.08	10	3.64	3.49	0.4	51.29	50.61
223		Percentage	65.36%	19.76%	7.19%	6.90%	0.79%		
224	BD-502-b	Mass (g)	47.61	4.94	0.35	0.13	0.06	53.09	53.09
224		Percentage	89.68%	9.30%	0.66%	0.24%	0.11%		
225	BD-503-b	Mass (g)	28.42	9.84	4	5.07	2.81	50.78	50.14
225		Percentage	56.68%	19.63%	7.98%	10.11%	5.60%		
226	BD-504-b	Mass (g)	38.91	8.25	2.27	1.13	0.21	51.17	50.77
226		Percentage	76.64%	16.25%	4.47%	2.23%	0.41%		
227	BD-505-b	Mass (g)	44.17	4.23	0.83	1.46	0.42	51.28	51.11
227		Percentage	86.42%	8.28%	1.62%	2.86%	0.82%		
228	BK-506-b	Mass (g)	48.14	3.39	0.4	0.45	0.6	53.5	52.98
228		Percentage	90.86%	6.40%	0.76%	0.85%	1.13%		
229	BK-507-b	Mass (g)	38.38	7.04	1.74	2.79	3.02	54.48	52.97
229		Percentage	72.46%	13.29%	3.28%	5.27%	5.70%		
230	AG-508-b	Mass (g)	17.92	9.38	4.11	7.56	9.96	50.25	48.93
230		Percentage	36.62%	19.17%	8.40%	15.45%	20.36%		
231	BD-601-b	Mass (g)	1.53	26.61	14.25	6.8	0.95	50.76	50.14
231		Percentage	3.05%	53.07%	28.42%	13.56%	1.89%		
232	BD-602-b	Mass (g)	6.52	38.37	5.03	0.91	0.04	51.53	50.87
232		Percentage	12.82%	75.43%	9.89%	1.79%	0.08%		
233	BD-603-b	Mass (g)	13.55	30.86	4.69	1.47	0.14	52.01	50.71
233		Percentage	26.72%	60.86%	9.25%	2.90%	0.28%		
234	BD-604-b	Mass (g)	15.87	25.96	5.06	3.2	1.13	52.05	51.22
234		Percentage	30.98%	50.68%	9.88%	6.25%	2.21%		
235	BD-605-b	Mass (g)	9.63	27.85	8.19	4.27	0.33	51.39	50.27
235		Percentage	19.16%	55.40%	16.29%	8.49%	0.66%		
236	BK-606-b	Mass (g)	0.74	17.29	16.13	17.17	3.32	55.54	54.65
236		Percentage	1.35%	31.64%	29.52%	31.42%	6.08%		

1g. Source A and Source B Labeling

Source A Labeling			
Location Sample#	Type of Sample	Drying #	Sample ID
#1 Potlatch River 6/1/2010			
1	Bed	88	BD-101-a
2	Bed	87	BD-102-a
3	Bed	86	BD-103-a
4	Bed	85	BD-104-a
5	Bed	84	BD-105-a
6	Bank	83	BK-106-a
7	Agriculture	82	AG-107-a
#2 Asotin Creek 6/2/2010			
1	Agriculture	81	AG-201-a
2	Bank	80	BK-202-a
3	Bed	79	BD-203-a
4	Bed	78	BD-204-a
5	Bed	77	BD-205-a
6	Bed	76	BD-206-a
7	Bed	75	BD-207-a
8	Bank	74	BK-208-a
#3 Clearwater 6/3/2010			
1	Bed	73	BD-301-a
2	Bed	72	BD-302-a
3	Bed	71	BD-303-a
4	Bed	70	BD-304-a
5	Bed	69	BD-305-a
6	Bank	68	BK-306-a
7	Agriculture	67	AG-307-a
8	Bank	66	BD-308-a

Source B Labeling			
Location Sample#	Type of Sample	Drying #	Sample ID
#1 Potlatch River 9/18/2010			
1	Bed	191	BD-101-b
2	Bed	192	BD-102-b
3	Bed	193	BD-103-b
4	Bed	194	BD-104-b
5	Bed	195	BD-105-b
6	Bank	196	BK-106-b
7	Agricultural	197	AG-107-b
#2 Asotin Creek 9/23/2010			
1	Agricultural	198	AG-201-b
2	Bank	199	BK-202-b
3	Bed	200	BD-203-b
4	Bed	201	BD-204-b
5	Bed	202	BD-205-b
6	Bed	203	BD-206-b
7	Bed	204	BD-207-b
8	Bank	205	BK-208-b
#3 Clearwater 9/18/2010			
1	Bed	206	BD-301-b
2	Bed	207	BD-302-b
3	Bed	208	BD-303-b
4	Bed	209	BD-304-b
5	Bed	210	BD-305-b
6	Bank	211	BK-306-b
7	Agriculture	212	AG-307-b
8	Bank	213	BK-308-b

Grande Ronde 6/11/2010

1	Bed	65	BD-401-a
2	Bed	64	BD-402-a
3	Bed	63	BD-403-a
4	Bed	62	BD-404-a
5	Bed	61	BD-405-a
6	Bank	60	BK-406-a
7	Bank	59	BK-407-a
8	Agriculture	58	AG-408-a
9	Bank	57	BK-409-a

Hell's Canyon 6/12/2010

1	Bed	56	BD-501-a
2	Bed	55	BD-502-a
3	Bed	54	BD-503-a
4	Bed	53	BD-504-a
5	Bed	52	BD-505-a
6	Bank	51	BK-506-a
7	Bank	50	BK-507-a
8	Agriculture	49	AG-508-a

Salmon River 6/23/2010

1	Bed	43	BD-601-a
2	Bed	44	BD-602-a
3	Bed	45	BD-603-a
4	Bed	46	BD-604-a
5	Bed	47	BD-605-a
6	Bank	48	BK-606-a

#4 Grande Ronde 9/23/2010

1	Bed	214	BD-401-b
2	Bed	215	BD-402-b
3	Bed	216	BD-403-b
4	Bed	217	BD-404-b
5	Bed	218	BD-405-b
6	Bank	219	BK-406-b
7	Bank	220	BK-407-b
8	Agricultural	221	AG-408-b
9	Bank	222	BK-409-b

#5 Hell's Canyon 10/7/2010

1	Bed	223	BD-501-b
2	Bed	224	BD-502-b
3	Bed	225	BD-503-b
4	Bed	226	BD-504-b
5	Bed	227	BD-505-b
6	Bank	228	BK-506-b
7	Bank	229	BK-507-b
8	Agricultural	230	AG-508-b

#6 Salmon River 9/30/2010

1	Bed	231	BD-601-b
2	Bed	232	BD-602-b
3	Bed	233	BD-603-b
4	Bed	234	BD-604-b
5	Bed	235	BD-605-b
6	Bank	236	BK-606-b

Source A Duplicates

Location Sample#	Type of Sample	Drying #	Sample ID
5	Bed	189	BD-305-a-Duplicate
6	Bank	190	BK-106-a-Duplicate

Source B Duplicates

Location Sample#	Type of Sample	Drying #	Sample ID
5	Bed	237	BD-305-b-Duplicate
6	Bank	238	BK-106-b-Duplicate

Appendix A2. Analyte Analysis

FUS- ICP & FUS-MS

Analyte Symbol	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃ (T)	MnO	MgO	CaO	Na ₂ O	K ₂ O	TiO ₂	P ₂ O ₅	LOI	Total	Sc	Be	V	Cr	Co	Ni
Unit Symbol	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.01	0.01	0.01	0.001	0.01	0.01	0.01	0.01	0.001	0.01	0.01	0.01	1	1	5	20	1	20
Analysis Method	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS	FUS-MS	FUS-MS
88	60.81	14.22	7.68	0.127	2	3.82	2.47	1.73	1.364	0.23	6.19	100.6	19	2	188	40	65	30
87	68.96	11.47	7.3	0.112	1.74	4.17	2.32	1.47	1.26	0.25	1.8	100.8	18	1	193	20	124	< 20
86	68.7	11.46	7.15	0.112	1.69	3.91	2.2	1.57	1.272	0.23	2.57	100.9	18	1	188	30	103	< 20
85	59.09	12.79	7.01	0.085	1.49	3.06	1.9	1.61	1.319	0.21	9.93	98.49	17	2	172	40	66	30
84	61.02	13.23	7.39	0.116	1.74	3.42	2.09	1.62	1.405	0.23	7.78	100	18	1	181	40	62	20
83	53.94	13.03	12.78	0.198	2.25	4.15	1.9	1.54	1.451	0.27	8.25	99.76	23	2	238	30	56	30
82	66.04	13.16	4.58	0.119	1.06	1.82	2.03	2.11	0.919	0.19	7.66	99.68	12	2	94	50	46	20
81	64.74	13.09	5.58	0.106	1.56	2.48	2.13	2.08	1.061	0.15	6.61	99.58	13	2	119	50	41	20
80	60.58	13.73	7.85	0.096	2.22	4.21	2.51	1.63	1.604	0.21	5.19	99.83	19	1	218	50	62	< 20
79	54.65	13.92	10.45	0.14	2.93	6.06	2.87	1.37	2.184	0.3	4.58	99.46	27	< 1	335	50	53	< 20
78	54.18	13.05	8.81	0.11	2.48	5.18	2.54	1.34	1.814	0.24	9.66	99.41	22	1	277	50	63	20
77	55.53	14.1	10.11	0.138	2.93	6.07	2.84	1.4	2.089	0.3	4.11	99.61	26	1	304	60	55	< 20
76	55.12	12.86	8.9	0.109	2.54	5	2.4	1.4	1.785	0.24	8.4	98.76	23	1	263	60	62	< 20
75	54.63	12.68	7.82	0.111	2.16	4.45	2.41	1.39	1.547	0.24	10.87	98.33	20	1	224	40	54	20
74	53.97	13.39	11.88	0.172	3.29	6.79	2.76	1.5	2.206	0.46	2.27	98.69	30	1	315	50	83	30
73	70.12	12.33	4.45	0.075	1.41	3.03	3	2.3	0.882	0.14	1.42	99.16	11	1	93	40	194	20
72	73.18	12.71	3.4	0.052	1.13	2.66	2.93	2.48	0.558	0.11	1.56	100.8	9	1	67	30	180	< 20
71	72.96	12.14	3.71	0.062	1.11	2.86	2.86	2.16	0.75	0.11	1.04	99.75	9	1	76	30	247	< 20
70	73.28	11.17	4.48	0.088	1.42	3.41	2.42	1.79	0.807	0.09	0.77	99.72	13	1	88	30	206	< 20
69	72.48	12.62	3.63	0.058	1.17	2.81	2.89	2.37	0.645	0.11	1.26	100.1	9	1	71	30	196	< 20
68	67.82	12.75	4.43	0.071	1.41	2.74	2.57	2.18	0.791	0.14	4.08	98.98	11	1	84	30	180	20
67	59.89	13.86	6.45	0.12	0.99	2.05	1.64	1.65	1.157	0.24	10.49	98.54	16	2	137	40	28	20
66	71.76	12.89	3.36	0.051	1.14	2.69	2.96	2.44	0.529	0.08	1.55	99.45	8	1	65	30	175	< 20
65	56.61	14.5	10.43	0.148	2.95	6.45	3.12	1.44	1.964	0.4	2.03	100	28	1	312	40	77	20
64	55.47	14.89	10.2	0.151	2.89	6.26	3.04	1.34	1.993	0.27	3.66	100.2	28	< 1	296	50	50	30
63	57.69	14.27	10.07	0.143	2.88	6.42	3.1	1.42	1.945	0.29	1.66	99.9	27	< 1	309	40	73	20
62	57.49	14.32	10.41	0.155	2.93	6.6	3.13	1.46	2.024	0.3	1.53	100.4	27	1	323	40	80	20
61	55.43	13.96	9.45	0.151	2.86	5.56	2.77	1.38	1.66	0.28	6.67	100.2	25	1	259	50	45	30
60	55.64	13.63	11.88	0.166	3.04	6.42	3.03	1.41	2.344	0.29	1.72	99.56	29	< 1	397	50	96	30
59	62.61	14.02	6.17	0.113	3.11	4.63	2.98	1.6	0.923	0.24	4.08	100.5	17	1	148	100	114	60
58	59.52	15.04	6.71	0.191	1.21	2.29	1.93	1.68	1.21	0.22	9.6	99.61	15	2	145	50	35	< 20
57	56.36	14.8	9.51	0.139	2.62	5.87	3.12	1.49	1.851	0.28	3.64	99.68	24	< 1	284	50	86	20
56	47.53	15.23	15.68	0.23	2.28	7.19	3.08	0.98	3.461	0.46	3.49	99.61	34	1	444	60	62	50
55	52.04	15.17	12.17	0.186	2.89	7.63	2.7	0.75	1.51	0.22	4.11	99.37	29	< 1	290	90	48	30
54	56.08	13.67	10.7	0.192	2.41	4.74	2.48	1.45	2.074	0.18	4.93	98.9	24	< 1	367	100	53	50
53	52.4	13.64	12.39	0.178	4.24	8.19	2.97	0.97	2.156	0.2	2.2	99.53	39	< 1	448	170	94	50
52	50.23	15.17	12.39	0.176	3.72	8.16	3.15	0.97	2.193	0.26	3.65	100.1	39	< 1	436	170	62	50

51	47.9	13.44	16.18	0.225	2.12	5.12	2.28	0.71	2.615	0.34	8.88	99.8	36	1	372	50	52	50
50	56.45	16.77	9.2	0.153	1.74	2.66	2.21	1.65	1.357	0.11	8.2	100.5	23	2	213	80	39	40
49	46.81	13.74	8.19	0.127	2.25	4.55	2.56	1.05	1.401	0.39	17.03	98.11	23	< 1	214	70	33	30
43	71.75	12.79	3.26	0.068	1.29	2.92	2.99	2.65	0.533	0.14	0.99	99.39	10	2	67	40	148	< 20
44	73.68	12.32	2.36	0.043	0.89	2.24	3.08	2.88	0.361	0.06	0.92	98.83	7	2	46	20	172	< 20
45	73.89	12.32	2.2	0.039	0.74	1.97	2.99	2.9	0.33	0.06	0.89	98.34	5	2	41	20	186	< 20
46	75.46	12.74	1.97	0.03	0.68	1.84	3.05	3.16	0.279	0.07	0.97	100.2	5	2	35	< 20	173	< 20
48	67.14	13.6	4.55	0.075	1.82	3.04	2.83	2.5	0.721	0.17	2.39	98.85	11	2	92	60	91	30
47	73.16	12.63	3.14	0.065	0.95	2.33	3.02	2.86	0.615	0.12	0.97	99.85	7	2	60	40	205	< 20
189	72.25	12.49	3.8	0.063	1.21	2.89	2.99	2.45	0.678	0.12	1.22	100.2	9	1	75	30	181	< 20
190	54.03	13.16	11.85	0.181	2.47	4.57	2.02	1.76	1.523	0.32	6.68	98.57	23	2	247	30	52	20
42	54.87	13.54	6.64	0.109	1.87	2.86	1.9	2.05	0.942	0.3	13.91	99	16	2	135	40	37	20
41	57.12	12.96	7.12	0.096	1.99	3.18	1.85	1.73	1.088	0.22	10.75	98.09	18	2	150	50	52	30
40	57.9	13.66	6.69	0.094	1.91	2.8	1.89	1.99	1.016	0.25	10.24	98.44	17	2	139	50	35	30
22	54.44	12.93	6.13	0.105	1.87	2.96	1.97	2.06	0.927	0.26	15.3	98.95	15	2	129	40	66	20
21	53.15	12.87	6.32	0.084	1.84	2.94	1.83	1.78	0.989	0.26	16.09	98.18	16	2	136	50	68	30
20	55.27	12.89	6.43	0.086	1.91	3.16	2.02	1.81	1.041	0.25	12.87	97.74	16	2	144	50	75	20
152	68.68	12.9	4.27	0.068	1.59	3.6	3.11	2.36	0.765	0.15	1.42	98.91	12	1	110	50	139	< 20
146	54.82	13.76	8.3	0.166	1.75	3.49	1.96	1.43	1.472	0.25	12.35	99.75	21	1	205	40	52	20
144	73.05	11.97	3.34	0.053	1.12	2.53	2.85	2.59	0.509	0.1	1.36	99.46	9	1	78	30	151	< 20
143	70.04	11.74	4.49	0.07	1.24	2.86	2.42	2.13	0.722	0.13	3.1	98.95	11	1	104	30	107	< 20
142	73.46	12.92	3.1	0.049	1.04	2.5	3.13	2.81	0.482	0.08	1.17	100.7	8	1	69	30	126	< 20
167	71.86	12.51	4.16	0.074	1.41	3.2	2.98	2.37	0.729	0.11	1.01	100.4	11	1	107	40	146	20
176	71.16	13.21	3.37	0.053	1.21	2.74	3.17	2.72	0.525	0.08	1.3	99.54	9	1	76	30	168	< 20
165	69.7	12.89	3.9	0.064	1.35	3.07	3.03	2.5	0.657	0.11	1.32	98.59	11	1	97	40	174	20
141	73.34	11.53	3.17	0.048	1.01	2.36	2.76	2.6	0.468	0.1	1.23	98.62	8	1	73	20	142	< 20
140	71.43	12.79	3.46	0.055	1.17	2.72	3.02	2.67	0.541	0.1	1.32	99.28	9	1	78	30	110	< 20
139	72.22	12.88	3.59	0.057	1.22	2.77	3.07	2.7	0.553	0.1	1.1	100.3	9	1	82	30	61	< 20
138	73.34	12.2	3.55	0.056	1.14	2.55	2.86	2.7	0.544	0.11	1.24	100.3	9	1	82	30	140	< 20
137	71.99	11.8	3.18	0.053	1.09	2.57	2.82	2.51	0.507	0.07	1.21	97.81	9	2	77	30	157	< 20
136	71.33	13.24	3.59	0.049	1.11	2.74	3.04	2.51	0.539	0.11	1.37	99.61	9	1	73	20	131	< 20
135	71.17	13	3.9	0.057	1.24	3.05	3.03	2.3	0.65	0.12	1.17	99.69	10	1	85	30	119	< 20
134	69.44	13.15	4.35	0.063	1.39	3.25	2.98	2.24	0.699	0.14	1.6	99.3	11	1	97	30	152	< 20
133	68.31	13.5	4.41	0.061	1.27	2.96	2.94	2.32	0.651	0.12	2.06	98.59	10	1	92	30	170	< 20
132	70.82	13.18	3.82	0.054	1.23	3.08	3	2.29	0.593	0.12	1.4	99.6	9	1	83	30	183	< 20
131	62.68	13.47	5.46	0.087	1.29	2.46	2.08	1.85	1.036	0.19	7.9	98.51	14	1	122	50	75	20
130	55.85	14.02	8.04	0.161	1.79	3.53	1.92	1.38	1.403	0.23	10.73	99.06	20	1	198	50	44	20
129	71.02	13.14	4.11	0.059	1.29	3.12	2.92	2.32	0.696	0.12	1.39	100.2	11	1	87	30	190	< 20
128	69.05	13.57	4.49	0.063	1.42	3.23	3.09	2.29	0.72	0.12	1.9	99.96	11	1	97	30	175	< 20
127	73.66	12.74	3.15	0.054	1.14	2.67	3.13	2.68	0.489	0.09	1.05	100.8	9	1	72	30	243	20
126	70.74	12.47	4.13	0.075	1.14	2.63	3.03	2.76	0.764	0.11	1.12	98.97	9	1	99	40	159	< 20
125	73.01	11.2	3.5	0.059	1.14	2.67	2.58	2.38	0.527	0.1	1.51	98.68	9	1	82	30	149	< 20
124	71.07	12.64	3.69	0.073	1.19	2.67	3.01	2.76	0.629	0.12	1.54	99.39	9	2	81	40	129	< 20
123	69.97	12.82	3.42	0.064	1.15	2.59	2.98	2.77	0.593	0.09	1.7	98.16	9	2	78	30	202	< 20
122	74.19	11.88	3.13	0.046	0.96	2.65	2.8	2.36	0.492	0.09	1.66	100.3	8	< 1	69	20	138	< 20
121	69.26	13.32	4.74	0.072	1.39	3.26	2.88	2.09	0.763	0.15	2.38	100.3	12	1	114	30	122	< 20
180	54.64	13.86	7.74	0.119	1.72	3.34	2.05	1.46	1.326	0.22	11.93	98.41	19	2	186	50	57	30
120	65.28	14.16	6.49	0.11	1.93	4.14	2.95	1.8	1.074	0.18	2.6	100.7	16	2	164	40	108	20

119	70.45	13.49	4.13	0.055	1.25	2.83	3.09	2.56	0.655	0.11	1.91	100.5	10	2	87	30	216	20
118	69.93	12.98	5.08	0.08	1.48	3.42	2.97	2.12	0.907	0.13	1.64	100.7	12	1	122	30	162	20
117	56.17	14.22	7.9	0.142	1.64	3.21	1.87	1.4	1.366	0.22	11.91	100.1	20	2	193	50	37	20
116	64.34	13.87	6.9	0.107	2.04	4.29	2.83	1.71	1.17	0.18	2.76	100.2	17	1	176	50	131	< 20
115	59.28	14.26	8.04	0.142	2.26	4.51	2.62	1.59	1.328	0.23	4.84	99.09	20	1	197	50	83	< 20
179	74.26	11.44	2.75	0.037	0.81	2.37	2.65	2.4	0.408	0.08	1.34	98.56	7	< 1	61	< 20	143	< 20
114	72.18	12.02	3.15	0.045	0.95	2.67	2.8	2.35	0.484	0.09	1.29	98.02	8	< 1	68	20	196	< 20
113	74.07	11.69	2.85	0.038	0.86	2.53	2.74	2.34	0.44	0.09	1.03	98.67	7	< 1	64	< 20	192	< 20
112	71.26	12.51	3.46	0.046	1.01	2.71	2.93	2.31	0.512	0.09	1.63	98.47	8	1	75	20	173	< 20
95	75.1	10.05	2.88	0.04	0.79	2.11	2.14	2.29	0.465	0.08	2.23	98.19	8	1	70	20	248	20
94	77.91	10.2	2.43	0.036	0.67	2.05	2.36	2.4	0.379	0.06	0.76	99.26	6	1	58	< 20	237	< 20
93	75.55	10.92	2.34	0.032	0.69	2.09	2.57	2.6	0.336	0.07	1.05	98.26	6	< 1	52	< 20	201	< 20
92	74.73	11.55	2.56	0.037	0.76	2.23	2.71	2.61	0.373	0.07	1.13	98.75	7	< 1	56	< 20	283	< 20
90	64.47	11.2	4.29	0.063	0.94	2.05	1.85	1.83	0.691	0.19	11.02	98.61	10	1	88	40	131	< 20
187	70.01	13.08	3.86	0.062	1.33	2.98	3.02	2.52	0.628	0.1	1.4	98.99	10	1	91	40	181	< 20

Analyte Symbol	Cu	Zn	Ga	Ge	As	Rb	Sr	Y	Zr	Nb	Mo	Ag	In	Sn	Sb	Cs	Ba	Bi
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm							
Detection Limit	10	30	1	1	5	2	2	4	1	2	0.5	0.2	1	0.5	0.5	3	0.4	
Analysis Method	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-ICP	FUS-MS	
88	20	90	19	2	< 5	59	354	34	281	14	< 2	0.9	< 0.2	2	< 0.5	2.1	720	< 0.4
87	10	80	16	1	< 5	36	289	22	162	7	< 2	< 0.5	< 0.2	< 1	< 0.5	0.8	679	< 0.4
86	10	70	16	1	< 5	43	296	27	174	9	< 2	0.6	< 0.2	1	< 0.5	1.1	730	< 0.4
85	20	90	18	2	< 5	61	256	34	305	14	< 2	0.9	< 0.2	2	< 0.5	2.4	662	< 0.4
84	20	90	18	2	< 5	60	279	34	290	15	< 2	1.1	< 0.2	2	< 0.5	2.1	666	< 0.4
83	70	80	19	2	5	62	285	31	211	12	< 2	0.7	< 0.2	5	1.7	3.5	618	< 0.4
82	20	70	17	2	< 5	81	269	33	336	15	< 2	1.2	< 0.2	2	< 0.5	3.2	721	< 0.4
81	20	80	17	2	< 5	69	279	29	283	12	< 2	1	< 0.2	2	< 0.5	3.4	645	< 0.4
80	20	90	19	2	< 5	54	311	28	274	13	< 2	0.9	< 0.2	2	< 0.5	2.2	636	< 0.4
79	20	120	20	2	< 5	42	327	28	211	12	< 2	0.7	< 0.2	2	< 0.5	1.4	632	< 0.4
78	20	130	19	2	< 5	45	307	25	218	12	< 2	0.8	< 0.2	2	< 0.5	1.7	577	< 0.4
77	20	110	20	2	< 5	42	331	27	225	14	< 2	0.7	< 0.2	2	< 0.5	1.4	718	< 0.4
76	20	110	19	2	< 5	47	288	26	221	12	< 2	0.7	< 0.2	2	< 0.5	1.8	630	< 0.4
75	20	90	18	2	< 5	48	289	27	215	11	< 2	0.7	< 0.2	1	< 0.5	1.9	576	< 0.4
74	20	130	21	2	< 5	40	301	34	227	13	< 2	0.8	< 0.2	2	< 0.5	1.1	944	< 0.4
73	< 10	50	16	2	< 5	61	379	37	458	14	< 2	1.5	< 0.2	2	< 0.5	1.5	791	< 0.4
72	< 10	50	16	1	< 5	70	394	21	220	9	< 2	0.8	< 0.2	1	< 0.5	1.7	858	< 0.4
71	< 10	40	15	2	< 5	58	378	33	354	12	< 2	1.2	< 0.2	2	< 0.5	1.2	751	0.5
70	< 10	40	14	2	< 5	47	344	38	224	12	< 2	0.8	< 0.2	2	< 0.5	0.9	648	< 0.4
69	< 10	40	16	1	< 5	66	394	28	270	11	< 2	0.9	< 0.2	1	< 0.5	1.5	835	< 0.4
68	10	60	17	2	< 5	71	329	39	401	12	< 2	1.3	< 0.2	2	< 0.5	2.2	730	< 0.4
67	30	90	19	2	< 5	69	233	34	251	12	< 2	0.9	< 0.2	2	< 0.5	3.5	670	< 0.4
66	< 10	50	16	1	< 5	68	398	17	180	9	< 2	0.6	< 0.2	1	< 0.5	1.6	845	< 0.4
65	20	120	20	2	< 5	36	383	30	176	10	< 2	0.6	< 0.2	1	< 0.5	1.1	695	< 0.4
64	30	120	21	2	< 5	37	393	27	185	11	< 2	0.6	< 0.2	1	< 0.5	1.2	706	< 0.4
63	20	120	20	2	< 5	35	393	26	180	10	< 2	0.6	< 0.2	1	< 0.5	1	696	< 0.4
62	20	120	20	2	< 5	34	407	37	204	10	< 2	0.6	< 0.2	1	< 0.5	1	701	< 0.4
61	40	120	19	2	< 5	40	382	29	187	11	< 2	0.6	< 0.2	1	< 0.5	1.5	657	< 0.4
60	20	130	20	2	< 5	34	367	27	373	11	< 2	1.2	< 0.2	2	< 0.5	1	672	< 0.4
59	40	100	17	2	< 5	46	439	30	172	9	< 2	0.6	< 0.2	< 1	< 0.5	1.8	681	< 0.4
58	20	100	19	2	< 5	70	264	30	261	13	< 2	0.8	< 0.2	2	< 0.5	3.4	748	< 0.4
57	20	110	21	2	< 5	37	417	25	194	10	< 2	0.6	< 0.2	1	< 0.5	1.2	712	< 0.4
56	130	170	25	2	5	25	370	44	245	17	< 2	0.8	< 0.2	2	< 0.5	0.9	600	< 0.4
55	80	110	19	2	< 5	21	311	26	125	8	< 2	< 0.5	< 0.2	1	0.6	1.1	422	< 0.4
54	90	160	19	2	15	42	268	28	191	14	3	0.7	< 0.2	1	2.6	2.6	654	< 0.4
53	130	140	20	2	< 5	22	344	27	129	7	< 2	< 0.5	< 0.2	1	< 0.5	0.8	410	< 0.4
52	160	130	22	2	< 5	22	401	26	133	7	< 2	< 0.5	< 0.2	1	< 0.5	0.8	468	< 0.4
51	170	130	24	2	< 5	26	289	41	251	15	< 2	0.8	< 0.2	2	< 0.5	2	470	< 0.4
50	100	130	22	2	10	67	262	30	201	12	< 2	1.2	< 0.2	2	1.4	4.1	664	< 0.4
49	60	100	17	1	< 5	29	279	21	101	6	< 2	< 0.5	< 0.2	< 1	< 0.5	1.1	393	< 0.4

43	< 10	50	17	2	< 5	83	372	24	122	15	< 2	< 0.5	< 0.2	1	0.8	2	822	< 0.4
44	< 10	< 30	13	1	< 5	71	370	15	133	3	< 2	< 0.5	< 0.2	1	< 0.5	1.8	896	< 0.4
45	< 10	< 30	14	1	< 5	80	364	13	115	7	< 2	< 0.5	< 0.2	2	0.6	1.8	954	< 0.4
46	< 10	< 30	14	1	< 5	86	372	11	121	7	< 2	< 0.5	< 0.2	2	0.8	2	989	< 0.4
48	20	60	16	2	9	78	383	24	268	14	< 2	0.5	< 0.2	4	3.8	2.7	823	< 0.4
47	< 10	< 30	15	1	< 5	79	384	27	324	14	< 2	0.6	< 0.2	3	0.7	1.9	899	< 0.4
189	< 10	40	16	2	< 5	62	389	29	309	10	< 2	0.6	< 0.2	4	< 0.5	1.5	856	< 0.4
190	50	90	18	2	6	64	270	32	212	10	< 2	< 0.5	< 0.2	9	2.2	3.6	615	< 0.4
42	40	40	19	2	10	80	259	35	147	14	< 2	< 0.5	< 0.2	4	1.3	4.9	675	< 0.4
41	50	120	21	2	18	68	248	31	182	13	3	< 0.5	< 0.2	5	1.3	3.9	630	0.5
40	50	110	19	2	10	76	238	29	170	11	< 2	< 0.5	< 0.2	4	1.9	4.4	672	< 0.4
22	40	40	19	2	13	77	263	35	167	13	< 2	< 0.5	< 0.2	4	1.5	4.7	685	< 0.4
21	40	110	20	2	15	70	253	35	168	10	3	< 0.5	< 0.2	4	0.8	4.3	619	< 0.4
20	40	90	18	2	8	65	275	31	186	9	< 2	< 0.5	< 0.2	3	0.9	3.6	660	< 0.4
152	10	50	16	1	< 5	66	369	20	172	11	< 2	< 0.5	< 0.2	3	0.7	1.7	769	< 0.4
146	30	100	18	2	< 5	52	262	35	189	9	< 2	< 0.5	< 0.2	4	< 0.5	2.5	664	< 0.4
144	20	40	14	1	< 5	73	335	14	113	7	< 2	< 0.5	< 0.2	3	0.7	1.6	886	< 0.4
143	1690	990	14	1	< 5	63	309	18	148	9	< 2	0.8	< 0.2	6	< 0.5	1.7	785	< 0.4
142	10	40	15	1	< 5	77	380	13	120	8	< 2	< 0.5	< 0.2	2	0.7	1.8	930	< 0.4
167	20	40	15	1	< 5	63	358	19	155	10	< 2	< 0.5	< 0.2	2	0.7	1.5	819	< 0.4
176	10	40	15	1	< 5	75	381	14	119	8	< 2	< 0.5	< 0.2	3	0.7	1.8	899	< 0.4
165	10	50	15	1	< 5	71	368	16	144	9	< 2	< 0.5	< 0.2	3	0.8	1.7	843	< 0.4
141	10	40	14	1	< 5	73	311	13	99	6	< 2	< 0.5	< 0.2	2	0.8	1.6	897	< 0.4
140	10	40	16	1	< 5	78	366	14	130	9	< 2	< 0.5	< 0.2	3	1	1.9	886	< 0.4
139	30	50	15	1	< 5	76	361	15	133	8	< 2	< 0.5	< 0.2	2	1.1	1.9	909	< 0.4
138	20	40	15	1	< 5	75	333	15	120	7	< 2	< 0.5	< 0.2	2	0.9	1.7	903	< 0.4
137	10	30	14	1	< 5	70	335	14	114	7	< 2	< 0.5	< 0.2	2	0.7	1.6	831	< 0.4
136	10	50	15	1	< 5	62	413	15	127	5	< 2	< 0.5	< 0.2	3	< 0.5	1.5	902	< 0.4
135	< 10	40	15	1	< 5	58	401	19	170	7	< 2	< 0.5	< 0.2	3	< 0.5	1.4	840	< 0.4
134	40	60	16	1	< 5	59	401	19	168	8	< 2	< 0.5	< 0.2	3	< 0.5	1.5	820	< 0.4
133	240	140	16	1	< 5	63	402	16	140	6	< 2	< 0.5	< 0.2	3	< 0.5	1.7	861	< 0.4
132	< 10	40	15	1	< 5	59	408	15	152	7	< 2	< 0.5	< 0.2	4	< 0.5	1.5	832	< 0.4
131	20	70	17	2	< 5	67	268	29	236	11	< 2	< 0.5	< 0.2	4	< 0.5	2.9	689	< 0.4
130	30	60	19	2	< 5	54	261	33	240	13	< 2	< 0.5	< 0.2	4	< 0.5	2.7	641	< 0.4
129	< 10	40	16	2	< 5	61	406	21	185	8	< 2	< 0.5	< 0.2	4	< 0.5	1.5	823	< 0.4
128	10	50	16	1	< 5	59	394	20	176	8	< 2	< 0.5	< 0.2	3	< 0.5	1.6	833	< 0.4
127	< 10	30	15	1	< 5	71	364	14	107	6	< 2	< 0.5	< 0.2	2	< 0.5	1.7	894	< 0.4
126	10	50	16	1	< 5	78	340	19	225	10	< 2	< 0.5	< 0.2	3	0.6	1.9	911	< 0.4
125	10	40	14	1	< 5	68	307	15	126	7	< 2	< 0.5	< 0.2	2	0.8	1.7	787	< 0.4
124	10	40	16	1	< 5	83	338	18	186	12	< 2	< 0.5	< 0.2	3	0.7	2.2	862	< 0.4
123	10	40	15	1	< 5	80	363	17	153	9	< 2	< 0.5	< 0.2	3	0.9	2.1	864	< 0.4
122	< 10	40	14	1	< 5	58	364	14	134	5	< 2	< 0.5	< 0.2	2	< 0.5	1.3	872	< 0.4
121	20	50	16	1	< 5	56	370	16	142	7	< 2	< 0.5	< 0.2	4	< 0.5	1.5	813	< 0.4
180	30	80	18	1	< 5	53	276	31	224	10	< 2	< 0.5	< 0.2	4	0.5	2.6	656	< 0.4
120	20	70	18	2	< 5	49	402	23	182	9	< 2	< 0.5	< 0.2	3	< 0.5	1.5	733	< 0.4
119	10	40	16	1	< 5	66	410	20	155	7	< 2	< 0.5	< 0.2	3	< 0.5	1.7	914	< 0.4
118	10	50	16	2	< 5	54	401	29	217	8	< 2	< 0.5	< 0.2	4	< 0.5	1.4	797	< 0.4
117	40	80	19	2	< 5	54	259	33	221	11	< 2	< 0.5	< 0.2	4	< 0.5	2.8	655	< 0.4

116	20	80	20	2	< 5	53	391	25	222	11	< 2	0.8	< 0.2	1	< 0.5	1.4	703	< 0.4
115	40	100	21	2	< 5	55	365	26	226	12	< 2	0.8	< 0.2	2	< 0.5	1.8	668	< 0.4
179	< 10	40	15	1	< 5	66	370	11	113	5	< 2	< 0.5	< 0.2	< 1	< 0.5	1.2	856	< 0.4
114	< 10	40	16	1	< 5	65	382	14	128	6	< 2	< 0.5	< 0.2	< 1	< 0.5	1.3	831	< 0.4
113	< 10	40	15	1	< 5	64	376	11	120	5	< 2	< 0.5	< 0.2	< 1	< 0.5	1.1	837	< 0.4
112	230	140	16	1	< 5	65	392	14	128	6	< 2	< 0.5	< 0.2	< 1	< 0.5	1.4	819	< 0.4
95	< 10	30	12	1	< 5	59	304	11	109	5	< 2	0.6	< 0.2	1	< 0.5	1.1	827	< 0.4
94	< 10	< 30	13	1	< 5	61	325	11	108	4	< 2	< 0.5	< 0.2	< 1	< 0.5	1	871	< 0.4
93	< 10	30	14	1	< 5	69	356	10	100	4	< 2	< 0.5	< 0.2	< 1	< 0.5	1.2	914	< 0.4
92	< 10	30	15	1	< 5	71	374	10	105	5	< 2	< 0.5	< 0.2	< 1	< 0.5	1.2	912	< 0.4
90	20	50	16	1	< 5	65	258	22	176	9	< 2	0.6	< 0.2	< 1	< 0.5	2.3	675	< 0.4
187	10	60	18	1	< 5	79	360	17	141	11	< 2	< 0.5	< 0.2	< 1	< 0.5	1.8	841	< 0.4

Appendix N – Fingerprinting Sediment Sources
 Lower Snake River Programmatic Sediment Management Plan – Final EIS

Analyte Symbol	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Tl
Unit Symbol	ppm																	
Detection Limit	0.1	0.1	0.05	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.05	0.05	0.1	0.04	0.2	0.1	1	0.1
Analysis Method	FUS-MS																	
88	47.6	94.7	10.6	40.2	8.2	1.79	7.4	1.1	6.3	1.2	3.5	0.5	3.2	0.55	7.2	1	388	0.3
87	22.7	47.1	5.38	22.3	4.8	1.56	4.6	0.7	4.1	0.8	2.2	0.31	2.1	0.32	4	0.6	873	0.2
86	29	57.2	6.85	27.2	5.8	1.61	5.9	0.9	5.3	1	3	0.42	2.8	0.46	4.5	0.7	803	0.2
85	59.1	109	11.8	44.6	8.7	2.13	8.1	1.3	7.6	1.4	4.2	0.62	4	0.63	6.9	1	466	0.4
84	44.2	86.6	9.86	38.3	7.6	1.75	6.9	1.1	6.1	1.2	3.5	0.5	3.4	0.55	7.4	1.1	403	0.4
83	31.3	68.4	7.45	29.8	6.6	1.66	6.4	1.1	6	1.2	3.4	0.5	3.3	0.55	5.2	0.9	240	0.4
82	49.6	95.5	10.5	39	7.5	1.63	6.7	1	5.9	1.1	3.3	0.5	3.2	0.56	8.6	1.3	298	0.5
81	42.7	85.4	9.18	34.9	6.8	1.49	6	1	5.6	1.1	3.2	0.46	3.1	0.5	7.4	1.1	239	0.5
80	35	70	7.7	30.2	6.2	1.6	5.6	0.9	5.3	1	2.9	0.43	2.9	0.48	7.1	1.1	356	0.3
79	25.5	51.7	6.04	25.2	5.5	1.74	5.5	0.9	5.3	1	2.8	0.41	2.7	0.43	5.3	0.9	219	0.2
78	27.4	55.2	6.33	25.6	5.7	1.58	5.4	0.9	5.1	1	2.9	0.42	2.7	0.46	5.6	0.9	303	0.3
77	27.4	54.9	6.53	26.4	5.9	1.8	5.7	0.9	5.3	1	3	0.44	3	0.5	5.8	1	226	0.2
76	29	58.2	6.75	27.2	5.8	1.68	5.8	0.9	5.3	1	3	0.45	2.8	0.49	5.7	0.9	304	0.3
75	28.6	57.9	6.63	26.8	5.7	1.6	5.5	0.9	5	1	3	0.43	2.8	0.49	5.8	0.9	305	0.3
74	30.9	62.3	7.58	31.6	7.2	2.31	7.3	1.2	6.7	1.3	3.7	0.54	3.5	0.57	5.8	1	379	0.2
73	87.2	171	18	66.4	11.7	1.67	9	1.3	7.1	1.3	4	0.59	3.9	0.64	12	1.1	1400	0.3
72	41.8	79.8	8.57	31.7	5.6	1.16	4.7	0.7	4	0.8	2.2	0.32	2.2	0.37	5.8	0.7	1360	0.4
71	84	163	17.2	62.5	11.2	1.57	8.5	1.2	6.6	1.2	3.5	0.5	3.2	0.55	9.1	0.9	1760	0.3
70	69.1	135	14.1	51	8.9	1.48	7.3	1.1	6.6	1.3	4	0.59	3.8	0.62	5.6	1	1490	0.3
69	55.5	106	11.3	41.7	7.4	1.31	6	0.9	5	1	2.8	0.43	2.8	0.45	6.9	0.8	1420	0.4
68	81.3	161	17.1	63.3	11.7	1.6	9.2	1.4	7.5	1.4	4.1	0.59	3.9	0.66	10.4	0.9	1280	0.4
67	38.9	78.8	8.74	34.3	7.1	1.66	6.5	1	5.9	1.2	3.4	0.51	3.4	0.58	6.6	1	89	0.5
66	35.5	68.2	7.24	27.5	5.1	1.07	4	0.6	3.4	0.6	1.9	0.26	1.9	0.3	4.4	0.7	1230	0.4
65	27.2	53.1	6.18	25.4	5.7	1.76	5.8	0.9	5.5	1.1	3	0.44	2.9	0.47	4.5	0.7	362	0.2
64	22.3	45.8	5.56	23	5.2	1.74	5.1	0.9	5	1	2.9	0.42	2.7	0.47	4.7	0.8	177	0.2
63	22.2	45.4	5.53	23	5.3	1.72	5.5	0.9	5.1	1	2.8	0.41	2.7	0.46	4.6	0.8	362	0.2
62	53	92.8	9.72	36.3	7.5	2.34	7.6	1.3	7.4	1.4	4	0.56	3.5	0.55	5.2	0.7	413	0.2
61	25.6	51.4	6.12	25.4	5.9	1.57	5.6	0.9	5.5	1.1	3.2	0.46	3.1	0.51	4.9	0.9	191	0.3
60	24.1	48.9	5.87	24.5	5.6	1.66	5.6	0.9	5.3	1.1	3	0.43	2.9	0.5	9.6	0.8	469	0.2
59	45.1	79.4	8.15	29.8	5.9	1.62	5.8	0.9	5.6	1.1	3	0.43	2.8	0.44	4.3	0.7	803	0.3
58	39.3	91.9	8.82	33.7	7	1.58	6.2	1	5.5	1.1	3.1	0.46	3.1	0.52	7	1.1	81	0.5
57	22.1	45.2	5.41	22.5	5.1	1.61	5	0.8	4.7	0.9	2.7	0.4	2.6	0.42	5.1	0.8	466	0.2
56	27.5	65.9	8.04	35.5	9	2.53	9.4	1.6	9	1.7	4.9	0.7	4.5	0.73	6.3	1.4	145	0.2
55	15.8	34.3	4.21	18.7	4.9	1.49	5.2	0.9	5.3	1.1	3	0.42	2.9	0.48	3.1	0.5	126	0.2
54	29.8	62.4	6.49	26	5.6	1.44	5.6	0.9	5.4	1.1	3	0.46	3.1	0.51	4.9	1.1	177	0.5
53	13.5	29.8	3.94	18.3	4.8	1.54	5.4	0.9	5.4	1.1	2.9	0.44	2.8	0.47	3.3	0.5	352	0.1
52	13.6	31.2	4.05	18.7	4.8	1.71	5.5	0.9	5.5	1.1	3	0.44	2.7	0.46	3.5	0.4	136	< 0.1
51	27.9	61.7	7.65	33.3	8.1	2.32	8.6	1.5	8.2	1.6	4.6	0.66	4.2	0.7	6.7	1.1	66	0.3
50	27.6	55.9	6.66	27.1	6.2	1.62	6.1	1	5.9	1.2	3.3	0.51	3.2	0.55	5.3	0.9	104	0.5
49	13.4	29.2	3.7	16	3.9	1.25	4.2	0.7	4.1	0.8	2.2	0.33	2.2	0.35	2.5	0.5	108	0.1

43	44.5	83.6	8.74	31.5	5.8	1.25	4.9	0.7	4.2	0.8	2.4	0.35	2.2	0.38	3.2	1.3	1120	0.4
44	23	43	4.93	18.1	3.3	0.8	2.7	0.4	2.3	0.4	1.3	0.2	1.4	0.21	0.9	0.5	1060	0.4
45	20.6	38.6	4.5	16.2	3.1	0.75	2.4	0.4	2.1	0.4	1.2	0.19	1.2	0.21	2.7	0.7	1310	0.4
46	19.4	36.2	4.26	15.2	2.9	0.74	2.4	0.4	2.1	0.4	1.2	0.19	1.2	0.2	2.8	0.7	1230	0.5
48	34.6	66.6	7.74	28.7	5.3	1.08	4.5	0.7	4.1	0.8	2.3	0.35	2.4	0.4	6.3	1.2	682	0.5
47	48.4	90.9	10.1	36	6.2	1	4.7	0.8	4.4	0.9	2.7	0.4	2.7	0.47	7.2	1.4	1410	0.4
189	61	119	13.7	49.9	8.8	1.45	6.8	1	5.6	1	3.1	0.45	3.1	0.51	6.9	0.9	1370	0.4
190	27	60.1	7.32	30	6.7	1.68	6.1	1	5.9	1.2	3.5	0.51	3.4	0.58	4.8	0.9	222	0.5
42	36.1	69.2	8.94	35.6	7.5	1.57	6.9	1.1	6.1	1.1	3.4	0.47	3.3	0.56	3.6	1.2	125	0.3
41	138	228	23.8	83.5	15.7	4.32	15.1	2.5	14.5	2.7	7.6	1.06	6.4	1.02	4.4	1	216	0.4
40	35.5	69.4	8.58	34	7	1.55	6.1	1	5.4	1.1	3.1	0.46	3	0.52	4.1	1.1	99	0.5
22	38.1	72.9	9.49	37.5	7.9	1.62	6.9	1.1	6.1	1.2	3.3	0.49	3.3	0.57	3.9	1.2	341	0.4
21	113	189	20.7	73.5	14.1	3.63	13.3	2.2	12.4	2.4	6.6	0.93	5.8	0.91	3.8	1	362	0.4
20	32.2	62.4	8.04	32.3	6.8	1.52	6	1	5.6	1.1	3.1	0.47	3	0.52	4.1	1	457	0.4
152	29.6	57	6.68	25.2	4.9	1.12	4	0.6	3.8	0.7	2.1	0.32	2	0.34	4	1	942	0.4
146	34	68.8	8.31	33.5	7.2	1.79	6.7	1.1	6.3	1.2	3.6	0.53	3.6	0.62	4.8	0.9	172	0.4
144	17.8	33.6	4.06	15.3	3.1	0.83	2.7	0.4	2.5	0.5	1.5	0.22	1.4	0.25	2.6	0.7	1000	0.4
143	21.9	43.1	4.89	19	4	1.03	3.6	0.6	3.4	0.6	2	0.3	1.9	0.32	3.5	0.8	787	0.4
142	17.7	33.4	4.05	15.2	3.1	0.81	2.6	0.4	2.4	0.5	1.3	0.2	1.4	0.23	2.8	0.7	836	0.4
167	25.7	49	5.78	21.7	4.2	0.98	3.6	0.6	3.3	0.6	1.9	0.29	1.9	0.34	3.6	0.9	1030	0.4
176	18.1	34.8	4.24	16.1	3.3	0.83	2.7	0.4	2.6	0.5	1.4	0.21	1.4	0.23	2.8	0.8	1140	0.4
165	22.1	42.2	5.09	19.2	3.9	0.94	3.2	0.5	2.9	0.6	1.6	0.25	1.7	0.28	3.4	0.9	1150	0.4
141	15.8	29.8	3.75	14.4	2.9	0.77	2.5	0.4	2.3	0.5	1.4	0.2	1.3	0.23	2.4	0.6	937	0.4
140	20	37.4	4.55	17	3.3	0.88	3	0.5	2.6	0.5	1.5	0.22	1.5	0.26	3.1	0.8	798	0.4
139	19.4	36.8	4.46	17.1	3.3	0.86	2.8	0.5	2.6	0.5	1.5	0.23	1.5	0.26	3.1	0.8	496	0.4
138	17.6	32.9	4.08	15.7	3.2	0.81	2.8	0.5	2.7	0.5	1.5	0.23	1.6	0.25	2.8	0.7	1010	0.4
137	17.9	34	4.13	15.6	3.1	0.79	2.7	0.4	2.5	0.5	1.5	0.22	1.5	0.24	2.7	0.6	1070	0.4
136	18.9	37.2	4.57	17.7	3.5	0.91	2.9	0.5	2.5	0.5	1.4	0.22	1.5	0.23	2.8	0.5	999	0.3
135	31.5	62.9	7.49	28.3	5.3	1.08	4.4	0.7	3.7	0.7	2.1	0.31	2	0.33	3.9	0.6	931	0.3
134	26.1	51.6	6.3	24.2	4.7	1.09	3.9	0.6	3.5	0.7	1.8	0.28	1.9	0.32	3.9	0.6	1080	0.3
133	20.1	39.6	4.94	19	3.8	0.97	3.4	0.5	3	0.6	1.6	0.26	1.6	0.28	3.1	0.5	1190	0.3
132	22.7	45	5.52	21.3	4.2	1.01	3.4	0.5	3	0.5	1.6	0.23	1.6	0.26	3.4	0.6	1270	0.3
131	32.7	63.9	7.99	31.6	6.4	1.47	5.7	0.9	5.1	1	3	0.44	2.9	0.5	5.5	1	484	0.4
130	30.4	64.4	7.89	31.9	6.9	1.68	6.3	1	6	1.2	3.4	0.51	3.5	0.6	5.9	1	152	0.3
129	33.1	65.3	7.8	29.8	5.7	1.14	4.7	0.7	4	0.8	2.2	0.34	2.2	0.37	4.2	0.7	1350	0.3
128	28	55.7	6.77	25.8	5.1	1.1	4.1	0.6	3.7	0.7	2	0.3	1.9	0.33	3.8	0.6	1240	0.3
127	16.8	31.9	3.91	15.2	3	0.8	2.6	0.4	2.4	0.4	1.4	0.2	1.4	0.22	2.5	0.7	1670	0.4
126	30.1	57.5	6.67	24.7	4.5	0.92	3.7	0.6	3.5	0.7	2	0.32	2.1	0.37	4.9	1	965	0.4
125	16.7	31.8	3.95	15.4	3.2	0.79	2.9	0.5	2.6	0.5	1.6	0.23	1.5	0.27	2.8	0.7	918	0.4
124	27.1	51.7	6.11	22.8	4.3	0.95	3.7	0.6	3.3	0.6	2	0.29	2	0.34	4.2	1	811	0.4
123	24.2	46.7	5.5	20.5	3.9	0.92	3.2	0.5	2.9	0.6	1.8	0.27	1.8	0.31	3.4	0.9	1350	0.4
122	17.8	35.6	4.28	16.8	3.2	0.84	2.8	0.4	2.5	0.5	1.4	0.21	1.4	0.26	3	0.5	941	0.3
121	19.7	40.6	4.91	19.6	3.9	1.03	3.5	0.5	3.1	0.6	1.7	0.26	1.8	0.28	3.4	0.6	762	0.3
180	29.8	61.9	7.73	31.2	6.7	1.56	6.2	1	5.8	1.1	3.2	0.5	3.3	0.55	5.3	0.9	276	0.4
120	23.6	48.8	6	23.6	5	1.26	4.5	0.7	4.1	0.8	2.2	0.33	2.1	0.38	4.1	0.6	698	0.3
119	27.8	55.6	6.62	25.1	4.8	1.02	3.9	0.6	3.5	0.7	2	0.3	2	0.33	3.4	0.6	1430	0.3
118	42.2	85.2	10	37.7	7.2	1.3	6	0.9	5.2	1	2.9	0.44	2.9	0.49	4.8	0.8	1080	0.3
117	29	62.2	7.5	30.6	6.7	1.65	6.2	1	5.9	1.2	3.4	0.5	3.4	0.58	5.2	1	94	0.4

Appendix N – Fingerprinting Sediment Sources
Lower Snake River Programmatic Sediment Management Plan – Final EIS

116	32.2	64.7	8.07	30.6	6.2	1.39	5.3	0.8	4.7	0.9	2.6	0.39	2.6	0.43	5.3	0.7	836	0.2
115	33.6	66.1	8.2	30.9	6.5	1.48	5.6	0.9	5.1	1	2.9	0.41	2.8	0.45	5.4	0.7	442	0.3
179	24.5	42.3	4.8	16.9	2.8	0.8	2.2	0.4	2	0.4	1.1	0.16	1.1	0.17	2.7	0.3	958	0.3
114	23.9	44.8	5.48	20.2	3.7	0.9	3	0.4	2.5	0.5	1.5	0.21	1.4	0.23	3.1	0.4	1360	0.3
113	20.7	37.8	4.67	17	3.1	0.82	2.5	0.4	2.2	0.4	1.2	0.18	1.2	0.19	2.8	0.3	1330	0.3
112	19.5	37.4	4.68	17.4	3.4	0.87	2.9	0.4	2.5	0.5	1.4	0.21	1.4	0.22	3.1	0.4	1100	0.3
95	15.9	30.9	3.43	12.9	2.7	0.8	2.4	0.4	2.1	0.4	1.2	0.18	1.2	0.18	3.1	0.4	1620	0.3
94	18.8	33.8	4.25	15.3	2.7	0.72	2.1	0.3	1.9	0.4	1.1	0.16	1.1	0.18	2.6	0.2	1610	0.3
93	17.6	30.8	3.84	13.8	2.6	0.71	1.9	0.3	1.7	0.3	1	0.14	0.9	0.15	2.3	0.2	1400	0.3
92	21.1	37.1	4.45	15.9	2.8	0.81	2.1	0.3	1.9	0.4	1.1	0.15	1.1	0.17	2.6	0.3	1840	0.3
90	31.2	57.4	7.41	27.9	5.2	1.22	4.5	0.7	4.1	0.8	2.4	0.35	2.3	0.37	4.3	0.6	836	0.3
187	33.1	54.4	7.07	25.3	4.3	0.99	3.4	0.5	3	0.6	1.7	0.25	1.7	0.27	3.4	0.8	1170	0.3

Analyte Symbol	Pb	Th	U
Unit Symbol	ppm	ppm	ppm
Detection Limit	5	0.1	0.1
Analysis Method	FUS-MS	FUS-MS	FUS-MS
88	15	11.8	3.1
87	11	5.1	1.3
86	12	6.7	1.6
85	15	14.4	2.8
84	16	10.7	2.7
83	28	7.8	2.4
82	18	12.8	3.3
81	17	11.7	2.7
80	22	8.9	2.4
79	11	5.9	2
78	9	6.5	2.4
77	10	6.1	1.9
76	9	6.9	2.3
75	12	7	2.7
74	10	6	1.5
73	17	25.1	3.7
72	17	11.1	2.1
71	16	23.1	3
70	14	16.6	2.3
69	18	15.5	2.4
68	22	24	3.7
67	17	10.1	2.7
66	17	9.1	1.8
65	9	5.9	1.6
64	10	4.9	2
63	9	4.7	1.6
62	11	12	1.6
61	10	5.6	3.5
60	9	5	1.7
59	10	10.8	1.5
58	20	10.4	2.9
57	9	4.7	1.7
56	8	4	1.3
55	7	2.5	0.9
54	14	7.4	1.7
53	9	2.1	0.7
52	8	2	0.8

51	8	5	1.3
50	17	7	1.9
49	< 5	2.2	1
43	16	10.8	2.1
44	13	6	1.4
45	12	6.2	1.5
46	14	6.1	1.5
48	13	10	2.5
47	12	13.8	2.7
189	15	16.7	2.6
190	28	6.8	2.1
42	< 5	9.6	7.3
41	22	34.5	4.8
40	19	9.4	4.4
22	< 5	9.8	9.7
21	18	29.2	7.8
20	12	8.4	4.9
152	11	7.3	1.8
146	11	7.9	2.8
144	10	5.1	1.4
143	13	5.5	1.7
142	12	5.2	1.5
167	10	6.9	1.6
176	12	5.3	1.4
165	12	6.1	1.6
141	11	4.9	1.4
140	12	5.8	1.5
139	13	5.4	1.5
138	11	5.2	1.4
137	11	5.1	1.4
136	13	4.5	1.3
135	12	8.7	1.6
134	13	6.5	1.6
133	14	5.2	1.5
132	11	5.8	1.4
131	12	8.1	2.8
130	< 5	7.6	3.2
129	14	8.6	1.9
128	12	7.5	1.7
127	10	5	1.3
126	12	9	2.1
125	10	5	1.4
124	11	8.1	1.9
123	12	7.1	1.7
122	13	4.6	1.2
121	11	4.7	1.2
180	9	7.4	3.3
120	12	6	1.5

119	12	7.5	1.6
118	13	11.7	2.1
117	8	7.2	2.8
116	12	8.1	1.8
115	12	7.6	2
179	12	4	1
114	13	6.1	1.2
113	12	4.8	1
112	12	4.9	1.2
95	10	3.9	1.3
94	12	4.2	0.9
93	13	3.8	0.8
92	12	4.6	1
90	< 5	7.2	3
187	11	8	1.6

Analyte Symbol	SiO2	Al2O3	Fe2O3(T)	MnO	MgO	CaO	Na2O	K2O	TiO2	P2O5	LOI	Total	Sc	Be	V	Cr	Co
Unit Symbol	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.01	0.01	0.01	0.001	0.01	0.01	0.01	0.01	0.001	0.01	0.01	0.01	1	1	5	20	1
Analysis Method	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS	FUS-MS
NIST 694 Meas	11.61	1.93	0.84	0.013	0.36	42.9	0.88	0.55	0.119	30.18					1677		
NIST 694 Cert	11.2	1.8	0.79	0.0116	0.33	43.6	0.86	0.51	0.11	30.2					1740		
DNC-1 Meas	46.77	18.23	9.81	0.146	9.93	11.45	1.88	0.22	0.477	0.06				31	155	270	58
DNC-1 Cert	47.15	18.34	9.97	0.15	10.13	11.49	1.89	0.234	0.48	0.07				31	148	270	57
GBW 07113 Meas	72.83	13.06	3.31	0.143	0.15	0.59	2.51	5.44	0.282	0.04				5	4	< 5	
GBW 07113 Cert	72.8	13	3.21	0.14	0.16	0.59	2.57	5.43	0.3	0.05				5	4	5	
LKSD-3 Meas															80	31	
LKSD-3 Cert															87	30	
NIST 1633b Meas	48.69	28.59	11.36	0.019	0.78	2.18	0.27	2.32	1.313	0.58				41		307	
NIST 1633b Cert	49.2	28.4	11.1	0.02	0.8	2.11	0.27	2.35	1.32	0.53				41		296	
TDB-1 Meas																240	
TDB-1 Cert																251	
W-2a Meas	52.62	15.2	10.81	0.166	6.28	11.06	2.24	0.62	1.069	0.12				36	< 1	279	90
W-2a Cert	52.4	15.4	10.7	0.163	6.37	10.9	2.14	0.626	1.06	0.13				36	1.3	262	92
NIST 696 Meas	4.07	54.15	8.67	0.008	0.06	0.09		0.02	2.63	0.07						399	
NIST 696 Cert	3.79	54.5	8.7	0.004	0.012	0.018		0.009	2.64	0.05						403	
DTS-2b Meas	39.82	0.43			49.81	0.15								3		19	
DTS-2b Cert	39.4	0.45			49.4	0.12								3		22	
SY-4 Meas	49.61	20.52	6.08	0.107	0.51	8.13	6.93	1.65	0.288	0.14				1	3	8	
SY-4 Cert	49.9	20.69	6.21	0.108	0.54	8.05	7.1	1.66	0.287	0.131				1.1	2.6	8	
CTA-AC-1 Meas																< 1	
CTA-AC-1 Cert																2.72	
BIR-1a Meas	47.46	15.5	11.3	0.17	9.49	13.42	1.78	0.02	0.961	< 0.01				43	< 1	338	370
BIR-1a Cert	47.96	15.5	11.3	0.175	9.7	13.3	1.82	0.03	0.96	0.021				44	0.58	310	370
NCS DC86312 Meas																26	
NCS DC86312 Cert																26.2	
NCS DC70014 Meas																	
NCS DC70014 Cert																	
NCS DC86316 Meas																	
NCS DC86316 Cert																	
NCS DC70009 (GBW07241) Meas																30	3
NCS DC70009 (GBW07241) Cert																30	3.7
OREAS 100a (Fusion) Meas																17	
OREAS 100a (Fusion) Cert																	18.1
OREAS 101a (Fusion) Meas																	48
OREAS 101a (Fusion) Cert																	48.8

OREAS 101b (Fusion) Meas																	46
OREAS 101b (Fusion) Cert																	47
JR-1 Meas																< 20	1
JR-1 Cert																2.83	0.83
NCS DC86318 Meas																	
NCS DC86318 Cert																	
USZ 25-2006 Meas																	
USZ 25-2006 Cert																	
74 Orig	54.02	13.4	11.87	0.172	3.29	6.77	2.76	1.5	2.206	0.47	2.27	98.73	30	1	315	60	83
74 Dup	53.92	13.39	11.88	0.173	3.29	6.81	2.76	1.5	2.207	0.45	2.27	98.65	30	1	315	50	84
57 Orig	56.66	14.95	9.55	0.14	2.63	5.88	3.12	1.51	1.873	0.27	3.64	100.2	24	< 1	283	40	85
57 Dup	56.05	14.65	9.48	0.139	2.61	5.87	3.11	1.47	1.83	0.28	3.64	99.14	24	< 1	284	50	88
131 Orig	62.64	13.47	5.45	0.087	1.3	2.46	2.09	1.86	1.035	0.19	7.9	98.47	14	1	122	50	75
131 Dup	62.72	13.48	5.48	0.087	1.29	2.45	2.07	1.84	1.036	0.2	7.9	98.54	14	1	122	50	75
117 Orig	56.13	14.26	7.93	0.143	1.64	3.22	1.89	1.41	1.37	0.23	11.91	100.1	20	2	194	40	37
117 Dup	56.2	14.18	7.88	0.142	1.65	3.21	1.86	1.39	1.361	0.21	11.91	100	20	2	191	50	37
Method Blank																< 20	< 1
Method Blank																< 20	< 1

Analyte Symbol	Ni	Cu	Zn	Ga	Ge	As	Rb	Sr	Y	Zr	Nb	Mo	Ag	In	Sn	Sb	Cs
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm								
Detection Limit	20	10	30	1	1	5	2	2	4	1	2	0.5	0.5	0.2	1	0.5	
Analysis Method	FUS-MS	FUS-ICP	FUS-ICP	FUS-MS													
NIST 694 Meas																	
NIST 694 Cert																	
DNC-1 Meas	250	100	70					141	16	36							0.8
DNC-1 Cert	247	100	70					144	18	38							0.96
GBW 07113 Meas								38	46	399							
GBW 07113 Cert								43	43	403							
LKSD-3 Meas	50	30				27	75				8	< 2	2		2	1.1	2.4
LKSD-3 Cert	47	35				27	78				8	2	2.7		3	1.3	2.3
NIST 1633b Meas								1053									
NIST 1633b Cert								1040									
TDB-1 Meas	90	310	170				21										
TDB-1 Cert	92	323	155				23										
W-2a Meas	70	100	80	18	2	< 5	20	190	19	90	7	< 2	< 0.5			0.9	0.9
W-2a Cert	70	110	80	17	1	1.2	21	190	24	94	7.9	0.6	0.046			0.79	0.99
NIST 696 Meas									1035								
NIST 696 Cert									1040								
DTS-2b Meas																	
DTS-2b Cert																	
SY-4 Meas								1197	116	527							
SY-4 Cert								1191	119	517							
CTA-AC-1 Meas		60	30														
CTA-AC-1 Cert		54	38														
BIR-1a Meas	170	120	70	15		< 5		103	14	16	< 1						0.6
BIR-1a Cert	170	125	70	16		0.44		110	16	18	0.6						0.58
NCS DC86312 Meas																	
NCS DC86312 Cert																	
NCS DC70014 Meas	70	2630	7400	25							270	16.8					180
NCS DC70014 Cert	70.9	2600	7400	25.2							270	16.7					180
NCS DC86316 Meas																	
NCS DC86316 Cert																	
NCS DC70009 (GBW07241) Meas	< 20	920	100	17	11	70	503					1.7	1.3	1700		43.8	
NCS DC70009 (GBW07241) Cert	2.8	960	100	16.5	11.2	69.9	500					1.8	1.3	1701		41	
OREAS 100a (Fusion) Meas		160								23							
OREAS 100a (Fusion) Cert		169								24.1							
OREAS 101a (Fusion) Meas		450								20							
OREAS 101a (Fusion) Cert		434								21.9							
OREAS 101b (Fusion) Meas	< 20	390								19							
OREAS 101b (Fusion) Cert	9	416								20.9							
JR-1 Meas	< 20	< 10	40	17	3	15	248				15	3	< 0.5	< 0.2	3	20.9	

JR-1 Cert	1.67	2.68	30.6	16.1	1.88	16.3	257			15.2	3.25	0.031	0.028	2.86		20.8	
NCS DC86318 Meas																	
NCS DC86318 Cert																	
USZ 25-2006 Meas																	
USZ 25-2006 Cert																	
74 Orig	30	20	120	21	2	< 5	41	300	34	228	14	< 2	0.8	< 0.2	2	< 0.5	1.1
74 Dup	30	20	130	21	2	< 5	40	302	34	226	13	< 2	0.8	< 0.2	1	< 0.5	1.1
57 Orig	20	20	110	20	2	< 5	37	422	25	197	10	< 2	0.6	< 0.2	1	< 0.5	1.2
57 Dup	20	20	120	21	2	< 5	38	411	25	192	10	< 2	0.7	< 0.2	1	< 0.5	1.2
131 Orig	20	20	70	17	2	< 5	67	270	29	227	11	< 2	< 0.5	< 0.2	3	< 0.5	2.9
131 Dup	20	20	70	17	2	< 5	67	266	29	245	11	< 2	0.5	< 0.2	4	< 0.5	2.9
117 Orig	20	40	80	19	2	< 5	54	261	34	226	11	< 2	< 0.5	< 0.2	4	< 0.5	2.8
117 Dup	20	40	70	19	2	< 5	55	258	32	216	11	< 2	< 0.5	< 0.2	4	< 0.5	2.9
Method Blank Method Blank	< 20	< 10	< 30	< 1	< 1	< 5	< 2				< 1	< 2	< 0.5	< 0.2	< 1	< 0.5	< 0.5
Method Blank Method Blank	< 20	< 10	< 30	< 1	< 1	< 5	< 2				< 1	< 2	< 0.5	< 0.2	< 1	< 0.5	< 0.5

Appendix N – Fingerprinting Sediment Sources
 Lower Snake River Programmatic Sediment Management Plan – Final EIS

Analyte Symbol	Ba	Bi	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	3	0.4	0.1	0.1	0.05	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.05	0.1	0.04	0.2
Analysis Method	FUS-ICP	FUS-MS															
NIST 694 Meas																	
NIST 694 Cert																	
DNC-1 Meas	106		4			5		0.58							1.9		
DNC-1 Cert	118		3.6			5.2		0.59							2		
GBW 07113 Meas	497																
GBW 07113 Cert	506																
LKSD-3 Meas		49.9	90		44.1	8	1.45			1	4.9				2.8	0.42	
LKSD-3 Cert		52	90		44	8	1.5			1	4.9				2.7	0.4	
NIST 1633b Meas	702																
NIST 1633b Cert	709																
TDB-1 Meas		16.6	39.2		23.9		1.95								3.3		
TDB-1 Cert		17	41		23		2.1								3.4		
W-2a Meas	172	< 0.4	10.9	23.7		13.1	3.4	1.1		0.7	3.8	0.8	2.4	0.33	2.1	0.31	2.5
W-2a Cert	182	0.03	10	23		13	3.3	1		0.63	3.6	0.76	2.5	0.38	2.1	0.33	2.6
NIST 696 Meas																	
NIST 696 Cert																	
DTS-2b Meas	15																
DTS-2b Cert	16																
SY-4 Meas	337																
SY-4 Cert	340																
CTA-AC-1 Meas		2190	3330		1140	167	45.7	130	15.1						11	1.16	
CTA-AC-1 Cert		2176	3326		1087	162	46.7	124	13.9						11.4	1.08	
BIR-1a Meas	7	0.6	1.9		2.3	1.1	0.5	1.9							1.6	0.33	0.6
BIR-1a Cert	6	0.63	1.9		2.5	1.1	0.55	2							1.7	0.3	0.6
NCS DC86312 Meas		2360	178		1560			223	34.2	183	35.7	96.3	14.4	87.4			
NCS DC86312 Cert		2360	190		1600			225	34.6	183	35.7	96.2	15.1	87.79			
NCS DC70014 Meas	80.3	42.3	83.5	10.9	36.9	7.7	1.74	7	1.2	6.3	1.3	3.5	0.53	3.4	0.51		
NCS DC70014 Cert	80.3	45.3	87	10.8	39.9	8	1.8	7.4	1.1	6.7	1.3	3.5	0.57	3.3	0.5		
NCS DC86316 Meas																	712
NCS DC86316 Cert																	712
NCS DC70009 (GBW07241)																	
Meas		22.9	57.7	7.84	31.7	12.4		14.2	3.3	21.1	4.3	12.9	2.35	16.2	2.37		
NCS DC70009 (GBW07241) Cert		23.7	60.3	7.9	32.9	12.5		14.8	3.3	20.7	4.5	13.4	2.2	14.9	2.4		
OREAS 100a (Fusion) Meas		251	451	46.4	147	23.9	3.56	20.7	3.7	22.6	4.8	14.4	2.36	15.2	2.23		
OREAS 100a (Fusion) Cert		260	463	47.1	152	23.6	3.71	23.6	3.8	23.2	4.81	14.9	2.31	14.9	2.26		
OREAS 101a (Fusion) Meas		802	1400	131	394	50.3	8.02		5.5	31.6	6.5	19.2	2.93	18.5	2.64		
OREAS 101a (Fusion) Cert		816	1396	134	403	48.8	8.06		5.92	33.3	6.46	19.5	2.9	17.5	2.66		
OREAS 101b (Fusion) Meas		773	1340	126	380	48.8	7.76		5.4	31.1	6.4	18.5	2.89	18.1	2.59		
OREAS 101b (Fusion) Cert		789	1331	127	378	48	7.77		5.37	32.1	6.34	18.7	2.66	17.6	2.58		
JR-1 Meas	0.5	19.9	47.2	6.09	23.6	6	0.28	5.1					3.6	0.71	4.8	4.4	
JR-1 Cert	0.56	19.7	47.2	5.58	23.3	6.03	0.3	5.06					3.61	0.67	4.55	4.51	
NCS DC86318 Meas					735	3330											

NCS DC86318 Cert					740	3430											
USZ 25-2006 Meas		18700	29900		8680												
USZ 25-2006 Cert		19300	29000		8800												
74 Orig	944	< 0.4	31	62.7	7.66	31.9	7.3	2.33	7.3	1.2	6.9	1.3	3.8	0.54	3.6	0.58	5.8
74 Dup	944	< 0.4	30.8	61.8	7.49	31.3	7.2	2.29	7.3	1.2	6.5	1.3	3.6	0.53	3.4	0.55	5.8
57 Orig	717	< 0.4	22.1	44.9	5.36	22.6	5	1.59	4.9	0.8	4.6	0.9	2.6	0.39	2.6	0.41	5.1
57 Dup	707	< 0.4	22.1	45.4	5.46	22.5	5.2	1.63	5.1	0.8	4.9	1	2.7	0.4	2.7	0.42	5.1
131 Orig	690	< 0.4	32.9	64	7.97	31.6	6.3	1.47	5.7	0.9	5.1	1	3	0.44	2.9	0.5	5.3
131 Dup	688	< 0.4	32.5	63.7	8	31.6	6.4	1.48	5.6	0.9	5.2	1	3	0.44	2.9	0.5	5.8
117 Orig	658	< 0.4	28.4	61.1	7.38	30.1	6.7	1.62	6.1	1	5.8	1.2	3.4	0.5	3.4	0.58	5.2
117 Dup	651	< 0.4	29.6	63.2	7.63	31.1	6.8	1.67	6.3	1	6	1.2	3.5	0.5	3.3	0.58	5.2
Method Blank Method Blank	< 0.4	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.05	< 0.1	< 0.04	< 0.2
Method Blank Method Blank	< 0.4	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.05	< 0.1	< 0.04	< 0.2

Analyte Symbol	Ta	W	Tl	Pb	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.1	1	0.1	5	0.1	0.1
Analysis Method	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS
NIST 694 Meas						
NIST 694 Cert						
DNC-1 Meas						
DNC-1 Cert						
GBW 07113 Meas						
GBW 07113 Cert						
LKSD-3 Meas	0.7	1		10.2	4.5	
LKSD-3 Cert	0.7	2		11.4	4.6	
NIST 1633b Meas						
NIST 1633b Cert						
TDB-1 Meas				2.6		
TDB-1 Cert				2.7		
W-2a Meas	0.5	< 1	< 0.1	8	2.2	0.5
W-2a Cert	0.5	0.3	0.2	9.3	2.4	0.53
NIST 696 Meas						
NIST 696 Cert						
DTS-2b Meas						
DTS-2b Cert						
SY-4 Meas						
SY-4 Cert						
CTA-AC-1 Meas	2.8			4.2		
CTA-AC-1 Cert	2.65			4.4		
BIR-1a Meas			< 5			
BIR-1a Cert			3			
NCS DC86312 Meas				25.8		
NCS DC86312 Cert				23.6		
NCS DC70014 Meas		27200				
NCS DC70014 Cert		27200				
NCS DC86316 Meas						
NCS DC86316 Cert						
NCS DC70009 (GBW07241)						
Meas	2200			27.9		
NCS DC70009 (GBW07241)						
Cert	2200			28.3		
OREAS 100a (Fusion) Meas				50.6	138	
OREAS 100a (Fusion) Cert				51.6	135	
OREAS 101a (Fusion) Meas				35.3	421	
OREAS 101a (Fusion) Cert				36.6	422	
OREAS 101b (Fusion) Meas				36.7	399	
OREAS 101b (Fusion) Cert				37.1	396	
JR-1 Meas	1.8	1.6	18	26.5	9.1	

JR-1 Cert	1.86	1.56	19.3	26.7	8.88
NCS DC86318 Meas					
NCS DC86318 Cert					
USZ 25-2006 Meas					
USZ 25-2006 Cert					
74 Orig	1	383	0.2	10	6.1
74 Dup	1	374	0.2	11	6
57 Orig	0.7	454	0.2	8	4.6
57 Dup	0.8	479	0.2	10	4.8
131 Orig	1	479	0.4	12	7.9
131 Dup	1	489	0.4	12	8.2
117 Orig	0.9	95	0.4	10	7.1
117 Dup	1	93	0.3	5	7.3
Method Blank Method Blank	< 0.1	< 1	< 0.1	< 5	< 0.1
Method Blank Method Blank	< 0.1	< 1	< 0.1	< 5	< 0.1

Appendix N – Fingerprinting Sediment Sources
 Lower Snake River Programmatic Sediment Management Plan – Final EIS

Analyte Symbol	SiO2	Al2O3	Fe2O3(T)	MnO	MgO	CaO	Na2O	K2O	TiO2	P2O5	LOI	Sc	V	Co	Ga	Rb	Sr	Y
Unit Symbol	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.01	0.01	0.01	0.001	0.01	0.01	0.01	0.01	0.001	0.01	1	FUS-ICP	5	1	FUS-MS	2	2	2
Analysis Method	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS	FUS-MS	FUS-ICP	FUS-ICP	FUS-ICP
197	66.62	13.21	4.52	0.12	1.06	1.96	2.10	2.25	0.92	0.20	7.64	11.00	97.00	43.00	17.00	83.00	276.00	32.00
198	64.78	12.86	5.37	0.11	1.42	2.42	2.13	2.03	1.05	0.14	6.07	13.00	121.00	35.00	17.00	70.00	273.00	28.00
212	69.11	12.57	4.41	0.07	1.26	2.80	2.92	2.46	0.85	0.12	1.88	9.00	86.00	93.00	17.00	71.00	390.00	40.00
221	61.71	14.88	6.32	0.17	1.08	2.05	1.89	1.66	1.13	0.20	9.85	14.00	138.00	52.00	19.00	73.00	266.00	29.00
230	49.96	14.54	9.23	0.14	2.50	5.09	2.61	1.14	1.61	0.39	12.74	25.00	244.00	34.00	19.00	47.00	304.00	23.00
196	53.11	13.57	13.09	0.20	2.71	4.94	2.07	1.52	1.78	0.37	7.29	26.00	288.00	71.00	20.00	57.00	305.00	34.00
199	54.57	14.24	11.34	0.15	3.15	6.56	2.87	1.40	2.36	0.33	3.42	29.00	375.00	66.00	21.00	40.00	338.00	29.00
211	66.61	13.11	5.01	0.08	1.54	2.83	2.53	2.15	0.96	0.16	3.69	11.00	99.00	135.00	17.00	71.00	332.00	48.00
219	53.04	14.07	12.07	0.17	2.93	6.08	2.75	1.32	2.29	0.32	4.94	30.00	374.00	48.00	21.00	39.00	349.00	30.00
228	48.39	13.66	17.03	0.26	1.68	4.95	2.19	0.63	2.81	0.39	7.66	37.00	421.00	65.00	23.00	26.00	304.00	43.00
236	69.78	13.38	4.03	0.07	1.64	2.99	2.71	2.40	0.62	0.12	1.94	11.00	86.00	122.00	17.00	82.00	385.00	21.00
213	60.30	13.46	6.35	0.13	0.99	2.19	1.69	1.65	1.14	0.25	10.22	15.00	141.00	40.00	18.00	65.00	243.00	33.00
222	55.85	14.16	9.56	0.15	2.64	6.06	2.98	1.42	1.82	0.24	3.90	23.00	290.00	43.00	20.00	37.00	397.00	25.00
229	57.55	13.92	8.08	0.15	1.84	3.96	2.09	1.45	1.19	0.21	8.71	21.00	197.00	34.00	18.00	45.00	257.00	22.00
191	75.47	12.10	2.46	0.04	0.74	2.13	2.75	2.72	0.35	0.05	0.84	7.00	49.00	243.00	15.00	72.00	400.00	10.00
200	54.53	14.02	11.03	0.15	3.04	6.16	2.76	1.36	2.20	0.30	4.08	29.00	347.00	36.00	20.00	40.00	328.00	28.00
206	72.25	11.11	5.78	0.12	1.34	3.02	2.37	2.05	0.99	0.11	0.67	14.00	119.00	216.00	14.00	53.00	326.00	36.00
214	55.80	13.12	11.42	0.16	2.96	6.50	3.05	1.46	2.12	0.30	1.43	28.00	364.00	117.00	20.00	37.00	358.00	27.00
223	48.82	15.08	14.05	0.18	2.83	7.93	3.19	1.14	3.19	0.43	1.81	31.00	380.00	57.00	24.00	31.00	362.00	39.00
231	72.58	12.88	2.48	0.04	0.86	2.06	3.10	3.08	0.38	0.09	1.19	6.00	43.00	160.00	15.00	90.00	373.00	17.00
235	73.57	12.07	3.81	0.10	1.09	2.61	2.85	2.55	0.79	0.10	0.78	9.00	77.00	157.00	14.00	70.00	363.00	29.00
39	55.83	13.47	6.68	0.10	1.92	2.72	1.82	1.97	0.97	0.26	13.38	16.00	133.00	51.00	17.00	74.00	245.00	34.00
36	60.32	13.31	6.44	0.11	1.92	3.06	2.21	2.01	1.01	0.22	7.55	16.00	139.00	58.00	17.00	71.00	282.00	28.00
35	56.84	13.72	6.67	0.10	1.95	2.95	1.94	2.08	0.96	0.28	13.39	16.00	133.00	29.00	21.00	85.00	259.00	34.00
175	56.75	13.10	6.32	0.09	1.88	3.05	2.06	1.97	0.97	0.24	12.22	15.00	135.00	59.00	19.00	75.00	268.00	31.00
27	58.00	13.32	6.69	0.09	2.03	3.16	2.07	1.90	1.08	0.22	10.31	17.00	148.00	38.00	18.00	70.00	273.00	30.00
30	57.57	13.37	6.11	0.10	1.88	3.17	2.24	2.18	0.97	0.26	10.86	15.00	134.00	40.00	18.00	77.00	290.00	31.00
26	53.65	13.40	6.53	0.12	1.88	2.95	1.92	1.98	0.96	0.29	16.38	16.00	135.00	37.00	20.00	84.00	263.00	36.00
19	55.59	13.13	6.40	0.10	1.96	3.23	2.29	2.17	1.01	0.25	12.65	15.00	135.00	45.00	19.00	79.00	300.00	33.00
14	55.84	13.56	5.80	0.11	1.80	2.96	2.21	2.29	0.89	0.24	12.67	14.00	119.00	46.00	18.00	85.00	291.00	33.00
17	52.20	13.07	6.89	0.14	1.91	3.32	1.94	1.86	1.01	0.33	17.53	17.00	149.00	29.00	20.00	74.00	270.00	36.00
10	54.92	13.23	6.85	0.14	1.94	3.57	2.13	1.89	1.04	0.31	14.79	17.00	150.00	43.00	17.00	65.00	301.00	34.00
174	61.07	12.35	5.48	0.12	1.67	2.86	2.22	2.14	0.88	0.23	10.13	13.00	118.00	68.00	16.00	72.00	291.00	28.00
173	63.86	12.85	4.95	0.08	1.62	3.00	2.79	2.58	0.77	0.17	5.57	11.00	101.00	68.00	17.00	83.00	340.00	26.00
172	65.97	12.74	5.23	0.09	1.63	3.23	2.83	2.41	1.03	0.17	3.43	13.00	129.00	91.00	16.00	69.00	347.00	30.00
7	56.32	13.01	6.26	0.12	1.90	3.38	2.39	2.08	0.97	0.24	12.13	15.00	138.00	56.00	17.00	72.00	326.00	30.00
5	51.84	13.48	8.30	0.17	1.92	3.65	1.86	1.43	1.27	0.36	16.01	21.00	189.00	49.00	21.00	59.00	255.00	38.00
181	61.51	13.59	5.88	0.09	2.08	3.40	2.68	2.42	0.88	0.19	6.48	13.00	115.00	90.00	17.00	79.00	339.00	27.00
178	66.90	13.37	4.97	0.07	1.86	3.76	3.04	2.28	0.87	0.13	1.53	13.00	128.00	152.00	16.00	63.00	392.00	20.00
159	53.68	11.47	5.57	0.13	1.52	2.69	1.58	1.63	0.77	0.37	20.34	14.00	114.00	62.00	14.00	57.00	236.00	28.00

156	70.50	13.50	3.95	0.06	1.43	3.02	2.97	2.63	0.66	0.12	1.32	11.00	94.00	97.00	15.00	74.00	382.00	18.00
155	61.54	12.39	4.73	0.09	1.48	2.84	2.51	2.48	0.72	0.18	9.51	11.00	97.00	109.00	15.00	77.00	330.00	24.00
148	71.73	12.55	3.36	0.05	1.19	2.82	3.06	2.60	0.54	0.10	0.87	9.00	79.00	120.00	15.00	71.00	373.00	14.00
109	78.11	10.29	2.23	0.03	0.64	2.06	2.42	2.42	0.35	0.07	0.72	6.00	54.00	290.00	11.00	55.00	337.00	10.00
100	76.66	10.67	2.91	0.05	0.87	2.43	2.47	2.29	0.47	0.07	0.75	8.00	66.00	224.00	12.00	53.00	348.00	13.00
99	75.99	11.04	2.45	0.04	0.76	2.25	2.66	2.51	0.37	0.05	0.64	6.00	56.00	193.00	12.00	56.00	367.00	9.00
185	74.16	11.49	2.92	0.05	0.93	2.54	2.67	2.31	0.43	0.07	1.58	8.00	65.00	180.00	12.00	52.00	374.00	16.00
89	74.05	11.36	2.88	0.05	0.90	2.51	2.66	2.30	0.42	0.08	1.29	8.00	64.00	176.00	13.00	54.00	364.00	16.00
186	62.64	13.25	5.55	0.09	1.29	2.38	2.06	1.87	1.01	0.16	7.95	14.00	124.00	81.00	16.00	64.00	268.00	29.00
188	70.87	12.34	3.91	0.07	1.11	2.45	2.95	2.88	0.70	0.09	1.07	9.00	92.00	143.00	15.00	77.00	357.00	19.00

Appendix N – Fingerprinting Sediment Sources
 Lower Snake River Programmatic Sediment Management Plan – Final EIS

Analyte Symbol	Zr	Nb	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	
Detection Limit	4	1	0.5	3	0.1	0.1	0.05	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.05	0.1	
Analysis Method	FUS-ICP	FUS-MS	FUS-MS	FUS-ICP	FUS-MS													
197	321.00	13.00	3.20	733.00	51.00	96.40	11.30	38.90	7.40	1.64	6.40	1.00	5.90	1.10	3.40	0.50	3.20	0.56
198	274.00	13.00	3.30	658.00	44.50	85.60	9.87	35.00	6.80	1.54	5.90	0.90	5.40	1.00	3.10	0.45	3.00	0.51
212	446.00	15.00	1.80	868.00	105.00	195.00	22.30	73.60	13.00	1.73	9.60	1.40	7.80	1.50	4.30	0.60	3.90	0.69
221	292.00	14.00	3.50	731.00	41.80	91.90	9.60	34.00	6.80	1.56	6.00	0.90	5.40	1.00	3.00	0.44	2.90	0.51
230	145.00	8.00	2.90	434.00	20.80	42.70	5.27	19.70	4.50	1.32	4.30	0.70	4.50	0.90	2.50	0.36	2.30	0.41
196	207.00	11.00	3.00	644.00	34.00	71.30	8.51	32.20	6.90	1.85	6.90	1.10	6.70	1.30	3.80	0.54	3.40	0.58
199	230.00	13.00	1.20	682.00	28.80	56.40	7.30	26.90	5.90	1.92	6.00	0.90	5.80	1.10	3.20	0.46	3.00	0.49
211	573.00	16.00	2.30	731.00	112.00	214.00	24.60	83.40	14.80	1.98	11.50	1.60	9.30	1.70	5.10	0.72	4.70	0.82
219	284.00	12.00	1.20	652.00	25.90	51.80	6.74	26.20	5.90	1.88	6.10	1.00	5.80	1.10	3.30	0.46	2.90	0.52
228	276.00	16.00	1.80	495.00	27.50	62.00	8.31	33.60	8.40	2.43	8.80	1.40	8.80	1.70	4.70	0.66	4.30	0.72
236	242.00	14.00	2.30	798.00	36.80	67.40	7.85	26.10	4.90	1.10	4.30	0.70	4.20	0.80	2.50	0.36	2.30	0.39
213	260.00	13.00	3.10	671.00	39.00	76.10	9.14	32.70	6.80	1.59	6.20	1.00	5.80	1.10	3.30	0.48	3.10	0.55
222	155.00	10.00	1.10	712.00	23.00	45.20	5.83	22.70	5.00	1.67	5.10	0.80	4.90	1.00	2.80	0.40	2.60	0.43
229	164.00	8.00	2.80	580.00	19.90	41.10	5.11	19.30	4.40	1.26	4.30	0.70	4.30	0.80	2.50	0.34	2.30	0.40
191	117.00	4.00	1.20	974.00	20.20	36.50	4.31	14.50	2.70	0.83	2.20	0.30	2.00	0.40	1.10	0.16	1.10	0.18
200	217.00	11.00	1.20	656.00	26.40	52.00	6.71	25.10	5.60	1.78	5.60	0.90	5.30	1.00	3.00	0.42	2.80	0.49
206	278.00	10.00	1.00	762.00	53.10	99.60	11.50	38.30	6.90	1.32	5.90	0.90	6.30	1.30	4.10	0.62	4.10	0.71
214	291.00	11.00	0.90	710.00	24.00	47.20	6.23	23.80	5.50	1.80	5.70	0.90	5.60	1.10	3.10	0.43	2.80	0.48
223	227.00	19.00	1.00	557.00	27.20	65.60	7.94	35.00	8.60	2.51	8.70	1.50	8.20	1.60	4.30	0.64	4.00	0.61
231	165.00	13.00	2.40	941.00	31.80	60.00	6.31	22.60	4.10	0.90	3.40	0.50	3.00	0.60	1.70	0.27	1.80	0.27
235	336.00	19.00	1.70	823.00	67.60	127.00	13.00	44.10	7.40	1.16	5.70	0.90	5.00	1.00	3.10	0.49	3.30	0.53
39	172.00	17.00	5.40	661.00	43.90	84.50	9.88	38.00	8.00	1.64	7.10	1.10	6.10	1.20	3.40	0.51	3.40	0.54
36	201.00	13.00	4.10	713.00	36.70	72.50	8.24	31.60	6.60	1.43	5.60	0.90	5.20	1.00	2.90	0.45	3.00	0.47
35	186.00	19.00	5.10	684.00	42.90	76.80	9.92	36.30	7.60	1.56	7.00	1.10	6.30	1.20	3.50	0.51	3.50	0.57
175	189.00	16.00	4.50	688.00	41.00	79.80	9.30	35.40	7.60	1.61	6.80	1.10	6.00	1.10	3.30	0.49	3.30	0.54
27	198.00	16.00	4.10	685.00	38.50	75.50	8.61	33.20	7.00	1.60	6.30	1.00	5.60	1.20	3.20	0.48	3.30	0.51
30	210.00	15.00	4.30	729.00	42.30	81.30	9.36	35.70	7.40	1.52	6.60	1.00	5.80	1.10	3.30	0.50	3.30	0.54
26	196.00	17.00	5.20	671.00	41.30	78.90	10.30	38.90	8.30	1.68	7.20	1.10	6.40	1.30	3.60	0.54	3.40	0.56
19	207.00	18.00	4.40	728.00	42.30	82.10	9.59	36.50	7.50	1.59	6.70	1.00	5.80	1.20	3.20	0.51	3.30	0.52
14	224.00	16.00	5.10	721.00	49.30	93.80	10.90	41.30	8.50	1.61	7.10	1.10	6.20	1.20	3.40	0.53	3.40	0.54
17	196.00	17.00	4.50	659.00	41.90	74.70	9.91	37.20	7.80	1.60	7.30	1.20	6.60	1.30	3.60	0.52	3.60	0.59
10	217.00	13.00	4.00	680.00	40.40	77.00	9.34	35.80	7.60	1.64	6.70	1.10	6.00	1.20	3.40	0.52	3.40	0.53
174	254.00	16.00	3.80	719.00	42.50	82.30	9.19	34.70	6.90	1.36	5.90	0.90	5.10	1.00	2.90	0.44	2.90	0.47
173	242.00	16.00	3.50	819.00	40.50	77.70	8.48	31.50	6.10	1.22	5.20	0.80	4.60	0.90	2.60	0.39	2.60	0.42
172	346.00	19.00	2.60	822.00	53.70	104.00	11.20	40.00	7.50	1.35	6.00	1.00	5.50	1.10	3.10	0.48	3.10	0.51
7	200.00	15.00	4.00	753.00	38.00	71.10	8.55	33.30	7.00	1.55	6.20	1.00	5.40	1.10	3.00	0.46	3.00	0.51
5	188.00	15.00	3.10	655.00	37.80	69.10	9.32	36.10	7.90	1.91	7.70	1.20	7.10	1.40	4.10	0.62	4.10	0.69
181	211.00	16.00	3.70	787.00	36.20	70.40	8.04	30.20	6.10	1.30	5.30	0.90	4.80	0.90	2.60	0.42	2.70	0.43
178	181.00	13.00	2.20	808.00	31.00	60.10	6.61	24.40	4.80	1.13	4.10	0.70	3.70	0.70	2.10	0.31	2.00	0.31
159	166.00	11.00	4.30	571.00	33.20	64.90	7.62	29.60	6.00	1.34	5.50	0.90	4.90	1.00	2.70	0.42	2.70	0.44

156	181.00	13.00	2.30	851.00	28.00	53.30	5.82	21.60	4.30	1.01	3.60	0.60	3.20	0.60	1.80	0.27	1.80	0.29
155	191.00	13.00	3.40	777.00	36.50	68.10	7.66	28.40	5.50	1.12	4.60	0.80	4.10	0.80	2.40	0.36	2.20	0.37
148	122.00	10.00	1.90	881.00	23.20	44.80	4.88	18.20	3.70	0.92	3.00	0.50	2.80	0.50	1.50	0.23	1.60	0.25
109	93.00	4.00	1.00	895.00	11.40	22.40	2.61	10.00	2.00	0.65	1.80	0.30	1.60	0.30	1.00	0.15	1.00	0.16
100	114.00	5.00	1.00	849.00	19.60	38.10	4.15	15.20	3.00	0.80	2.60	0.40	2.40	0.50	1.40	0.21	1.40	0.24
99	95.00	4.00	1.10	928.00	14.30	28.00	3.29	12.20	2.50	0.71	2.10	0.30	1.80	0.40	1.00	0.14	1.00	0.16
185	110.00	6.00	1.20	865.00	23.10	42.70	4.99	18.90	3.50	0.93	3.10	0.50	2.80	0.50	1.50	0.23	1.50	0.24
89	105.00	5.00	1.20	848.00	21.60	42.40	4.69	17.20	3.30	0.94	2.80	0.50	2.80	0.60	1.70	0.24	1.60	0.25
186	213.00	13.00	3.10	715.00	39.50	77.50	8.97	33.80	6.80	1.51	5.90	1.00	5.30	1.10	3.00	0.47	3.10	0.48
188	217.00	16.00	2.10	937.00	32.00	61.00	6.51	23.60	4.30	0.91	3.60	0.60	3.50	0.70	2.10	0.34	2.20	0.35

Analyte Symbol	Hf	Ta	W	Th	U
Unit Symbol	ppm	ppm	ppm	ppm	ppm
Detection Limit	0.2	0.1	1	0.1	0.1
Analysis Method	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS
197	7.50	1.10	270.00	11.90	3.40
198	6.80	1.10	186.00	10.40	2.80
212	10.90	1.00	717.00	26.90	4.00
221	6.70	1.10	239.00	9.70	3.10
230	3.70	0.60	90.00	4.60	1.60
196	4.50	0.90	327.00	7.00	2.10
199	5.30	1.00	314.00	5.80	2.10
211	12.80	1.30	883.00	31.20	5.20
219	6.50	0.80	134.00	5.10	1.90
228	5.80	1.20	131.00	3.90	1.40
236	5.50	1.10	971.00	9.40	2.60
213	6.20	1.00	192.00	9.00	2.70
222	4.10	0.70	143.00	3.90	1.70
229	3.60	0.60	83.00	4.50	1.60
191	2.60	0.30	1590.00	4.50	1.10
200	4.60	0.80	75.00	5.30	1.90
206	5.60	0.80	1450.00	12.00	2.00
214	6.80	0.70	581.00	4.40	1.60
223	5.90	1.30	131.00	3.90	1.40
231	4.20	1.00	1170.00	8.70	2.10
235	8.00	1.50	1190.00	16.30	2.80
39	4.50	1.30	262.00	11.90	9.00
36	4.80	1.10	347.00	9.60	4.70
35	4.90	1.30	85.00	12.00	8.00
175	5.10	1.20	321.00	11.00	6.80
27	5.10	1.20	185.00	10.00	5.70
30	5.10	1.40	224.00	11.40	6.40
26	4.70	1.30	153.00	11.80	12.20
19	5.40	1.30	240.00	11.20	9.20
14	4.90	1.40	227.00	12.90	12.40
17	5.00	1.20	77.00	10.80	12.60
10	4.70	1.10	233.00	8.80	9.10
174	6.30	1.20	524.00	12.00	3.90
173	6.00	1.20	570.00	11.10	3.50
172	8.10	1.40	730.00	15.30	3.60
7	5.00	1.20	371.00	9.40	9.20
5	5.30	0.90	200.00	8.30	7.70
181	5.10	1.20	614.00	9.90	5.40
178	4.60	1.00	1120.00	8.30	2.10
159	3.80	0.80	401.00	8.00	6.20

156	4.00	1.00	791.00	7.80	2.10
155	4.40	1.10	831.00	11.00	5.20
148	3.10	0.80	985.00	6.50	1.80
109	2.30	0.20	2320.00	3.20	1.00
100	2.80	0.40	1890.00	4.60	1.20
99	2.30	0.30	1690.00	4.10	1.10
185	3.00	0.40	1500.00	5.40	1.50
89	2.80	0.40	1550.00	5.40	1.30
186	5.80	1.00	601.00	9.40	3.30
188	5.60	1.50	1310.00	9.90	2.70

Appendix N – Fingerprinting Sediment Sources
 Lower Snake River Programmatic Sediment Management Plan – Final EIS

Analyte Symbol	SiO2	Al2O3	Fe2O3(T)	MnO	MgO	CaO	Na2O	K2O	TiO2	P2O5	LOI	Total	Sc	Be	V	Cr
Unit Symbol	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm	ppm	ppm
Detection Limit	0.01	0.01	0.01	0.001	0.01	0.01	0.01	0.01	0.001	0.01	0.01	0.01	1	1	5	20
Analysis Method	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS
NIST 694 Meas	11.48	1.94	0.76	0.012	0.35	43.61	0.89	0.57	0.12	30.22						1694
NIST 694 Cert	11.2	1.8	0.79	0.0116	0.33	43.6	0.86	0.51	0.11	30.2						1740
DNC-1 Meas	47.21	18.38	9.83	0.148	10.14	11.29	1.9	0.23	0.485	0.06						270
DNC-1 Cert	47.15	18.34	9.97	0.15	10.13	11.49	1.89	0.234	0.48	0.07						270
GBW 07113 Meas	72.17	12.54	3.21	0.141	0.14	0.58	2.44	5.37	0.277	0.03			5	4	< 5	
GBW 07113 Cert	72.8	13	3.21	0.14	0.16	0.59	2.57	5.43	0.3	0.05			5	4	5	
LKSD-3 Meas																70
LKSD-3 Cert																87
TDB-1 Meas																230
TDB-1 Cert																251
W-2a Meas	52.68	15.34	10.88	0.167	6.3	10.85	2.25	0.63	1.068	0.11			35	< 1	275	80
W-2a Cert	52.4	15.4	10.7	0.163	6.37	10.9	2.14	0.626	1.06	0.13			36	1.3	262	92
SY-4 Meas	50.53	20.61	6.23	0.108	0.52	8.03	7.11	1.71	0.292	0.11			1	3	< 5	
SY-4 Cert	49.9	20.69	6.21	0.108	0.54	8.05	7.1	1.66	0.287	0.131			1.1	2.6	8	
CTA-AC-1 Meas																
CTA-AC-1 Cert																
BIR-1a Meas	48.1	15.8	11.39	0.172	9.64	13.36	1.82	0.02	0.977	0.01			44	< 1	335	370
BIR-1a Cert	47.96	15.5	11.3	0.175	9.7	13.3	1.82	0.03	0.96	0.021			44	0.58	310	370
NCS DC86312 Meas																
NCS DC86312 Cert																
NCS DC70014 Meas																
NCS DC70014 Cert																
NCS DC70009 (GBW07241) Meas																30
NCS DC70009 (GBW07241) Cert																30
OREAS 100a (Fusion) Meas																
OREAS 100a (Fusion) Cert																
OREAS 101a (Fusion) Meas																
OREAS 101a (Fusion) Cert																
OREAS 101b (Fusion) Meas																
OREAS 101b (Fusion) Cert																
JR-1 Meas																< 20
JR-1 Cert																2.83
212 Orig	68.85	12.69	4.39	0.068	1.26	2.79	2.89	2.44	0.85	0.12	1.88	98.25	9	1	87	30
212 Dup	69.38	12.46	4.43	0.069	1.26	2.8	2.94	2.48	0.84	0.12	1.88	98.65	9	2	86	30
35 Orig	56.62	13.79	6.67	0.098	1.95	2.96	1.94	2.08	0.964	0.28	13.39	100.7	16	3	133	50
35 Dup	57.06	13.65	6.66	0.097	1.94	2.94	1.94	2.08	0.952	0.28	13.39	101	16	3	132	50
Method Blank																< 20
Method Blank																< 20

Analyte Symbol	Co	Ni	Cu	Zn	Ga	Ge	As	Rb	Sr	Y	Zr	Nb	Mo	Ag	In	Sn	Sb
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm									
Detection Limit	1	20	10	30	1	1	5	2	2	2	4	1	2	0.5	0.2	0.5	
Analysis Method	FUS-MS	FUS-ICP	FUS-ICP	FUS-ICP	FUS-MS	FUS-MS	FUS-MS	FUS-MS	FUS-MS								
NIST 694 Meas																	
NIST 694 Cert																	
DNC-1 Meas	57	250	90	70					140	16	34						1.2
DNC-1 Cert	57	247	100	70					144	18	38						0.96
GBW 07113 Meas									38	45	393						
GBW 07113 Cert									43	43	403						
LKSD-3 Meas	32	50	30	150			26	67				< 2	2.8		2	0.7	
LKSD-3 Cert	30	47	35	152			27	78				2	2.7		3	1.3	
TDB-1 Meas			90	320	150			21									
TDB-1 Cert			92	323	155			23									
W-2a Meas	43	70	110	80	18	2	< 5	19	193	20	85	6	< 2	< 0.5		1.3	
W-2a Cert	43	70	110	80	17	1	1.2	21	190	24	94	7.9	0.6	0.046		0.79	
SY-4 Meas									1223	119	556						
SY-4 Cert									1191	119	517						
CTA-AC-1 Meas	< 1			60													
CTA-AC-1 Cert	2.72			54													
BIR-1a Meas	54	170	130	80	15		< 5		105	15	15	< 1					0.6
BIR-1a Cert	52	170	125	70	16		0.44		110	16	18	0.6					0.58
NCS DC86312 Meas																	
NCS DC86312 Cert																	
NCS DC70014 Meas	25	70	2580	7400	25							270	16.7				180
NCS DC70014 Cert	26.2	70.9	2600	7400	25.2							270	16.7				180
NCS DC70009 (GBW07241) Meas	3	< 20	1030	110	18	11	71	516						1.8	1.3	1700	4.1
NCS DC70009 (GBW07241) Cert	3.7	2.8	960	100	16.5	11.2	69.9	500						1.8	1.3	1701	3.1
OREAS 100a (Fusion) Meas	17			170							23						
OREAS 100a (Fusion) Cert	18.1			169							24.1						
OREAS 101a (Fusion) Meas	48			420							20						
OREAS 101a (Fusion) Cert	48.8			434							21.9						
OREAS 101b (Fusion) Meas	44	< 20		400							19						
OREAS 101b (Fusion) Cert	47	9		416							20.9						
JR-1 Meas	< 1	< 20	< 10	< 30	16	3	16	232				11	3	< 0.5	< 0.2	3	1.3
JR-1 Cert	0.83	1.67	2.68	30.6	16.1	1.88	16.3	257				15.2	3.25	0.031	0.028	2.86	1.19
212 Orig	93	< 20	< 10	50	17	2	< 5	70	389	39	445	15	< 2	1.6	< 0.2	3	< 0.5
212 Dup	94	< 20	< 10	60	17	2	< 5	72	390	40	448	16	< 2	1.6	< 0.2	3	< 0.5
35 Orig	28	20	50	130	21	2	11	84	261	33	185	18	< 2	1.2	< 0.2	3	0.7
35 Dup	29	20	50	140	21	2	10	86	258	35	187	20	< 2	1.2	< 0.2	3	0.5
Method Blank Method Blank	< 1	< 20	< 10	< 30	< 1	< 1	< 5	< 2				< 1	< 2	< 0.5	< 0.2	< 1	< 0.5
Method Blank Method Blank	< 1	< 20	< 10	< 30	< 1	< 1	< 5	< 2				< 1	< 2	< 0.5	< 0.2	< 1	< 0.5

Analyte Symbol	Cs	Ba	Bi	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm		
Detection Limit	0.5	3	0.4	0.1	0.1	0.05	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.05	0.04		
Analysis Method	FUS-MS	FUS-ICP	FUS-MS															
NIST 694 Meas																		
NIST 694 Cert																		
DNC-1 Meas	106			3.3												1.9		
DNC-1 Cert	118			3.6												2		
GBW 07113 Meas	497																	
GBW 07113 Cert	506																	
LKSD-3 Meas	2.4			46.5	84.9		42.3	7.7	1.36		0.9	4.7				2.6	0.39	
LKSD-3 Cert	2.3			52	90		44	8	1.5		1	4.9				2.7	0.4	
TDB-1 Meas				16.8	39.5		23.8		1.89							3.3		
TDB-1 Cert				17	41		23		2.1							3.4		
W-2a Meas	1	176	< 0.4	10.4	22.7		12.5	3.2	1.03		0.6	3.7	0.8	2.1	0.33	2	0.32	
W-2a Cert	0.99	182	0.03	10	23		13	3.3	1		0.63	3.6	0.76	2.5	0.38	2.1	0.33	
SY-4 Meas	356																	
SY-4 Cert	340																	
CTA-AC-1 Meas				2240	3350		1160	170	46.5	134	15.5					11.1	1.11	
CTA-AC-1 Cert				2176	3326		1087	162	46.7	124	13.9					11.4	1.08	
BIR-1a Meas	7				2.3		2.5	1.1	0.5	1.8		2.5				1.6	0.25	
BIR-1a Cert	6				1.9		2.5	1.1	0.55	2		4				1.7	0.3	
NCS DC86312 Meas				2310	175		1550			221	34	183	35.7	96.2	14.3	87.3	12	
NCS DC86312 Cert				2360	190		1600			225	34.6	183	35.7	96.2	15.1	87.79	11.96	
NCS DC70014 Meas				80.3	45.1	83.2	10	38.1	7.8	1.64	7.1	1.1	6.3	1.3	3.4	0.53	3.3	0.47
NCS DC70014 Cert				80.3	45.3	87	10.8	39.9	8	1.8	7.4	1.1	6.7	1.3	3.5	0.57	3.3	0.5
NCS DC70009 (GBW07241) Meas	47.2				24.1	59.2	8.05	33.7	13.3	0.12	15.5	3.5	22.1	4.6	13.7	2.49	17	2.4
NCS DC70009 (GBW07241) Cert	41				23.7	60.3	7.9	32.9	12.5	0.16	14.8	3.3	20.7	4.5	13.4	2.2	14.9	2.4
OREAS 100a (Fusion) Meas				253	445	44.8	147	24	3.6	22.9	3.7	23.1	4.9	14.5	2.39	15.2	2.15	
OREAS 100a (Fusion) Cert				260	463	47.1	152	23.6	3.71	23.6	3.8	23.2	4.81	14.9	2.31	14.9	2.26	
OREAS 101a (Fusion) Meas				794	1350	125	387	49.9	7.94		5.5	31.8	6.5	18.8	2.94	18.2	2.5	
OREAS 101a (Fusion) Cert				816	1396	134	403	48.8	8.06		5.92	33.3	6.46	19.5	2.9	17.5	2.66	
OREAS 101b (Fusion) Meas				758	1320	113	359	46.6	7.19		5.1	29.1	6	17.4	2.73	17	2.34	
OREAS 101b (Fusion) Cert				789	1331	127	378	48	7.77		5.37	32.1	6.34	18.7	2.66	17.6	2.58	
JR-1 Meas	20.7		0.8	18.5	42.8	5.53	22.3	5.6	0.26	5.4	1	6	1.3	3.9	0.67	4.5	0.67	
JR-1 Cert	20.8		0.56	19.7	47.2	5.58	23.3	6.03	0.3	5.06	1.01	5.69	1.11	3.61	0.67	4.55	0.71	
212 Orig	1.8	862	< 0.4	105	195	22.4	74	12.9	1.72	9.6	1.4	7.8	1.5	4.3	0.6	3.9	0.7	
212 Dup	1.7	875	< 0.4	104	195	22.2	73.2	13	1.74	9.6	1.4	7.8	1.4	4.2	0.61	3.9	0.68	
35 Orig	5	682	0.8	42.3	76	9.76	36.3	7.4	1.56	6.9	1.1	6.1	1.2	3.4	0.5	3.4	0.57	
35 Dup	5.2	686	0.7	43.5	77.5	10.1	36.3	7.8	1.57	7.2	1.1	6.4	1.2	3.5	0.53	3.5	0.58	

Method Blank Method Blank	< 0.5	< 0.4	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.05	< 0.1	< 0.04
Method Blank Method Blank	< 0.5	< 0.4	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1	< 0.05	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.05	< 0.1	< 0.04

Analyte Symbol	Hf	Ta	W	Tl	Pb	Th	U
Unit Symbol	ppm						
Detection Limit	0.2	0.1	1	0.1	5	0.1	0.1
Analysis Method	FUS-MS						
NIST 694 Meas							
NIST 694 Cert							
DNC-1 Meas							
DNC-1 Cert							
GBW 07113 Meas							
GBW 07113 Cert							
LKSD-3 Meas	0.6	2			10.6	4.4	
LKSD-3 Cert	0.7	2			11.4	4.6	
TDB-1 Meas					2.8		
TDB-1 Cert					2.7		
W-2a Meas	2.3	0.5	1	< 0.1	9	2.2	0.5
W-2a Cert	2.6	0.5	0.3	0.2	9.3	2.4	0.53
SY-4 Meas							
SY-4 Cert							
CTA-AC-1 Meas	1.2	3			23.8	4.2	
CTA-AC-1 Cert	1.13	2.65			21.8	4.4	
BIR-1a Meas	0.5			< 5			
BIR-1a Cert	0.6			3			
NCS DC86312 Meas					25.3		
NCS DC86312 Cert					23.6		
NCS DC70014 Meas				27200			
NCS DC70014 Cert				27200			
NCS DC70009 (GBW07241)							
Meas		2200	2.7		29.7		
NCS DC70009 (GBW07241)		2200	1.8		28.3		
OREAS 100a (Fusion) Meas					50.9	135	
OREAS 100a (Fusion) Cert					51.6	135	
OREAS 101a (Fusion) Meas					35.2	422	
OREAS 101a (Fusion) Cert					36.6	422	
OREAS 101b (Fusion) Meas					36.7	387	
OREAS 101b (Fusion) Cert					37.1	396	
JR-1 Meas	3.7	1.8		1.6	20	25.7	8.6
JR-1 Cert	4.51	1.86		1.56	19.3	26.7	8.88
212 Orig	10.8	1	721	0.4	17	26.6	4
212 Dup	10.9	1	713	0.4	17	27.2	4

35 Orig	4.7	1.3	84	0.5	37	11.8	7.9
35 Dup	5	1.4	86	0.5	35	12.1	8
Method Blank Method Blank	< 0.2	< 0.1	< 1	< 0.1	< 5	< 0.1	< 0.1
Method Blank Method Blank	< 0.2	< 0.1	< 1	< 0.1	< 5	< 0.1	< 0.1

Appendix #A3 NAA Data

Sample	Sc46 (mg/g)	La140 (mg/g)	Ce141 (mg/g)	Sc46 (mg/g)	La140 (mg/g)	Ratio	Ration
49	0.032			0.063		0.507937	
81	0.016	0.051	0.053	0.055	0.173	0.290909	0.294798
85	0.022	0.041		0.045	0.084	0.488889	0.488095
86	0.016	0.034		0.023	0.048	0.695652	0.708333
87	0.018	0.020		0.040	0.044	0.45	0.454545
93	0.005			0.005		1	
94	0.008			0.016		0.5	
118	0.014			0.016		0.875	
123	0.011			0.012		0.916667	
128	0.012	0.038		0.033	0.100	0.363636	0.377
132	0.013	0.066		0.013	0.063	1	1.047619
135	0.014	0.069		0.027	0.136	0.518519	0.507353
136	0.010	0.020		0.016	0.032	0.625	0.625
174	0.014	0.050		0.014	0.050	1	1
re-calculated results							

Note from
Scott

Josh Ryan Results - this is the main data file for the 15 min irradiation
 Josh Ryan Results 2 - this is the file for the selected samples for a 4hr irradiation
 Josh Ryan Results b - this is the recalculated results for a sample set within the 15 min irradiation data set.

53 is missing
61 is missing
 68 is missing
 126 is missing

Sample	Sc46 (mg/g)	La140 (mg/g)	Zn65 (mg/g)	As76 (mg/g)	Ce141 (mg/g)	Sb122 (mg/g)	Sc46 ppm	La140 ppm
1	0.023	0.033	ND	ND	ND	ND	23	33
2	0.019	0.046	ND	ND	ND	ND	19	46
3	0.011	0.030	ND	ND	ND	ND	11	30
4	0.013	0.051	ND	ND	ND	ND	13	51
5	0.026	0.042	ND	ND	ND	ND	26	42
6	0.017	0.047	ND	ND	ND	ND	17	47
7	0.016	0.042	ND	ND	ND	ND	16	42
8	0.020	0.043	ND	ND	ND	ND	20	43
9	0.016	0.046	ND	ND	ND	ND	16	46
10	0.017	0.003	ND	ND	ND	ND	17	3
11	0.016	0.035	ND	ND	0.037	ND	16	35
12	0.021	0.042	ND	ND	ND	ND	21	42
13	0.033	0.003	ND	ND	ND	ND	33	3
14	0.015	0.068	ND	ND	ND	ND	15	68
15	0.019	0.057	ND	ND	ND	ND	19	57
16	0.018	0.057	ND	0.017	ND	ND	18	57
17	0.015	0.050	ND	ND	ND	ND	15	50
18	0.025	0.051	ND	ND	ND	ND	25	51
19	ND	0.046	ND	ND	ND	ND		46
20	0.020	0.043	ND	ND	ND	ND	20	43
21	0.018	0.057	ND	ND	ND	ND	18	57
22	0.017	0.050	ND	ND	ND	ND	17	50
23	0.020	0.045	ND	ND	ND	ND	20	45
24	0.023	0.047	ND	ND	ND	ND	23	47
25	0.024	0.046	ND	ND	ND	ND	24	46
26	0.023	0.052	ND	ND	ND	ND	23	52
27	0.022	0.045	ND	ND	ND	ND	22	45

28	0.020	0.046	ND	ND	ND	ND	20	46
29	0.018	0.048	ND	ND	ND	ND	18	48
30	0.017	0.034	ND	ND	ND	ND	17	34
31	0.020	0.041	ND	ND	ND	ND	20	41
32	0.024	0.045	2.3	0.018	ND	ND	24	45
33	0.022	0.043	ND	ND	ND	ND	22	43
34	0.019	0.044	ND	ND	ND	ND	19	44
35	0.023	0.052	ND	ND	ND	ND	23	52
36	0.016	0.040	ND	ND	ND	ND	16	40
37	0.019	0.045	ND	ND	ND	ND	19	45
38	0.027	0.041	ND	ND	ND	ND	27	41
39	0.022	0.002	ND	ND	ND	ND	22	2
40	0.016	0.003	ND	0.009	ND	ND	16	3
41	0.024	0.045	ND	ND	ND	ND	24	45
42	0.019	0.055	ND	0.009	ND	ND	19	55
43	0.017	0.035	ND	ND	ND	ND	17	35
44	ND	0.075	ND	ND	ND	ND		75
45	ND	0.016	ND	ND	ND	ND		16
46	no detects	ND	ND	ND	ND	ND		
47		ND	0.041	ND	ND	ND		41
48	0.015	0.040	ND	ND	ND	ND	15	40
49	0.063	ND	ND	ND	ND	ND	63	
50	0.043	0.024	ND	ND	ND	ND	43	24
51	0.025	0.026	ND	ND	0.18	ND	25	26
52	0.053	ND	ND	ND	ND	ND	53	53 is missing
54	0.033	0.011	ND	0.022	ND	ND	33	
55	0.029	0.017	ND	ND	ND	ND	29	17
56	0.045	0.029	ND	ND	ND	ND	45	29
57	0.028	0.045	ND	ND	ND	ND	28	45

58	0.024	0.040	ND	ND	ND	ND	24	40	
59	0.026	0.024	ND	ND	ND	ND	26	24	
60	0.046	0.030	ND	ND	ND	ND	46	30	61 is missing
62	ND	0.030	ND	ND	ND	ND		30	
63	0.199	0.086	ND	ND	ND	ND	199	86	
64	0.028	0.046	ND	ND	ND	ND	28	46	
65	0.030	0.031	ND	ND	ND	ND	30	31	
66	0.014	0.014	ND	ND	ND	ND	14	14	
67	0.019	0.048	ND	ND	ND	ND	19	48	68 is missing
69	0.010	0.025	ND	ND	ND	ND	10	25	
70	0.014	0.033	ND	ND	ND	ND	14	33	
71	0.010	0.019	ND	ND	ND	ND	10	19	
72	0.009	0.031	ND	ND	ND	ND	9	31	
73	0.015	0.045	ND	ND	ND	ND	15	45	
74	0.039	0.035	ND	ND	ND	ND	39	35	
75		0.043	ND	ND	ND	ND	0	43	
76	0.030	0.052	ND	ND	ND	ND	30	52	
77	0.032	0.025	ND	ND	ND	ND	32	25	
78	0.023	0.044	ND	ND	ND	ND	23	44	
79	0.037	0.042	ND	ND	ND	ND	37	42	
80	0.015	0.029	ND	ND	ND	ND	15	29	
81	0.055	0.173	ND	ND	0.182	ND	55	173	
82		0.060	ND	ND	ND	ND	0	60	
83	0.037	0.039	ND	ND	ND	ND	37	39	
84	0.016	0.033	ND	ND	ND	ND	16	33	
85	0.045	0.084	ND	ND	ND	ND	45	84	
86	0.023	0.048	ND	ND	ND	ND	23	48	
87	0.040	0.044	ND	ND	ND	ND	40	44	
88	0.021	0.034	ND	ND	ND	ND	21	34	

89	0.005	0.015	ND	ND	0.014	ND	5	15
90	0.012	0.060	ND	0.011	ND	ND	12	60
91	0.016	0.047	ND	ND	ND	ND	16	47
92		0.020	ND	ND	ND	ND	0	20
93	0.005	ND	ND	ND	ND	ND	5	
94	0.016	ND	ND	ND	ND	ND	16	
95	ND	0.065	ND	ND	ND	ND		65
96	0.006	0.006	ND	ND	ND	ND	6	6
97	ND	0.015	ND	ND	ND	ND		15
98	0.008	0.020	ND	ND	ND	ND	8	20
99	0.008	0.010	ND	ND	ND	ND	8	10
100	0.007	0.009	ND	ND	ND	ND	7	9
101	0.022	0.070	ND	ND	ND	ND	22	70
102	0.023	0.004	ND	ND	ND	ND	23	4
103	0.022	0.049	ND	ND	ND	ND	22	49
104	0.025	0.048	ND	ND	ND	ND	25	48
105	0.013	0.067	ND	ND	ND	ND	13	67
106	0.025	0.047	ND	ND	ND	ND	25	47
107	0.009	0.016	ND	ND	ND	ND	9	16
108	0.009	0.005	ND	ND	ND	ND	9	5
109	0.010	ND	ND	ND	ND	ND	10	
110	0.028	0.053	ND	ND	ND	ND	28	53
111	0.015	0.057	ND	ND	ND	ND	15	57
112	ND	0.028	ND	ND	ND	ND		28
113	0.006	0.021	ND	ND	ND	ND	6	21
114	0.007	0.066	ND	ND	ND	ND	7	66
115	0.022	0.028	ND	ND	ND	ND	22	28
116	0.019	0.033	ND	ND	ND	ND	19	33
117	0.085	8.840	ND	ND	ND	ND	85	8840
118	0.016	ND	ND	ND	ND	ND	16	
119	ND	0.162	ND	ND	ND	ND		162

120		0.020	0.056	ND	ND	ND	ND	20	56	
121		0.020	0.002	ND	ND	ND	ND	20	2	
122	no detects	ND	ND	ND	ND	ND	ND			
123		0.012	ND	ND	ND	ND	ND	12		
124		0.018	0.067	ND	ND	ND	ND	18	67	
125		0.011	0.019	ND	0.008	ND	ND	11	19	126 is missing
127		0.011	0.031	ND	ND	ND	ND	11	31	
128		0.033	0.100	ND	ND	ND	ND	33	100	
129		0.009	0.028	ND	ND	ND	ND	9	28	
130		0.032	0.035	ND	ND	ND	ND	32	35	
131		0.019	0.048	ND	ND	ND	ND	19	48	
132		0.013	0.063	ND	ND	ND	ND	13	63	
133		0.013	0.013	ND	ND	ND	ND	13	13	
134		ND	0.045	ND	ND	ND	ND		45	
135		0.027	0.136	ND	ND	ND	ND	27	136	
136		0.016	0.032	ND	ND	ND	ND	16	32	
137		0.020	ND	ND	ND	ND	ND	20		
138		0.011	0.022	ND	ND	ND	ND	11	22	
139		ND	0.024	ND	ND	ND	ND		24	
140		0.012	ND	ND	ND	ND	ND	12		
141	no detects	ND	ND	ND	ND	ND	ND			
142		ND	0.002	ND	ND	ND	ND		2	
143		0.014	0.022	ND	ND	ND	ND	14	22	
144		0.014	0.012	ND	ND	ND	ND	14	12	
145		0.025	0.048	ND	0.024	ND	ND	25	48	
146		0.024	0.041	ND	ND	ND	ND	24	41	
147		0.013	0.060	ND	ND	ND	ND	13	60	
148		ND	0.063	ND	ND	ND	ND		63	

149	0.022	0.046	ND	0.015	0.082	ND	22	46
150	0.007	0.036	ND	ND	ND	ND	7	36
151	0.023	0.062	ND	ND	ND	0.006	23	62
152	ND	0.060	ND	ND	ND	ND		60
153	0.016	0.012	ND	ND	ND	ND	16	12
154	0.011	0.067	ND	ND	ND	ND	11	67
155	0.011	0.038	ND	ND	ND	ND	11	38
156	0.006	0.050	ND	ND	ND	ND	6	50
157	0.006	0.050	ND	ND	ND	ND	6	50
158	0.020	0.033	ND	ND	ND	ND	20	33
159	0.011	0.048	ND	0.014	ND	ND	11	48
160	0.030	0.070	ND	ND	ND	ND	30	70
161	0.015	0.060	ND	ND	ND	ND	15	60
162	0.025	0.038	ND	ND	ND	ND	25	38
163	0.031	0.044	ND	ND	ND	ND	31	44
164	0.010	0.140	ND	ND	ND	ND	10	140
165	0.015	0.106	ND	ND	1.64	ND	15	106
166	0.018	0.039	ND	0.015	ND	ND	18	39
167	0.009	0.013	ND	ND	ND	ND	9	13
168	0.025	0.041	ND	ND	ND	ND	25	41
169	0.013	0.019	ND	ND	ND	ND	13	19
170	0.024	0.091	ND	ND	ND	ND	24	91
171	0.010	0.018	ND	ND	ND	ND	10	18
172	0.030	0.137	ND	ND	0.207	ND	30	137
173	0.017	0.037	ND	ND	ND	ND	17	37
174	0.014	0.050	ND	ND	ND	ND	14	50
175	0.011	0.057	ND	ND	ND	ND	11	57
176	0.012	0.058	ND	ND	ND	ND	12	58
177	0.024	0.044	ND	ND	ND	ND	24	44
178	0.015	0.041	ND	ND	ND	ND	15	41
179	0.012	0.014	ND	ND	ND	ND	12	14

180	0.026	0.044	ND	ND	ND	ND	26	44
181	0.017	0.050	ND	ND	ND	ND	17	50
182	ND	0.037	ND	ND	ND	ND		37
183	0.028	0.062	ND	ND	ND	ND	28	62
184	0.016	0.061	ND	0.015	ND	ND	16	61
185	0.006	0.013	ND	ND	ND	ND	6	13
186	0.017	0.040	ND	ND	ND	ND	17	40
187	ND	0.020	ND	ND	ND	ND		20
188	0.010	0.016	ND	ND	ND	ND	10	16
189	ND	0.250	ND	ND	ND	ND		250
190	0.036	0.036	ND	ND	ND	ND	36	36

NAA ID	Sample	Mass (g)
1	81	0.0105
2	49	0.0095
3	85	0.0117
4	87	0.0108
5	86	0.0131
6	170	0.0101
7	53	0.0167
8	128	0.0093
9	183	0.0102
10	85	0.0099
	82	0.0119
	59	0.0107
	184	0.0098
	61	0.0105
	112	0.0094
	50	0.014
	83	0.0095
	84	0.0115
	80	0.0173
	171	0.0088
	60	0.0185
	164	0.0095
	57	0.0084
	75	0.0101
	63	0.0146
	62	0.0102
	64	0.0098

78	0.0106
79	0.0117
65	0.0182
189	0.0131
124	0.0109
76	0.012
58	0.0137
56	0.0181
77	0.0118
55	0.0117
187	0.0141
54	0.0109
186	0.0116
185	0.0111
188	0.0193
51	0.0107
88	0.0173
74	0.0135
190	0.0186
52	0.0156
177	0.0128
110	0.0121
44	0.0122
27	0.0132
15	0.0109
43	0.0157
155	0.0144
4	0.0112
114	0.0177
163	0.0168
148	0.0159

2	0.0181
67	0.0148
142	0.0123
113	0.011
168	0.013
26	0.0116
31	0.0132
21	0.0136
18	0.0118
35	0.0133
20	0.0143
22	0.0136
17	0.0125
42	0.0193
32	0.017
41	0.0192
28	0.0122
6	0.0148
8	0.0164
39	0.0142
14	0.0163
24	0.0128
12	0.0124
34	0.0121
25	0.0131
37	0.0153
36	0.0178
13	0.0121
38	0.0109
16	0.0116
7	0.0115

46	0.0125
10	0.0136
70	0.0162
71	0.0108
3	0.0111
33	0.0101
11	0.0137
29	0.0117
23	0.0124
47	0.012
1	0.0142
9	0.0117
19	0.0104
40	0.0148
5	0.0112
92	0.0195
89	0.0158
159	0.015
45	0.013
176	0.0133
30	0.0109
95	0.0188
153	0.0105
156	0.011
66	0.0178
69	0.0165
73	0.017
72	0.0186
108	0.0134
48	0.0115

Appendix #A4 - ISOTOPE Data

4a – Isotope statement



World Class. Pace to Pace.

Stable Isotope Core Laboratory

The Stable Isotope Core Laboratory has analyzed the following samples received for isotopic analysis. For questions please contact Benjamin Harlow and refer to the Our Lab ID numbers associated with your project. These isotopic results supersede any results that may have been submitted to you previously.

Method

Samples for carbon and nitrogen isotopic analysis are converted to N₂ and CO₂ with an elemental analyzer (ECS 4010, Costech Analytical, Valencia, CA); these two gases are separated with a 3m GC column and analyzed with a continuous flow isotope ratio mass spectrometer (Delta PlusXP, ThermoFinnigan, Bremen) (Brenna et al., 1997; Qi et al., 2003). Isotopic reference materials are interspersed with samples for calibration. Contribution of ¹⁷O is corrected by the IRMS software using the Santrock correction (Santrock et al. 1985).

Reporting of Carbon Isotope Ratios

Carbon isotopic results were previously reported in per mill relative to VPDB (Vienna PeeDee belemnite) by assigning a value of +1.95 per mill to NBS 19 CaCO₃ (Coplen 1994). Current NIST calibration of VPDB uses NBS 19 and L-SVEC as anchor points. The carbon isotopic compositions of internationally distributed isotopic reference materials, had they been analyzed in this laboratory with your samples, are (Coplen et al. 2006):

NBS 19	CaCO ₃	+1.95 (exactly)
NBS 18	CaCO ₃	-5.01
IAEA-CO-1	CaCO ₃	+2.49
L-SVEC	Li ₂ CO ₃	-46.6
RM 8542	Sucrose	-10.45
USGS24	graphite	-16.05
NBS 22	oil	-30.03
USGS40	glutamic acid	-26.39
USGS41	glutamic acid	+37.63
IAEA-CO-9	BaCO ₃	-47.32 (exactly)

The 2-sigma uncertainty of carbon isotopic results is 0.5 per mill unless otherwise indicated. This means that if the same sample were resubmitted for isotopic analysis, the newly measured value would lay within the uncertainty bounds 95 percent of the time.

Your samples were normalized using two of our internal running standards (See normalization tab). Running standards are previously calibrated to NBS 19, RM 8542, and IAEA-CO-9 as defined above. The precision (1 sigma) of standards used and associated normalization coefficients are provided in the accompanying .xls results file.

4b. Data

Standards used (SD in parentheses)						$1000x \delta^{13}C_{VPDB}$ Normalization information
sequence	acetanilide	corn	N	Normalization equation	drift correction	
1,2	-29.90 (0.12)	-13.36 (0.04)	5,6	0.98x-38.59	-0.008 per mil/hr	
3,4	-29.90 (0.06)	-13.36 (0.02)	7,6	0.98x-38.48	none	
5,6	-29.90 (0.06)	-13.36 (0.01)	5,6	0.98x-38.49	none	
7,8	-29.90 (0.10)	-13.36 (0.04)	6,6	0.98x-38.48	none	
9	-29.90 (0.11)	-13.36 (0.02)	3,2	0.98x-38.45	none	

Standards used (SD in parentheses)						$1000x \delta^{15}N_{AIR}$ Normalization information
sequence	acetanilide	corn	USGS25	N	Normalization equation	
1	0.26 (0.32)	6.53 (0.26)	-30.47 (0.28)	3,3,3	1.02x-0.50	
2	0.40 (0.04)	6.02	-30.47 (0.23)	2,1,3	1.00x-0.31	
3,4	-0.06 (0.15)	6.77 (0.19)	-30.41 (0.12)	7,4,5	1.00x-0.36	
5,6	0.00 (0.31)	6.72 (0.39)	-30.42 (0.11)	5,4,6	1.01x-0.72	
7,8	0.17 (0.22)	6.59 (0.40)	-30.46 (0.14)	6,6,6	1.02x-0.69	
9	0.05 (0.28)	6.64 (0.32)	-30.45 (0.00)	3,2,2	1.02x-0.76	0.016 per mil/hr

Lab QC check, NIST peach		$1000x \delta^{13}C_{VPDB}$		$1000x \delta^{15}N_{AIR}$		This sample was not included in any normalization, but is included in every sequence as a check of the normalization.	
		observed	actual	observed	actual		
1	-26.02	-25.9		2.04	1.9		
1	-25.97			2.18			
2	-25.93			2.11			
2	-25.99			2.03			
3	-25.95			2.04			
3	-25.93			1.99			
4	-25.92			2.15			
4	-25.94			1.89			

5	-25.96	2.14
5	-25.98	1.95
6	-25.98	2.17
6	-25.96	2.18
7	-26.01	2.26
7	-26.02	2.19
8	-25.96	2.13
8	-25.93	2.11
9	-26.00	2.13
9	-25.97	2.09
9	-25.95	1.91
average	-25.97	2.09
SD	0.03	0.10

C% and N% was calculated using acetanilide

Client: J. Ullman

Project: CN Snake River samples
Date: 8/24/2010

Delta values were calculated using a multi-point normalization by fitting a regression line through two running standards. See normalization tab.

C and N% was calculated with a multi point normalization using acetanilide. Some samples are out of range. These are indicated in red.

OurLabID	Sample ID	Area C (mV/s)	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	C%	Area N (mV/s)	$\delta^{15}\text{N}_{\text{air}} \times 1000$	N%	Sequence
G-33566	99	16.675	-23.56	0.070	11.229	2.63	0.010	1
G-33567	27	154.883	-26.37	2.861	62.44	4.39	0.223	1
G-33568	2	116.511	-26.25	2.498	41.315	3.74	0.175	1
G-33569	98	38.928	-23.48	0.044	12.167	1.83	0.0055	2
G-33570	102	184.986	-26.11	4.024	72.831	4.59	0.312	1
G-33571	127	13.022	-21.55	0.054	7.106	5.45	0.006	1
G-33572	95	106.327	-25.26	0.468	39.659	2.75	0.034	1
G-33573	115	180.622	-26.18	0.762	65.64	5.52	0.054	1
G-33574	96	41.642	-23.46	0.0487	12.435	1.36	0.0061	2
G-33575	135	19.923	-24.48	0.094	13.028	2.54	0.012	1
G-33576	152	15.631	-20.2	0.071	9.797	4.52	0.009	1
G-33577	92	29.219	-25	0.133	11.319	3.28	0.010	1
G-33578	97	18.656	-23.99	0.093	7.706	2.32	0.007	1
G-33579	178	23.368	-20.95	0.107	22.289	3.71	0.019	1
G-33580	133	43.499	-24.01	0.195	19.893	4.32	0.018	1
G-33581	141	12.619	-21.87	0.062	6.351	4.6	0.006	1
G-33582	171	102.805	-25.45	0.472	50.737	6.97	0.045	1
G-33583	118	25.461	-24.35	0.123	13.18	3.94	0.012	1
G-33584	129	24.751	-24.9	0.123	12.316	2.44	0.013	1
G-33585	150	46.187	-15.14	0.224	31.351	5.13	0.029	2
G-33586	122	14.149	-23.93	0.071	10.039	2.76	0.010	2
G-33587	100	19.142	-23.92	0.099	11.529	2.99	0.012	2
G-33588	147	44.993	-20.06	0.0515	12.875	4.1	0.006	2
G-33589	158	17.593	-22.44	0.095	10.675	3.79	0.011	2
G-33590	94	41.627	-23.45	0.0479	11.16	1.98	0.0054	2
G-33591	121	37.545	-24.6	0.181	15.321	4.14	0.015	2
G-33592	139	53.196	-19.58	0.0593	11.048	4.13	0.0051	2

G-33593	179	34.625	-23.29	0.171	11.557	3.4	0.012	2
G-33594	128	42.655	-24.46	0.213	24.857	2.64	0.025	2
G-33595	154	31.429	-23.22	0.162	11.908	4.05	0.013	2
G-33596	140	55.325	-21.7	0.0627	13.913	4.01	0.0065	2
G-33597	138	43.569	-20.63	0.0505	11.59	4.46	0.0053	2
G-33598	165	12.347	-21.96	0.064	6.744	5.31	0.007	2
G-33599	93	53.373	-23.58	0.0612	15.174	2.29	0.007	2
G-33601	132	20.511	-23.92	0.101	12.765	2.99	0.013	2
G-33602	3	114.29	-25.19	0.571	24.781	4.77	0.025	2
G-33603	142	10.679	-21.19	0.059	6.932	6.35	0.007	2
G-33606	137	88.245	-24.17	0.102	14.475	4.52	0.0073	2
G-33607	11	75.47	-25.73	1.9006	38.762	4.7	0.1275	1
G-33608	182	18.482	-21.59	44.422	11.975	4	0.010	3
G-33609	161	24.038	-20.59	0.078	42.683	8.37	0.031	3
G-33610	126	28.334	-21.87	0.097	15.428	4.18	0.012	3
G-33611	116	3.736		0.1047	2.577		0.0126	1
G-33613	173B	35.677	-25.86	0.7993	23.151	3.48	0.0691	1
G-33614	12	207.563	-26.17	1.346	89.17	4.3	0.348	3
G-33615	162	193.025	-26	4.315	87.416	6.72	0.327	3
G-33616	168	242.568	-26.55	3.772	95.782	6.16	0.261	3
G-33617	36	113.632	-26.1	3.566	45.38	4.6	0.136	3
G-33618	21	271.016	-26.33	1.778	107.19	4.15	0.434	3
G-33619	25	212.808	-26.29	39.595	82.753	4.71	0.296	3
G-33620	10	65.624	-26.09	5.8117	36.455	4.2	0.4195	1
G-33621	59	137.442	-26.05	6.574	64.172	5.03	0.202	3
G-33622	29	188.733	-26.37	2.258	76.169	3.89	0.309	3
G-33623	19	262.082	-26.35	4.064	93.312	3.97	0.313	3
G-33624	1	50.831	-26.01	5.0776	29.712	2.94	0.3887	1
G-33625	160	181.47	-26.08	5.886	78.348	4.88	0.238	3
G-33626	26	61.766	-26.26	6.3343	30.97	2.77	0.4087	1
G-33627	180	235.042	-26.79	7.304	77.626	4.52	0.214	3
G-33628	90	200.96	-23.78	3.464	97.085	3.22	0.291	3
G-33629	34	179.068	-26.2	2.706	82.809	5.33	0.234	4
G-33630	159	53.07	-25.23	7.1188	39.147	4.92	0.6912	1
G-33631	20	223.032	-26.35	4.513	90.41	4.57	0.338	4
G-33633	181	103.847	-25.99	1.487	37.86	4.1	0.105	4

G-33634	172	59.678	-25.93	0.852	28.12	5.34	0.077	4
G-33635	35	209.895	-26.56	4.530	83.263	3.68	0.331	4
G-33636	175	258.026	-26.56	4.259	91.698	3.6	0.277	4
G-33637	32	209.364	-26.35	2.959	82.015	4.23	0.216	4
G-33638	15	293.119	-26.07	4.732	114.543	3.84	0.328	4
G-33639	149	218.131	-25.56	3.549	72.052	4.82	0.218	4
G-33640	67	183.404	-26.63	2.572	83.525	6.2	0.218	4
G-33641	14	231.542	-26.21	4.447	80.61	3.86	0.287	4
G-33642	38	138.315	-26.2	2.712	62.552	5.37	0.235	4
G-33643	17	78.178	-26.3	7.1372	36.283	2.32	0.4465	1
G-33644	22	61.873	-26.05	5.6875	34.926	3.22	0.4171	1
G-33645	170	216.918	-26.09	3.669	111.853	4.56	0.354	4
G-33646	24	105.027	-26.1	5.2323	49.947	3.24	0.3138	1
G-33647	16	39.262	-25.91	6.0759	21.667	3.2	0.4428	1
G-33648	145	202.89	-26.64	3.210	79.819	6.08	0.237	4
G-33649	18	265.729	-26.27	4.852	118.308	4.2	0.395	4
G-33650	37	166.036	-26.11	2.618	74.738	4.4	0.225	4
G-33651	104	146.878	-26.64	2.662	61.155	6.48	0.212	4
G-33652	9	128.09	-26.27	6.9996	62.887	2.83	0.4188	1
G-33653	117	174.385	-26.59	3.255	62.72	5.4	0.221	4
G-33654	31	163.571	-26.23	2.623	64.961	4.68	0.198	4
G-33655	33	184.04	-26.19	3.586	88.255	4.74	0.322	4
G-33656	39	45.972	-26.34	4.3656	26.896	2.44	0.3356	1
G-33657	157	58.562	-25.44	1.065	30.35	4.56	0.107	4
G-33658	177	159.657	-26.63	2.752	64.439	6.43	0.210	4
G-33659	163	182.974	-26.24	2.660	66.808	5.4	0.183	4
G-33660	146	170.486	-26.64	3.375	66.801	6.3	0.255	4
G-33661	131	126.313	-26.1	1.960	55.734	5.12	0.165	4
G-33662	183	68.737	-26.22	6.4354	33.09	2.22	0.4023	1
G-33663	184	257.818	-26.05	4.834	98.555	3.45	0.336	4
G-33664	185	77.167	-24.1	0.296	36.992	2.69	0.027	5
G-33665	186	21.154	-22.29	0.078	8.841	5	0.007	5
G-33666	187	11.074	-21.65	0.046	7.942	6.1	0.006	5
G-33667	188	117.346	-26.07	2.084	50.445	4.92	0.172	5
G-33668	167	187.043	-24.18	0.752	40.447	3.73	0.034	5
G-33669	130	193.473	-26.32	2.882	75.494	6.16	0.212	5

G-33670	124	25.679	-22.82	0.104	17.881	8.57	0.014	5
G-33671	151	168.689	-26.17	3.191	66.273	4.52	0.252	5
G-33672	109	34.331	-23.72	0.0418	10.945	0.81	0.0054	2
G-33673	101	24.869	-23.05	0.0301	14.247	4.32	0.0063	2
G-33674	105	24.686	-23.83	0.103	16.256	3.77	0.013	5
G-33675	103	169.182	-26.98	2.615	69.341	6.41	0.217	5
G-33676	112	32.65	-25.32	0.137	13.661	3.12	0.011	5
G-33677	136	20.921	-24.15	0.089	14.94	2.15	0.012	5
G-33678	113	10.998	-23.64	0.041	8.248	2.5	0.007	5
G-33679	144	23.516	-22.67	0.096	7.651	4.79	0.007	5
G-33680	123	33.356	-23.01	0.142	16.701	6.45	0.014	5
G-33682	107	37.018	-23.94	0.0439	18.928	4.18	0.0084	2
G-33683	6	296.867	-26.07	4.123	118.689	3.8	0.341	5
G-33684	8	48.945	-24.85	0.885	22.618	6.94	0.082	5
G-33685	174	185.206	-26.47	3.532	92.061	6.22	0.353	5
G-33686	42	299.956	-26.65	4.340	113.711	3.68	0.341	5
G-33688	30	272.593	-26.44	3.572	95.92	3.67	0.260	6
G-33689	143	158.035	-26.18	0.648	56.152	5.18	0.045	6
G-33690	134	45.487	-24.44	0.186	21.95	3.34	0.017	6
G-33691	119	39.565	-25.44	0.165	20.902	2.37	0.016	6
G-33692	91	40.127	-22.53	7.0882	28.931	2.44	0.665	1
G-33694	114	15.455	-22.99	0.069	10.899	1.73	0.009	6
G-33695	120	47.536	-24.03	0.194	27.685	5.87	0.022	6
G-33696	81	89.988	-25.42	1.258	43.166	7.23	0.116	6
G-33697	155	179.085	-25.89	21.1058	42.615	3.17	0.546	1
G-33698	85	124.882	-26.46	2.126	50.676	3.95	0.168	6
G-33699	156	20.858	-22.19	0.092	10.023	4.54	0.009	6
G-33700	89	104.385	-27.67	1.729	45.033	2.52	0.146	6
G-33701	57	45.527	-26.18	0.768	20.289	4.48	0.065	6
G-33702	83	86.61	-25.39	1.543	22.542	4.46	0.079	6
G-33703	111	91.128	-26.4	1.765	37.202	5.9	0.139	6
G-33704	110	127.045	-26.7	2.315	52.367	5.3	0.186	6
G-33705	78	199.006	-28.4	2.641	70.625	3.63	0.189	6
G-33706	74	24.15	-26.63	0.396	12.005	4.89	0.039	6
G-33707	52	116.487	-24.63	0.474	32.969	6.24	0.027	6
G-33708	87	19	-24.95	0.084	12.113	5.96	0.010	6

G-33709	84	94.828	-25.49	1.847	46.402	4.82	0.174	7
G-33710	60	32.53	-24.71	0.171	17.497	4.2	0.017	7
G-33711	82	101.176	-26.62	2.085	44.019	7.02	0.168	7
G-33712	80	41.636	-27.22	0.745	19.587	5	0.064	7
G-33713	61	98.202	-25.92	1.864	37.93	3.34	0.133	7
G-33714	62	21.684	-22.23	0.115	10.801	4.36	0.010	7
G-33715	63	22.508	-23.15	0.121	12.111	4.35	0.013	7
G-33716	79	52.174	-27.87	1.284	22.278	3.38	0.099	7
G-33717	64	36.118	-25.58	0.730	14.035	3.93	0.052	7
G-33718	75	141.171	-28.15	3.410	55.314	3.88	0.249	7
G-33719	88	56.597	-26.18	1.156	21.342	3.93	0.083	7
G-33720	77	32.471	-27.3	0.696	15.599	4.32	0.060	7
G-33721	65	44.394	-24.43	0.214	21.952	4.32	0.020	7
G-33722	55	55.139	-14.72	0.264	13.519	6.96	0.013	7
G-33723	58	103.351	-26.23	2.596	41.647	6.41	0.192	7
G-33724	53	30.43	-21.44	0.0721	5.185	1.12	0.0058	2
G-33725	76	114.526	-28.51	2.584	43.895	3.62	0.182	7
G-33726	54	58.318	-13.08	0.292	24.55	4.12	0.022	7
G-33727	56	16.761	-21.22	0.087	10.04	5.31	0.009	7
G-33728	50	61.374	-21.61	0.295	51.468	7.97	0.046	8
G-33729	51	73.129	-23.67	0.346	36.702	5.36	0.032	8
G-33730	86	88.461	-24.86	0.395	23.846	4.9	0.021	8
G-33731	49	33.022	-28.24	7.6587	21.152	5.28	0.6422	1
G-33732	189	21.834	-24.87	0.107	10.264	1.84	0.008	8
G-33733	190	90.996	-25.34	1.732	19.992	4.51	0.070	8
G-33734	106	143.304	-26.39	2.622	57.723	6.71	0.195	8
G-33735	28	177.757	-26.27	3.486	78.838	4.28	0.287	8
G-33736	40	143.233	-26.13	2.665	63.937	4.53	0.220	8
G-33738	166	116.415	-25.83	2.141	42.842	5.64	0.151	8
G-33739	45	31.946	-20.24	0.0387	5.312	1.95	0.0031	2
G-33740	7	252.351	-26.15	4.663	90.495	3.64	0.297	8
G-33741	70	21.689	-23.06	0.0219	5.82	0.81	0.0028	2
G-33742	71	20.816	-25.35	0.095	12.544	3.57	0.010	8
G-33743	72	46.388	-25.25	0.205	19.393	3.19	0.016	8
G-33744	73	50.771	-25.58	0.225	20.041	2.99	0.016	8
G-33745	4	72.231	-25.58	1.7051	34.597	3.01	0.1058	1

G-33746	43	42.297	-18.49	0.0513	7.723	1.93	0.0038	2
G-33747	44	37.745	-19.07	0.0443	7.433	1.81	0.0038	2
G-33748	46	35.251	-20.76	0.0427	7.087	1.84	0.0036	2
G-33749	48	99.919	-24.56	0.448	31.04	Reweigh	0.028	9
G-33750	66	53.825	-26.19	0.255	20.888	1.39	0.019	9
G-33751	153	14.011	-21.27	0.071	9.246	4.57	0.008	9
G-33752	176	12.318	-20.77	0.061	6.745	6.42	0.007	9
G-33753	164	58.705	-23.6	0.287	26.205	5.39	0.024	9
G-33754	169	67.444	-23.74	0.325	15.422	4.28	0.015	9

OurLabID	Sample ID	Reweigh
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	amount
G-33566	99
G-33567	27
G-33568	2
G-33569	98
	300
G-33570	102
G-33571	127
G-33572	95
G-33573	115
G-33574	96
	300
G-33575	135
G-33576	152
G-33577	92
G-33578	97
G-33579	178
G-33580	133
G-33581	141
G-33582	171
G-33583	118
G-33584	129
G-33585	150
G-33586	122
G-33587	100
G-33588	147
	300
G-33589	158
G-33590	94
	300
G-33591	121
G-33592	139
	300
G-33593	179
G-33594	128
G-33595	154
G-33596	140
	300.00
G-33597	138
	300.00
G-33598	165
G-33599	93
	300.00

G-33601	132	
G-33602	3	
G-33603	142	
G-33606	137	300.00
G-33607	11	40.00
G-33608	182	
G-33609	161	
G-33610	126	
G-33611	116	20.00
G-33613	173B	40.00
G-33614	12	
G-33615	162	
G-33616	168	
G-33617	36	
G-33618	21	
G-33619	25	
G-33620	10	10.00
G-33621	59	
G-33622	29	
G-33623	19	
G-33624	1	10.00
G-33625	160	
G-33626	26	10.00
G-33627	180	
G-33628	90	
G-33629	34	
G-33630	159	5.00
G-33631	20	
G-33633	181	
G-33634	172	
G-33635	35	
G-33636	175	
G-33637	32	
G-33638	15	
G-33639	149	
G-33640	67	

G-33641	14
G-33642	38
G-33643	17
	10.00
G-33644	22
	10.00
G-33645	170
G-33646	24
G-33647	16
	5.00
G-33648	145
G-33649	18
G-33650	37
G-33651	104
G-33652	9
G-33653	117
G-33654	31
G-33655	33
G-33656	39
	10.00
G-33657	157
G-33658	177
G-33659	163
G-33660	146
G-33661	131
G-33662	183
	10
G-33663	184
G-33664	185
G-33665	186
G-33666	187
G-33667	188
G-33668	167
G-33669	130
G-33670	124
G-33671	151
G-33672	109
	300
G-33673	101
	300
G-33674	105
G-33675	103
G-33676	112

G-33677	136
G-33678	113
G-33679	144
G-33680	123
G-33682	107
G-33683	6
G-33684	8
G-33685	174
G-33686	42
G-33688	30
G-33689	143
G-33690	134
G-33691	119
G-33692	91
G-33694	114
G-33695	120
G-33696	81
G-33697	155
G-33698	85
G-33699	156
G-33700	89
G-33701	57
G-33702	83
G-33703	111
G-33704	110
G-33705	78
G-33706	74
G-33707	52
G-33708	87
G-33709	84
G-33710	60
G-33711	82
G-33712	80
G-33713	61
G-33714	62
G-33715	63

300

5

10

G-33716	79
G-33717	64
G-33718	75
G-33719	88
G-33720	77
G-33721	65
G-33722	55
G-33723	58
G-33724	53
	150
G-33725	76
G-33726	54
G-33727	56
G-33728	50
G-33729	51
G-33730	86
G-33731	49
	5
G-33732	189
G-33733	190
G-33734	106
G-33735	28
G-33736	40
G-33738	166
G-33739	45
	300
G-33740	7
G-33741	70
	300
G-33742	71
G-33743	72
G-33744	73
G-33745	4
	40
G-33746	43
	300
G-33747	44
	300
G-33748	46
	300
G-33749	48
G-33750	66
G-33751	153
G-33752	176

G-33753	164
G-33754	169

Sample ID	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	C%	Area N (mV/s)	$\delta^{15}\text{N}_{\text{air}} \times 1000$	N%
99	-23.56	0.0698	11.229	2.63	0.0099
27	-26.37	2.8605	62.44	4.39	0.223
2	-26.25	2.4983	41.315	3.74	0.1749
98	-23.48	0.044	12.167	1.83	0.0055
102	-26.11	4.0237	72.831	4.59	0.312
127	-21.55	0.0539	7.106	5.45	0.0063
95	-25.26	0.4679	39.659	2.75	0.0335
115	-26.18	0.7619	65.64	5.52	0.0535
96	-23.46	0.0487	12.435	1.36	0.0061
135	-24.48	0.0943	13.028	2.54	0.0115
152	-20.2	0.0713	9.797	4.52	0.0085
92	-25	0.1329	11.319	3.28	0.01
97	-23.99	0.0931	7.706	2.32	0.0074
178	-20.95	0.1066	22.289	3.71	0.0188
133	-24.01	0.1954	19.893	4.32	0.0178
141	-21.87	0.0617	6.351	4.6	0.0062
171	-25.45	0.4723	50.737	6.97	0.0451
118	-24.35	0.1233	13.18	3.94	0.012
129	-24.9	0.1232	12.316	2.44	0.0128
150	-15.14	0.2235	31.351	5.13	0.0291
122	-23.93	0.0712	10.039	2.76	0.0097
100	-23.92	0.0992	11.529	2.99	0.0117
147	-20.06	0.0515	12.875	4.1	0.006
158	-22.44	0.0945	10.675	3.79	0.0111
94	-23.45	0.0479	11.16	1.98	0.0054
121	-24.6	0.1805	15.321	4.14	0.0152
139	-19.58	0.0593	11.048	4.13	0.0051
179	-23.29	0.1713	11.557	3.4	0.0122
128	-24.46	0.2127	24.857	2.64	0.0248
154	-23.22	0.1623	11.908	4.05	0.0133
140	-21.7	0.0627	13.913	4.01	0.0065
138	-20.63	0.0505	11.59	4.46	0.0053
165	-21.96	0.0641	6.744	5.31	0.0072
93	-23.58	0.0612	15.174	2.29	0.007

132	-23.92	0.1006	12.765	2.99	0.0126
3	-25.19	0.5712	24.781	4.77	0.0253
142	-21.19	0.0594	6.932	6.35	0.0069
137	-24.17	0.102	14.475	4.52	0.0073
11	-25.73	1.9006	38.762	4.7	0.1275
182	-21.59	44.4223	11.975	4	0.0097
161	-20.59	0.0783	42.683	8.37	0.0308
126	-21.87	0.0966	15.428	4.18	0.0118
116		0.1047	2.577		0.0126
173B	-25.86	0.7993	23.151	3.48	0.0691
12	-26.17	1.3455	89.17	4.3	0.3475
162	-26	4.3147	87.416	6.72	0.327
168	-26.55	3.7718	95.782	6.16	0.2605
36	-26.1	3.5661	45.38	4.6	0.1355
21	-26.33	1.7776	107.19	4.15	0.4344
25	-26.29	39.5947	82.753	4.71	0.2956
10	-26.09	5.8117	36.455	4.2	0.4195
59	-26.05	6.5737	64.172	5.03	0.2022
29	-26.37	2.2576	76.169	3.89	0.309
19	-26.35	4.0644	93.312	3.97	0.3128
1	-26.01	5.0776	29.712	2.94	0.3887
160	-26.08	5.8862	78.348	4.88	0.2384
26	-26.26	6.3343	30.97	2.77	0.4087
180	-26.79	7.3042	77.626	4.52	0.2137
90	-23.78	3.4644	97.085	3.22	0.2905
34	-26.2	2.706	82.809	5.33	0.2338
159	-25.23	7.1188	39.147	4.92	0.6912
20	-26.35	4.5133	90.41	4.57	0.3384
181	-25.99	1.487	37.86	4.1	0.1047
172	-25.93	0.8521	28.12	5.34	0.0766
35	-26.56	4.5299	83.263	3.68	0.3308
175	-26.56	4.2585	91.698	3.6	0.2771
32	-26.35	2.9586	82.015	4.23	0.2156
15	-26.07	4.7319	114.543	3.84	0.3277
149	-25.56	3.549	72.052	4.82	0.2176
67	-26.63	2.5722	83.525	6.2	0.2184

14	-26.21	4.4471	80.61	3.86	0.2865
38	-26.2	2.7115	62.552	5.37	0.2354
17	-26.3	7.1372	36.283	2.32	0.4465
22	-26.05	5.6875	34.926	3.22	0.4171
170	-26.09	3.6693	111.853	4.56	0.354
24	-26.1	5.2323	49.947	3.24	0.3138
16	-25.91	6.0759	21.667	3.2	0.4428
145	-26.64	3.2102	79.819	6.08	0.2366
18	-26.27	4.8522	118.308	4.2	0.3948
37	-26.11	2.6181	74.738	4.4	0.2249
104	-26.64	2.6622	61.155	6.48	0.2122
9	-26.27	6.9996	62.887	2.83	0.4188
117	-26.59	3.2552	62.72	5.4	0.2212
31	-26.23	2.6231	64.961	4.68	0.1978
33	-26.19	3.586	88.255	4.74	0.3223
39	-26.34	4.3656	26.896	2.44	0.3356
157	-25.44	1.0653	30.35	4.56	0.1073
177	-26.63	2.7519	64.439	6.43	0.2096
163	-26.24	2.6602	66.808	5.4	0.1831
146	-26.64	3.3753	66.801	6.3	0.2545
131	-26.1	1.9602	55.734	5.12	0.1645
183	-26.22	6.4354	33.09	2.22	0.4023
184	-26.05	4.8339	98.555	3.45	0.3358
185	-24.1	0.2959	36.992	2.69	0.027
186	-22.29	0.0784	8.841	5	0.007
187	-21.65	0.0455	7.942	6.1	0.0062
188	-26.07	2.0835	50.445	4.92	0.1721
167	-24.18	0.7518	40.447	3.73	0.0336
130	-26.32	2.8816	75.494	6.16	0.2122
124	-22.82	0.1043	17.881	8.57	0.0139
151	-26.17	3.1905	66.273	4.52	0.252
109	-23.72	0.0418	10.945	0.81	0.0054
101	-23.05	0.0301	14.247	4.32	0.0063
105	-23.83	0.1026	16.256	3.77	0.0126
103	-26.98	2.6146	69.341	6.41	0.2167
112	-25.32	0.1365	13.661	3.12	0.0108

136	-24.15	0.089	14.94	2.15	0.0122
113	-23.64	0.0406	8.248	2.5	0.007
144	-22.67	0.096	7.651	4.79	0.0072
123	-23.01	0.1423	16.701	6.45	0.0135
107	-23.94	0.0439	18.928	4.18	0.0084
6	-26.07	4.1233	118.689	3.8	0.3412
8	-24.85	0.8847	22.618	6.94	0.0824
174	-26.47	3.5318	92.061	6.22	0.3533
42	-26.65	4.3399	113.711	3.68	0.3407
30	-26.44	3.5721	95.92	3.67	0.2598
143	-26.18	0.6482	56.152	5.18	0.0452
134	-24.44	0.1862	21.95	3.34	0.017
119	-25.44	0.1648	20.902	2.37	0.0162
91	-22.53	7.0882	28.931	2.44	0.665
114	-22.99	0.0691	10.899	1.73	0.0091
120	-24.03	0.1939	27.685	5.87	0.0217
81	-25.42	1.2576	43.166	7.23	0.1159
155	-25.89	21.1058	42.615	3.17	0.546
85	-26.46	2.1259	50.676	3.95	0.1681
156	-22.19	0.0917	10.023	4.54	0.0092
89	-27.67	1.7286	45.033	2.52	0.146
57	-26.18	0.768	20.289	4.48	0.0652
83	-25.39	1.5431	22.542	4.46	0.079
111	-26.4	1.765	37.202	5.9	0.1385
110	-26.7	2.3152	52.367	5.3	0.1858
78	-28.4	2.6409	70.625	3.63	0.1888
74	-26.63	0.3964	12.005	4.89	0.0392
52	-24.63	0.4742	32.969	6.24	0.027
87	-24.95	0.0839	12.113	5.96	0.0104
84	-25.49	1.8473	46.402	4.82	0.1739
60	-24.71	0.171	17.497	4.2	0.0172
82	-26.62	2.085	44.019	7.02	0.1675
80	-27.22	0.745	19.587	5	0.0639
61	-25.92	1.8636	37.93	3.34	0.1334
62	-22.23	0.1147	10.801	4.36	0.0098
63	-23.15	0.1212	12.111	4.35	0.0127

79	-27.87	1.2837	22.278	3.38	0.099
64	-25.58	0.7296	14.035	3.93	0.0515
75	-28.15	3.4098	55.314	3.88	0.2489
88	-26.18	1.1561	21.342	3.93	0.0827
77	-27.3	0.6963	15.599	4.32	0.0599
65	-24.43	0.2135	21.952	4.32	0.0196
55	-14.72	0.2636	13.519	6.96	0.013
58	-26.23	2.5957	41.647	6.41	0.1922
53	-21.44	0.0721	5.185	1.12	0.0058
76	-28.51	2.5841	43.895	3.62	0.1815
54	-13.08	0.2917	24.55	4.12	0.0219
56	-21.22	0.0873	10.04	5.31	0.0089
50	-21.61	0.2951	51.468	7.97	0.0457
51	-23.67	0.3457	36.702	5.36	0.0321
86	-24.86	0.3947	23.846	4.9	0.0209
49	-28.24	7.6587	21.152	5.28	0.6422
189	-24.87	0.1073	10.264	1.84	0.0084
190	-25.34	1.7316	19.992	4.51	0.07
106	-26.39	2.6218	57.723	6.71	0.1947
28	-26.27	3.4858	78.838	4.28	0.2868
40	-26.13	2.6651	63.937	4.53	0.2201
166	-25.83	2.1405	42.842	5.64	0.1506
45	-20.24	0.0387	5.312	1.95	0.0031
7	-26.15	4.6633	90.495	3.64	0.2966
70	-23.06	0.0219	5.82	0.81	0.0028
71	-25.35	0.0951	12.544	3.57	0.0098
72	-25.25	0.2051	19.393	3.19	0.0157
73	-25.58	0.225	20.041	2.99	0.0161
4	-25.58	1.7051	34.597	3.01	0.1058
43	-18.49	0.0513	7.723	1.93	0.0038
44	-19.07	0.0443	7.433	1.81	0.0038
46	-20.76	0.0427	7.087	1.84	0.0036
48	-24.56	0.4475	31.04	Reweigh	0.0279
66	-26.19	0.255	20.888	1.39	0.019
153	-21.27	0.071	9.246	4.57	0.0083
176	-20.77	0.0613	6.745	6.42	0.0071

164	-23.6	0.2866	26.205	5.39	0.024
169	-23.74	0.3247	15.422	4.28	0.015

	Sample	OurLabID	ID	Date_Time	Analysis	Peak_Number	Procedure_Code	Extraction_ID	Port	Analysis_Comment	Amount	Amount_Unit	Area
G-38511	192		4/4/2011	A-55562		4	356	272.5		0.0728	145.5429	mg	14.373
G-38512	207		4/4/2011	A-55563		4	356	271.5		0.094	138.4163	mg	17.918
G-38515	235		4/4/2011	A-55564		4	356	273.2		0.0538	180.7249	mg	13.415
G-38523	210		4/4/2011	A-55565		4	356	272.3		0.0403	178.7642	mg	9.878
G-38526	216		4/4/2011	A-55566		4	356	271.9		0.1206	95.7597	mg	15.698
G-38531	206		4/4/2011	A-55567		4	356	272.5		0.0624	170.7271	mg	14.595
G-38533	233		4/11/2011	A-55913		4	356	273.2		0.0506	301.048	mg	14.319
G-38537	234		4/4/2011	A-55569		4	356	271.1		0.1399	111.6863	mg	21.8
G-38543	191		4/4/2011	A-55570		4	356	271.1		0.0585	181.2896	mg	14.719
G-38546	208		4/4/2011	A-55571		4	356	271.7		0.074	143.8559	mg	14.347
G-38547	236		4/4/2011	A-55575		4	356	272.3		0.1571	116.716	mg	25.333
G-38548	219		4/7/2011	A-55866		4	356	255.8		0.8307	162.6115	mg	206.56
G-38549	232		4/7/2011	A-55867		4	356	274.4		0.0748	179.5237	mg	20.156
G-38550	209		4/4/2011	A-55578		4	356	273.8		0.026	180.404	mg	6.367
G-38551	217		4/4/2011	A-55579		4	356	273.2		0.0965	103.0242	mg	13.581
G-38552	223		4/4/2011	A-55580		4	356	274.0		0.0408	153.8963	mg	8.569
G-38553	224		4/4/2011	A-55581		4	356	273.4		0.0901	141.6244	mg	17.271
G-38555	226		4/4/2011	A-55582		4	356	272.3		0.126	118.4748	mg	20.178
G-38556	231		4/4/2011	A-55583		4	356	273.8		0.0865	125.2779	mg	14.911

OurLabID	Sample ID	Mass Fraction C x 100	Ignore Mass Fraction C	MS_Error_Code	Penultimate_Delta	Blank_Coeff	Hourly_Drift_Coeff	Expand_Coeff	Additive_Coeff	Final_Delta
G-38511	192		FALSE	0	18.46		-0.04	0.98792	-41.99	-23.8
G-38512	207		FALSE	0	21.06		-0.05	0.98792	-41.99	-21.24
G-38515	235		FALSE	0	21.8		-0.06	0.98792	-41.99	-20.52
G-38523	210		FALSE	0	21.01		-0.07	0.98792	-41.99	-21.31
G-38526	216		FALSE	0	21.92		-0.08	0.98792	-41.99	-20.42
G-38531	206		FALSE	0	22.1		-0.1	0.98792	-41.99	-20.25
G-38533	233		FALSE	0	22.01		-0.01	0.98517	-41.9	-20.23
G-38537	234		FALSE	0	18.96		-0.12	0.98792	-41.99	-23.38
G-38543	191		FALSE	0	19.42		-0.13	0.98792	-41.99	-22.94
G-38546	208		FALSE	0	20.45		-0.14	0.98792	-41.99	-21.93
G-38547	236		FALSE	0	20.84		-0.18	0.98792	-41.99	-21.59
G-38548	219		FALSE	100	16.2			0.98392	-42.09	-26.15
G-38549	232		FALSE	0	28.03			0.98392	-42.09	-14.51
G-38550	209		FALSE	260	20.55		-0.21	0.98792	-41.99	-21.9
G-38551	217		FALSE	0	20.13		-0.22	0.98792	-41.99	-22.33
G-38552	223		FALSE	260	20.02		-0.23	0.98792	-41.99	-22.44
G-38553	224		FALSE	0	24.38		-0.24	0.98792	-41.99	-18.14
G-38555	226		FALSE	0	18.42		-0.25	0.98792	-41.99	-24.05
G-38556	231		FALSE	0	21.5		-0.26	0.98792	-41.99	-21.02

OurLabID	Sample ID	MeanDeltaOfAnalyses	StdDevOfDeltasOfAnalyses	MeanDeltaOfPeaks	StdDevOfDeltaOfPeaks
G-38511	192	-23.8		-23.8	
G-38512	207	-21.15	0.13	-21.24	
G-38515	235	-20.52		-20.52	
G-38523	210	-21.33	0.03	-21.31	
G-38526	216	-20.42		-20.42	
G-38531	206	-20.37	0.16	-20.25	
G-38533	233	-19.98	0.34		
G-38537	234	-23.38		-23.38	
G-38543	191	-22.79	0.21	-22.94	
G-38546	208	-22.02	0.13	-21.93	
G-38547	236	-21.59		-21.59	
G-38548	219	-26.28	0.19	-26.15	
G-38549	232	-14.51		-14.51	
G-38550	209	-21.9		-21.9	
G-38551	217	-22.06	0.37	-22.33	
G-38552	223	-22.44		-22.44	
G-38553	224	-18.35	0.29	-18.14	
G-38555	226	-24.05		-24.05	
G-38556	231	-21.02	0.01	-21.02	

OurLabID	Sample ID	Ignore_Analysis	Tray .	Tray Position	Last_Name	Submit_Date	Medium	Project_Purpose	Pr
G-38511	192	FALSE	1	A1	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38512	207	FALSE	1	A2	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38515	235	FALSE	1	A5	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38523	210	FALSE	1	C1	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38526	216	FALSE	1	C4	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38531	206	FALSE	1	D3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38533	233	FALSE	1	D5	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38537	234	FALSE	2	A3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38543	191	FALSE	2	B3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38546	208	FALSE	2	B6	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38547	236	FALSE	2	C1	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38548	219	FALSE	2	C2	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38549	232	FALSE	2	C3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38550	209	FALSE	2	C4	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38551	217	FALSE	2	C5	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38552	223	FALSE	2	C6	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38553	224	FALSE	2	D1	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38555	226	FALSE	2	D3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	
G-38556	231	FALSE	2	D4	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	

	Sample	OurLabID	ID	Date_Time	Analysis	Peak_Number	Procedure_Code	Extraction_ID	Port	Analysis_Comment	Amount	Amount_Unit	Area
G-38511	192		4/4/2011	A-55562		3	584	151.9		0.0113	145.5429	mg	10.589
G-38512	207		4/4/2011	A-55563		3	584	150.7		0.0112	138.4163	mg	11.272
G-38515	235		4/4/2011	A-55564		3	584	150.9		0.0047	180.7249	mg	6.286
G-38523	210		4/4/2011	A-55565		3	584	151.7		0.0052	178.7642	mg	6.875
G-38526	216		4/4/2011	A-55566		3	584	150.3		0.0159	95.7597	mg	10.97
G-38531	206		4/4/2011	A-55567		3	584	152.2		0.0086	170.7271	mg	10.47
G-38533	233		4/11/2011	A-55913		3	584	151.7		0.0036	301.048	mg	4.219
G-38537	234		4/4/2011	A-55569		3	584	150.7		0.0117	111.6863	mg	9.67
G-38543	191		4/4/2011	A-55570		3	584	150.7		0.0082	181.2896	mg	10.593
G-38546	208		4/4/2011	A-55571		3	584	151.3		0.0087	143.8559	mg	8.931
G-38547	236		4/4/2011	A-55575		3	584	151.9		0.0116	116.716	mg	9.759
G-38548	219		4/7/2011	A-55866		3	584	148.4		0.0675	162.6115	mg	72.925
G-38549	232		4/7/2011	A-55867		3	584	153.0		0.0026	179.5237	mg	4.674
G-38550	209		4/4/2011	A-55578		3	584	153.4		0.0034	180.404	mg	4.551
G-38551	217		4/4/2011	A-55579		3	584	152.2		0.0121	103.0242	mg	8.793
G-38552	223		4/4/2011	A-55580		3	584	152.8		0.0153	153.8963	mg	9.038
G-38553	224		4/4/2011	A-55581		3	584	151.9		0.0109	141.6244	mg	11.099
G-38555	226		4/4/2011	A-55582		3	584	153.2		0.0203	118.4748	mg	17.047
G-38556	231		4/4/2011	A-55583		3	584	152.6		0.0095	125.2779	mg	8.466

OurLabID	Sample ID	Mass Fraction N x 100	Ignore Mass Fraction N	MS_Error_Co de	Penultimate_Delta	Blank_Co rr	Hourly_Drift_Co rr	Expand_Coeff	Additive_Coeff	Final_Delta
G-38511	192		FALSE	260	7.04		0.02	1.01819	-0.82	6.37
G-38512	207		FALSE	260	2.61		0.03	1.01819	-0.82	1.87
G-38515	235		FALSE	260	4.06		0.03	1.01819	-0.82	3.34
G-38523	210		FALSE	260	2.68		0.04	1.01819	-0.82	1.95
G-38526	216		FALSE	260	2.67		0.04	1.01819	-0.82	1.94
G-38531	206		FALSE	260	2.79		0.05	1.01819	-0.82	2.07
G-38533	233		FALSE	260	3.63			1	-0.8	2.83
G-38537	234		FALSE	260	3.76		0.06	1.01819	-0.82	3.07
G-38543	191		FALSE	260	3.68		0.06	1.01819	-0.82	2.99
G-38546	208		FALSE	260	3.16		0.07	1.01819	-0.82	2.47
G-38547	236		FALSE	260	3.82		0.09	1.01819	-0.82	3.15
G-38548	219		FALSE	0	4.5		0.02	1	-0.58	3.94
G-38549	232		FALSE	260	3		0.03	1	-0.58	2.45
G-38550	209		FALSE	260	3.25		0.1	1.01819	-0.82	2.59
G-38551	217		FALSE	260	3.84		0.1	1.01819	-0.82	3.19
G-38552	223		FALSE	260	10.43		0.11	1.01819	-0.82	9.91
G-38553	224		FALSE	260	9.03		0.11	1.01819	-0.82	8.49
G-38555	226		FALSE	0	6.53		0.12	1.01819	-0.82	5.95
G-38556	231		FALSE	260	3.41		0.12	1.01819	-0.82	2.78

	Sample	OurLabID	ID	MeanDeltaOfAnalyses	StdDevOfDeltasOfAnalyses	MeanDeltaOfPeaks	StdDevOfDeltaOfPeaks	Ignore_Analysis
G-38511	192			6.37		6.37		FALSE
G-38512	207			1.64	0.34	1.87		FALSE
G-38515	235			3.34		3.34		FALSE
G-38523	210			1.95		1.95		FALSE
G-38526	216			1.68	0.37	1.94		FALSE
G-38531	206			2.07		2.07		FALSE
G-38533	233			3	0.24	2.83		FALSE
G-38537	234			3.07		3.07		FALSE
G-38543	191			2.99		2.99		FALSE
G-38546	208			2.47		2.47		FALSE
G-38547	236			3.1	0.07	3.15		FALSE
G-38548	219			3.91	0.24	3.94		FALSE
G-38549	232			2.45		2.45		FALSE
G-38550	209			2.59		2.59		FALSE
G-38551	217			3.19		3.19		FALSE
G-38552	223			9.91		9.91		FALSE
G-38553	224			8.49		8.49		FALSE
G-38555	226			5.95		5.95		FALSE
G-38556	231			2.78		2.78		FALSE

OurLabID	Sample ID	Tray .	Tray Position	Last_Name	Submit_Date	Medium	Project_Purpose	Project_Location
G-38511	192	1	A1	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38512	207	1	A2	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38515	235	1	A5	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38523	210	1	C1	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38526	216	1	C4	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38531	206	1	D3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38533	233	1	D5	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38537	234	2	A3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38543	191	2	B3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38546	208	2	B6	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38547	236	2	C1	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38548	219	2	C2	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38549	232	2	C3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38550	209	2	C4	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38551	217	2	C5	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38552	223	2	C6	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38553	224	2	D1	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38555	226	2	D3	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River
G-38556	231	2	D4	Ullman	#####	26 --> G, C & N, C- and N-bearing material	Snake River Project	Snake River

Standards used (SD in parentheses)					
	acetanilide	corn	N	Normalization equation	drift correction
1	-29.90 (0.11)	-13.47 (0.07)	3,3	0.99x-41.99	-0.072 per mil/hr
2	-29.90 (0.17)	-13.36 (0.05)	3,3	0.98x-42.09	none
3	-29.90 (0.13)	-13.36 (0.03)	3,3	0.99x-41.90	-0.020 per mil/hr

Standards used (SD in parentheses)					
	acetanilide	corn	USGS25	N	Normalization equation
1	-0.10 (0.11)	6.82 (0.22)	-30.41 (0.14)	4,2,3	1.02x-0.82
2	-0.03 (0.15)	6.27 (0.10)	-29.93 (0.25)	4,3,3	1.00x-0.58
3	-0.13 (0.14)	6.55 (0.20)	-30.10 (0.12)	4,3,3	1.00x-0.80

1000x $\delta^{13}\text{C}_{\text{VPDB}}$ Normalization information

1000x $\delta^{15}\text{N}_{\text{AIR}}$ Normalization information

Lab QC check, NIST peach		1000x $\delta^{13}\text{C}_{\text{VPDB}}$		1000x $\delta^{15}\text{N}_{\text{AIR}}$		This sample was not included in any normalization, but is included in every sequence as a check of the normalization.
		observed	actual	observed	actual	
1	-26.09	-25.9		1.89	1.9	
1	-26.12			1.84		
2	-26.01			2.02		
2	-26.02			1.96		
3	-26.00			1.97		
3	-26.02			1.89		
average	-26.04			1.93		C% and N% was calculated using acetanilide
SD	0.05			0.07		

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Client: J. Ullman
Project: Snake river samples
Date: 4/12/2011

Delta values are the mean of replicates where standard deviation is indicated
Delta values were calculated using a two point normalization by fitting a regression line through two running standards. See normalization tab.

C and N% was calcuated with a multi point normalization using acetanilide.

OurLabID	Sample ID	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	$\delta^{13}\text{C}$ St. Dev.	C%	Area C (V/s)	$\delta^{15}\text{N}_{\text{AIR}} \times 1000$	$\delta^{15}\text{N}$ St. Dev.
G-38511	192	-23.8		0.073	14.373	6.37	
G-38512	207	-21.15	0.13	0.094	17.918	1.64	0.34
G-38515	235	-20.52		0.054	13.415	3.34	
G-38523	210	-21.33	0.03	0.040	9.878	1.95	
G-38526	216	-20.42		0.121	15.698	1.68	0.37
G-38531	206	-20.37	0.16	0.062	14.595	2.07	
G-38533	233	-19.98	0.34	0.051	14.319	0.24	2.83
G-38537	234	-23.38		0.140	21.8	3.07	
G-38543	191	-22.79	0.21	0.059	14.719	2.99	
G-38546	208	-22.02	0.13	0.074	14.347	2.47	
G-38547	236	-21.59		0.157	25.333	3.1	0.07
G-38548	219	-26.28	0.19	0.831	206.56	3.91	0.24
G-38549	232	-14.51	0.075	20.156		2.45	
G-38550	209	-21.9	0.026	6.367		2.59	
G-38551	217	-22.06	0.37	0.097	13.581	3.19	
G-38552	223	-22.44		0.041	8.569	9.91	
G-38553	224	-18.35	0.29	0.090	17.271	8.49	
G-38555	226	-24.05		0.126	20.178	5.95	
G-38556	231	-21.02	0.01	0.087	14.911	2.78	

Client: J. Ullman
Project: Snake river samples
Date: 4/12/2011

[Redacted]

[Redacted]

OurLabID	Sample ID	N%	Area N (V/s)	Sequence	Notes
G-38511	192	0.011	10.589	1	
G-38512	207	0.011	11.272	1	
G-38515	235	0.005	6.286	1	
G-38523	210	0.005	6.875	1	
G-38526	216	0.016	10.97	1	
G-38531	206	0.009	10.47	1	
G-38533	233	0.004	4.219	3	N signal still below range of reliable detection at maximum sample size
G-38537	234	0.012	9.67	1	
G-38543	191	0.008	10.593	1	
G-38546	208	0.009	8.931	1	
G-38547	236	0.012	9.759	1	
G-38548	219	0.068	72.925	2	
G-38549	232	0.003	4.674	2	N signal still below range of reliable detection at maximum sample size
G-38550	209	0.003	4.551	1	N signal below range of reliable detection
G-38551	217	0.012	8.793	1	sample had minor leaks; double-wrapped for analysis
G-38552	223	0.015	9.038	1	
G-38553	224	0.011	11.099	1	
G-38555	226	0.020	17.047	1	sample had minor leaks; double-wrapped for analysis
G-38556	231	0.010	8.466	1	

Appendix #A5 - Sediment Data for Statistical Analysis

5a Original Source A Data

Location name	Sample ID	Sample type	$\delta^{13}\text{C}$	C%	$\delta^{15}\text{N}$	N%	C/N (molar ratio)
Potlatch 1	88	BD	-26.18	1.156	3.93	0.0827	16.3
Potlatch 2	87	BD	-24.95	0.084	5.96	0.0104	9.4
Potlatch 3	86	BD	-24.86	0.395	4.9	0.0209	22.0
Potlatch 4	85	BD	-26.46	2.126	3.95	0.1681	14.8
Potlatch 5	84	BD	-25.49	1.847	4.82	0.1739	12.4
Potlatch 6	83	BK	-25.39	1.543	4.46	0.079	22.8
Potlatch 7	82	Ag	-26.62	2.085	7.02	0.1675	14.5
Clearwater1	73	BD	-25.58	0.225	2.99	0.0161	16.3
Clearwater2	72	BD	-25.25	0.205	3.19	0.0157	15.2
Clearwater3	71	BD	-25.35	0.095	3.57	0.0098	11.3
Clearwater4	70	BD	-23.06	0.022	0.81	0.0028	9.1
Clearwater5	69	BD	-24.52	0.12	1.30	0.01	13.92
Clearwater6 (BK)	68	BK	-27.81	1.18	1.46	0.09	14.65
Clearwater7 (Ag)	67	Ag	-26.63	2.572	6.2	0.2184	13.7
Clearwater8 (BK)	66	BK	-26.19	0.255	1.39	0.019	15.7
Asotin1 (Ag)	81	Ag	-25.42	1.258	7.23	0.1159	12.7
Asotin 2 (Submerged)	80	BK	-27.22	0.745	5	0.0639	13.6
Asotin3	79	BD	-27.87	1.284	3.38	0.099	15.1
Asotin4	78	BD	-28.4	2.641	3.63	0.1888	16.3
Asotin5	77	BD	-27.3	0.696	4.32	0.0599	13.6
Asotin6	76	BD	-28.51	2.584	3.62	0.1815	16.6

Asotin7	75	BD	-28.15	3.41	3.88	0.2489	16.0
Asotin8 (BK)	74	BK	-26.63	0.396	4.89	0.0392	11.8
GR1	65	BD	-24.43	0.214	4.32	0.0196	12.7
GR2	64	BD	-25.58	0.73	3.93	0.0515	16.5
GR3	63	BD	-23.15	0.121	4.35	0.0127	11.1
GR4	62	BD	-22.23	0.115	4.36	0.0098	13.7
GR5	61	BD	-25.92	1.864	3.34	0.1334	16.3
GR6 (BK)	60	BK	-24.71	0.171	4.2	0.0172	11.6
GR7 (BK)	59	BK	-26.05	2.258	5.03	0.2022	13.0
GR8 (Ag)	58	Ag	-26.23	2.596	6.41	0.1922	15.8
GR9 (BK)	57	BK	-26.18	0.768	4.48	0.0652	13.7
Salmon 1	43	BD	-18.49	0.051	1.93	0.0038	15.8
Salmon 2	44	BD	-19.07	0.044	1.81	0.0038	13.6
Salmon 3	45	BD	-20.24	0.039	1.95	0.0031	14.6
Salmon 4	46	BD	-20.76	0.043	1.84	0.0036	13.8
Sample 5	47	BD	-20.535	0.041	0.825	0.0043	11.2
Salmon 6 (BK)	48	BK	-24.5	0.421	2.185	0.0265	18.6
Duplicate samples							
Salmon 5	189	BD	-24.87	0.107	1.84	0.0084	14.9
Salmon 6	190	BK	-25.34	1.732	4.51	0.07	28.9
HC1	56	BD	-21.22	0.087	5.31	0.0089	11.4
HC2	54	BD	-13.08	0.292	4.12	0.0219	15.5
HC3	53	BD	-21.44	0.072	1.12	0.0058	14.5
HC4	52	BD	-24.63	0.474	6.24	0.027	20.5
HC6	55	BD	-14.72	0.264	6.96	0.013	23.7
HC5 (BK)	51	BK	-23.67	0.346	5.36	0.0321	12.6

HC7 (BK)	50	BK	-21.61	0.295	7.97	0.0457	7.5
HC8 (Ag)	49	Ag	-28.24	7.659	5.28	0.6422	13.9

Data in blue: Original

Agriculture soil							
	Average		-26.63	3.23	6.43	0.27	14.12
	Std deviation		1.03	2.53	0.77	0.21	1.14
	CV%		-3.86	78.31	11.96	79.70	8.04
Bank soil Average			-25.44	0.84	4.24	0.06	15.36
Std deviation			1.68	0.68	1.84	0.05	5.68
CV%			-6.59	81.08	43.26	80.07	36.99
Bed soil Average			-23.62	0.69	3.50	0.05	14.78
Std deviation			3.75	0.94	1.58	0.07	3.21
CV%			-15.88	136.13	45.18	134.76	21.71

Location name	Sample ID	Sample type	Grain size% < 150 µm	Sc46 mg/g	La140 mg/g	SiO ₂ %	Al ₂ O ₃ %	Fe ₂ O ₃ %
Potlatch 1	88	BD	69.90	0.02	0.03	60.81	14.22	7.68
Potlatch 2	87	BD	0.23	0.04	0.04	68.96	11.47	7.3
Potlatch 3	86	BD	6.94	0.02	0.05	68.7	11.46	7.15
Potlatch 4	85	BD	62.64	0.05	0.08	59.09	12.79	7.01
Potlatch 5	84	BD	62.12	0.02	0.03	61.02	13.23	7.39
Potlatch 6	83	BK	31.65	0.04	0.04	53.94	13.03	12.78
Potlatch 7	82	Ag	69.25	ND	0.06	66.04	13.16	4.58
Clearwater1	73	BD	32.27	0.02	0.05	70.12	12.33	4.45
Clearwater2	72	BD	26.10	0.01	0.03	73.18	12.71	3.4
Clearwater3	71	BD	10.73	0.01	0.02	72.96	12.14	3.71
Clearwater4	70	BD	4.76	0.01	0.03	73.28	11.17	4.48
Clearwater5	69	BD	15.13	0.01	0.03	72.48	12.62	3.63
Clearwater6 (BK)	68	BK	35.81	0.01	0.12	67.82	12.75	4.43
Clearwater7 (Ag)	67	Ag		0.02	0.05	59.89	13.86	6.45
Clearwater8 (BK)	66	BK	24.02	0.01	0.01	71.76	12.89	3.36
Asotin1 (Ag)	81	Ag	75.32	0.06	0.17	64.74	13.09	5.58
Asotin 2 (Submerged)	80	BK	76.51	0.02	0.03	60.58	13.73	7.85
Asotin3	79	BD	60.08	0.04	0.04	54.65	13.92	10.45
Asotin4	78	BD	81.94	0.02	0.04	54.18	13.05	8.81
Asotin5	77	BD	62.76	0.03	0.03	55.53	14.1	10.11
Asotin6	76	BD	69.53	0.03	0.05	55.12	12.86	8.9
Asotin7	75	BD	89.44	ND	0.04	54.63	12.68	7.82
Asotin8 (BK)	74	BK	18.42	0.04	0.04	53.97	13.39	11.88

GR1	65	BD	41.83	0.03	0.03	56.61	14.5	10.43
GR2	64	BD	93.34	0.03	0.05	55.47	14.89	10.2
GR3	63	BD	37.44	0.20	0.09	57.69	14.27	10.07
GR4	62	BD	37.53	ND	0.03	57.49	14.32	10.41
GR5	61	BD	78.08	0.03	0.03	55.43	13.96	9.45
GR6 (BK)	60	BK	13.87	0.05	0.03	55.64	13.63	11.88
GR7 (BK)	59	BK	68.76	0.03	0.02	62.61	14.02	6.17
GR8 (Ag)	58	Ag	49.89	0.02	0.04	59.52	15.04	6.71
GR9 (BK)	57	BK	56.00	0.03	0.05	56.36	14.8	9.51
Salmon 1	43	BD	22.44	0.02	0.04	71.75	12.79	3.26
Salmon 2	44	BD	7.42	ND	0.08	73.68	12.32	2.36
Salmon 3	45	BD	0.83	ND	0.02	73.89	12.32	2.2
Salmon 4	46	BD	4.65	ND	ND	75.46	12.74	1.97
Sample 5	47	BD	6.74	0.02	0.04	73.16	12.63	3.14
Salmon 6 (BK)	48	BK	53.69	0.01	0.04	67.14	13.6	4.55
Duplicate samples								
Salmon 5	189	BD		ND	0.25	72.25	12.49	3.8
Salmon 6	190	BK		0.04	0.04	54.03	13.16	11.85
HC1	56	BD	4.52	0.05	0.03	47.53	15.23	15.68
HC2	54	BD	19.15	0.03	0.01	56.08	13.67	10.7
HC3	53	BD	6.84	0.04	ND	52.4	13.64	12.39
HC4	52	BD	16.51	0.05	ND	50.23	15.17	12.39
HC6	55	BD	1.18	0.03	0.02	52.04	15.17	12.17
HC5 (BK)	51	BK	6.43	0.03	0.03	47.9	13.44	16.18
HC7 (BK)	50	BK	21.75	0.04	0.02	56.45	16.77	9.2
HC8 (Ag)	49	Ag	35.26	0.06	ND	46.81	13.74	8.19

Data in blue: Original

Agriculture soil						
Average	57.43	0.04	0.08	59.40	13.78	6.30
Std deviation	18.33	0.02	0.06	7.61	0.78	1.35
CV%	31.92	54.63	77.73	12.80	5.69	21.35
Bank soil Average	36.99	0.03	0.04	59.02	13.77	9.14
Std deviation	23.36	0.01	0.03	7.05	1.09	3.96
CV%	63.14	43.26	70.97	11.94	7.95	43.34
Bed soil Average	34.44	0.03	0.05	62.45	13.25	7.51
Std deviation	30.53	0.04	0.04	8.97	1.13	3.66
CV%	88.66	106.76	95.05	14.37	8.50	48.70

Location name	Sample ID	Sample type	MnO	MgO	CaO	Na ₂ O	K ₂ O	TiO ₂	P ₂ O ₅
			%	%	%	%	%	%	%
Potlatch 1	88	BD	0.127	2	3.82	2.47	1.73	1.364	0.23
Potlatch 2	87	BD	0.112	1.74	4.17	2.32	1.47	1.26	0.25
Potlatch 3	86	BD	0.112	1.69	3.91	2.2	1.57	1.272	0.23
Potlatch 4	85	BD	0.085	1.49	3.06	1.9	1.61	1.319	0.21
Potlatch 5	84	BD	0.116	1.74	3.42	2.09	1.62	1.405	0.23
Potlatch 6	83	BK	0.198	2.25	4.15	1.9	1.54	1.451	0.27
Potlatch 7	82	Ag	0.119	1.06	1.82	2.03	2.11	0.919	0.19
Clearwater1	73	BD	0.075	1.41	3.03	3	2.3	0.882	0.14
Clearwater2	72	BD	0.052	1.13	2.66	2.93	2.48	0.558	0.11
Clearwater3	71	BD	0.062	1.11	2.86	2.86	2.16	0.75	0.11
Clearwater4	70	BD	0.088	1.42	3.41	2.42	1.79	0.807	0.09
Clearwater5	69	BD	0.058	1.17	2.81	2.89	2.37	0.645	0.11
Clearwater6 (BK)	68	BK	0.071	1.41	2.74	2.57	2.18	0.791	0.14
Clearwater7 (Ag)	67	Ag	0.12	0.99	2.05	1.64	1.65	1.157	0.24
Clearwater8 (BK)	66	BK	0.051	1.14	2.69	2.96	2.44	0.529	0.08
Asotin1 (Ag)	81	Ag	0.106	1.56	2.48	2.13	2.08	1.061	0.15
Asotin 2 (Submerged)	80	BK	0.096	2.22	4.21	2.51	1.63	1.604	0.21
Asotin3	79	BD	0.14	2.93	6.06	2.87	1.37	2.184	0.3
Asotin4	78	BD	0.11	2.48	5.18	2.54	1.34	1.814	0.24
Asotin5	77	BD	0.138	2.93	6.07	2.84	1.4	2.089	0.3
Asotin6	76	BD	0.109	2.54	5	2.4	1.4	1.785	0.24
Asotin7	75	BD	0.111	2.16	4.45	2.41	1.39	1.547	0.24
Asotin8 (BK)	74	BK	0.172	3.29	6.79	2.76	1.5	2.206	0.46
GR1	65	BD	0.148	2.95	6.45	3.12	1.44	1.964	0.4

GR2	64	BD	0.151	2.89	6.26	3.04	1.34	1.993	0.27
GR3	63	BD	0.143	2.88	6.42	3.1	1.42	1.945	0.29
GR4	62	BD	0.155	2.93	6.6	3.13	1.46	2.024	0.3
GR5	61	BD	0.151	2.86	5.56	2.77	1.38	1.66	0.28
GR6 (BK)	60	BK	0.166	3.04	6.42	3.03	1.41	2.344	0.29
GR7 (BK)	59	BK	0.113	3.11	4.63	2.98	1.6	0.923	0.24
GR8 (Ag)	58	Ag	0.191	1.21	2.29	1.93	1.68	1.21	0.22
GR9 (BK)	57	BK	0.139	2.62	5.87	3.12	1.49	1.851	0.28
Salmon 1	43	BD	0.068	1.29	2.92	2.99	2.65	0.533	0.14
Salmon 2	44	BD	0.043	0.89	2.24	3.08	2.88	0.361	0.06
Salmon 3	45	BD	0.039	0.74	1.97	2.99	2.9	0.33	0.06
Salmon 4	46	BD	0.03	0.68	1.84	3.05	3.16	0.279	0.07
Sample 5	47	BD	0.065	0.95	2.33	3.02	2.86	0.615	0.12
Salmon 6 (BK)	48	BK	0.075	1.82	3.04	2.83	2.5	0.721	0.17
Duplicate samples									
Salmon 5	189	BD	0.063	1.21	2.89	2.99	2.45	0.678	0.12
Salmon 6	190	BK	0.181	2.47	4.57	2.02	1.76	1.523	0.32
HC1	56	BD	0.23	2.28	7.19	3.08	0.98	3.461	0.46
HC2	54	BD	0.192	2.41	4.74	2.48	1.45	2.074	0.18
HC3	53	BD	0.178	4.24	8.19	2.97	0.97	2.156	0.2
HC4	52	BD	0.176	3.72	8.16	3.15	0.97	2.193	0.26
HC6	55	BD	0.186	2.89	7.63	2.7	0.75	1.51	0.22
HC5 (BK)	51	BK	0.225	2.12	5.12	2.28	0.71	2.615	0.34
HC7 (BK)	50	BK	0.153	1.74	2.66	2.21	1.65	1.357	0.11
HC8 (Ag)	49	Ag	0.127	2.25	4.55	2.56	1.05	1.401	0.39

Data in blue: Original

Agriculture soil							
Average	0.13	1.41	2.64	2.06	1.71	1.15	0.24
Std deviation	0.03	0.52	1.10	0.34	0.43	0.18	0.09
CV%	25.28	36.52	41.60	16.28	25.04	15.56	38.44
Bank soil Average	0.14	2.27	4.41	2.60	1.70	1.49	0.24
Std deviation	0.06	0.68	1.45	0.42	0.49	0.67	0.11
CV%	40.43	29.79	32.96	15.99	28.66	45.14	44.49
Bed soil Average	0.11	2.06	4.56	2.77	1.78	1.40	0.21
Std deviation	0.05	0.92	1.92	0.35	0.65	0.74	0.10
CV%	45.03	44.81	42.12	12.48	36.80	52.91	46.51

Location name	Sample ID	Sample type	LO %	Sc ppm	V ppm	Co ppm	Ga ppm	Rb ppm	Sr ppm
Potlatch 1	88	BD	6.19	19	188	65	19	59	354
Potlatch 2	87	BD	1.8	18	193	124	16	36	289
Potlatch 3	86	BD	2.57	18	188	103	16	43	296
Potlatch 4	85	BD	9.93	17	172	66	18	61	256
Potlatch 5	84	BD	7.78	18	181	62	18	60	279
Potlatch 6	83	BK	8.25	23	238	56	19	62	285
Potlatch 7	82	Ag	7.66	12	94	46	17	81	269
Clearwater1	73	BD	1.42	11	93	194	16	61	379
Clearwater2	72	BD	1.56	9	67	180	16	70	394
Clearwater3	71	BD	1.04	9	76	247	15	58	378
Clearwater4	70	BD	0.77	13	88	206	14	47	344
Clearwater5	69	BD	1.26	9	71	196	16	66	394
Clearwater6 (BK)	68	BK	4.08	11	84	180	17	71	329
Clearwater7 (Ag)	67	Ag	10.49	16	137	28	19	69	233
Clearwater8 (BK)	66	BK	1.55	8	65	175	16	68	398
Asotin1 (Ag)	81	Ag	6.61	13	119	41	17	69	279
Asotin 2 (Submerged)	80	BK	5.19	19	218	62	19	54	311
Asotin3	79	BD	4.58	27	335	53	20	42	327
Asotin4	78	BD	9.66	22	277	63	19	45	307
Asotin5	77	BD	4.11	26	304	55	20	42	331
Asotin6	76	BD	8.4	23	263	62	19	47	288
Asotin7	75	BD	10.87	20	224	54	18	48	289
Asotin8 (BK)	74	BK	2.27	30	315	83	21	40	301

GR1	65	BD	2.03	28	312	77	20	36	383
GR2	64	BD	3.66	28	296	50	21	37	393
GR3	63	BD	1.66	27	309	73	20	35	393
GR4	62	BD	1.53	27	323	80	20	34	407
GR5	61	BD	6.67	25	259	45	19	40	382
GR6 (BK)	60	BK	1.72	29	397	96	20	34	367
GR7 (BK)	59	BK	4.08	17	148	114	17	46	439
GR8 (Ag)	58	Ag	9.6	15	145	35	19	70	264
GR9 (BK)	57	BK	3.64	24	284	86	21	37	417
Salmon 1	43	BD	0.99	10	67	148	17	83	372
Salmon 2	44	BD	0.92	7	46	172	13	71	370
Salmon 3	45	BD	0.89	5	41	186	14	80	364
Salmon 4	46	BD	0.97	5	35	173	14	86	372
Sample 5	47	BD	0.97	7	60	205	15	79	384
Salmon 6 (BK)	48	BK	2.39	11	92	91	16	78	383
Duplicate samples									
Salmon 5	189	BD	1.22	9	75	181	16	62	389
Salmon 6	190	BK	6.68	23	247	52	18	64	270
HC1	56	BD	3.49	34	444	62	25	25	370
HC2	54	BD	4.93	24	367	53	19	42	268
HC3	53	BD	2.2	39	448	94	20	22	344
HC4	52	BD	3.65	39	436	62	22	22	401
HC6	55	BD	4.11	29	290	48	19	21	311
HC5 (BK)	51	BK	8.88	36	372	52	24	26	289
HC7 (BK)	50	BK	8.2	23	213	39	22	67	262
HC8 (Ag)	49	Ag	17.03	23	214	33	17	29	279

Data in blue: Original

Agriculture soil							
Average	10.28	15.80	141.80	36.60	17.80	63.60	264.80
Std deviation	4.07	4.32	44.86	7.02	1.10	19.99	18.93
CV%	39.64	27.37	31.64	19.18	6.15	31.44	7.15
Bank soil Average	4.74	21.17	222.75	90.50	19.17	53.92	337.58
Std deviation	2.67	8.42	109.82	46.15	2.52	16.86	60.82
CV%	56.27	39.77	49.30	51.00	13.13	31.27	18.02
Bed soil Average	3.61	19.42	210.58	110.94	17.87	50.32	348.65
Std deviation	3.03	9.79	129.79	63.24	2.70	18.54	45.05
CV%	84.10	50.43	61.63	57.01	15.14	36.85	12.92

Location name	Sample ID	Sample type	Y ppm	Zr ppm	Nb ppm	Cs ppm	Ba ppm	La ppm
Potlatch 1	88	BD	34	281	14	2.1	720	47.6
Potlatch 2	87	BD	22	162	7	0.8	679	22.7
Potlatch 3	86	BD	27	174	9	1.1	730	29
Potlatch 4	85	BD	34	305	14	2.4	662	59.1
Potlatch 5	84	BD	34	290	15	2.1	666	44.2
Potlatch 6	83	BK	31	211	12	3.5	618	31.3
Potlatch 7	82	Ag	33	336	15	3.2	721	49.6
Clearwater1	73	BD	37	458	14	1.5	791	87.2
Clearwater2	72	BD	21	220	9	1.7	858	41.8
Clearwater3	71	BD	33	354	12	1.2	751	84
Clearwater4	70	BD	38	224	12	0.9	648	69.1
Clearwater5	69	BD	28	270	11	1.5	835	55.5
Clearwater6 (BK)	68	BK	39	401	12	2.2	730	81.3
Clearwater7 (Ag)	67	Ag	34	251	12	3.5	670	38.9
Clearwater8 (BK)	66	BK	17	180	9	1.6	845	35.5
Asotin1 (Ag)	81	Ag	29	283	12	3.4	645	42.7
Asotin 2 (Submerged)	80	BK	28	274	13	2.2	636	35
Asotin3	79	BD	28	211	12	1.4	632	25.5
Asotin4	78	BD	25	218	12	1.7	577	27.4
Asotin5	77	BD	27	225	14	1.4	718	27.4
Asotin6	76	BD	26	221	12	1.8	630	29
Asotin7	75	BD	27	215	11	1.9	576	28.6

Asotin8 (BK)	74	BK	34	227	13	1.1	944	30.9
GR1	65	BD	30	176	10	1.1	695	27.2
GR2	64	BD	27	185	11	1.2	706	22.3
GR3	63	BD	26	180	10	1	696	22.2
GR4	62	BD	37	204	10	1	701	53
GR5	61	BD	29	187	11	1.5	657	25.6
GR6 (BK)	60	BK	27	373	11	1	672	24.1
GR7 (BK)	59	BK	30	172	9	1.8	681	45.1
GR8 (Ag)	58	Ag	30	261	13	3.4	748	39.3
GR9 (BK)	57	BK	25	194	10	1.2	712	22.1
Salmon 1	43	BD	24	122	15	2	822	44.5
Salmon 2	44	BD	15	133	3	1.8	896	23
Salmon 3	45	BD	13	115	7	1.8	954	20.6
Salmon 4	46	BD	11	121	7	2	989	19.4
Sample 5	47	BD	27	324	14	1.9	899	48.4
Salmon 6 (BK)	48	BK	24	268	14	2.7	823	34.6
Duplicate samples								
Salmon 5	189	BD	29	309	10	1.5	856	61
Salmon 6	190	BK	32	212	10	3.6	615	27
HC1	56	BD	44	245	17	0.9	600	27.5
HC2	54	BD	28	191	14	2.6	654	29.8
HC3	53	BD	27	129	7	0.8	410	13.5
HC4	52	BD	26	133	7	0.8	468	13.6
HC6	55	BD	26	125	8	1.1	422	15.8
HC5 (BK)	51	BK	41	251	15	2	470	27.9
HC7 (BK)	50	BK	30	201	12	4.1	664	27.6

HC8 (Ag)	49	Ag	21
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101	6	1.1	393
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13.4			
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Data in blue: Original

Agriculture soil								
	Average		29.40	246.40	11.60	2.92	635.40	36.78
	Std deviation		5.13	87.67	3.36	1.02	141.47	13.76
	CV%		17.44	35.58	28.98	35.04	22.26	37.40
Bank soil Average			29.83	247.00	11.67	2.25	700.83	35.20
	Std deviation		6.51	73.07	1.92	1.03	124.36	15.76
	CV%		21.81	29.58	16.48	45.82	17.74	44.76
Bed soil Average			27.74	216.35	10.94	1.50	706.39	36.95
	Std deviation		7.00	79.03	3.12	0.49	140.80	19.70
	CV%		25.23	36.53	28.52	32.84	19.93	53.31

Location name	Sample ID	Sample type	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm
Potlatch 1	88	BD	94.7	10.6	40.2	8.2	1.79	7.4	1.1
Potlatch 2	87	BD	47.1	5.38	22.3	4.8	1.56	4.6	0.7
Potlatch 3	86	BD	57.2	6.85	27.2	5.8	1.61	5.9	0.9
Potlatch 4	85	BD	109	11.8	44.6	8.7	2.13	8.1	1.3
Potlatch 5	84	BD	86.6	9.86	38.3	7.6	1.75	6.9	1.1
Potlatch 6	83	BK	68.4	7.45	29.8	6.6	1.66	6.4	1.1
Potlatch 7	82	Ag	95.5	10.5	39	7.5	1.63	6.7	1
Clearwater1	73	BD	171	18	66.4	11.7	1.67	9	1.3
Clearwater2	72	BD	79.8	8.57	31.7	5.6	1.16	4.7	0.7
Clearwater3	71	BD	163	17.2	62.5	11.2	1.57	8.5	1.2
Clearwater4	70	BD	135	14.1	51	8.9	1.48	7.3	1.1
Clearwater5	69	BD	106	11.3	41.7	7.4	1.31	6	0.9
Clearwater6 (BK)	68	BK	161	17.1	63.3	11.7	1.6	9.2	1.4
Clearwater7 (Ag)	67	Ag	78.8	8.74	34.3	7.1	1.66	6.5	1
Clearwater8 (BK)	66	BK	68.2	7.24	27.5	5.1	1.07	4	0.6
Asotin1 (Ag)	81	Ag	85.4	9.18	34.9	6.8	1.49	6	1
Asotin 2 (Submerged)	80	BK	70	7.7	30.2	6.2	1.6	5.6	0.9
Asotin3	79	BD	51.7	6.04	25.2	5.5	1.74	5.5	0.9
Asotin4	78	BD	55.2	6.33	25.6	5.7	1.58	5.4	0.9
Asotin5	77	BD	54.9	6.53	26.4	5.9	1.8	5.7	0.9
Asotin6	76	BD	58.2	6.75	27.2	5.8	1.68	5.8	0.9
Asotin7	75	BD	57.9	6.63	26.8	5.7	1.6	5.5	0.9
Asotin8 (BK)	74	BK	62.3	7.58	31.6	7.2	2.31	7.3	1.2

GR1	65	BD	53.1	6.18	25.4	5.7	1.76	5.8	0.9
GR2	64	BD	45.8	5.56	23	5.2	1.74	5.1	0.9
GR3	63	BD	45.4	5.53	23	5.3	1.72	5.5	0.9
GR4	62	BD	92.8	9.72	36.3	7.5	2.34	7.6	1.3
GR5	61	BD	51.4	6.12	25.4	5.9	1.57	5.6	0.9
GR6 (BK)	60	BK	48.9	5.87	24.5	5.6	1.66	5.6	0.9
GR7 (BK)	59	BK	79.4	8.15	29.8	5.9	1.62	5.8	0.9
GR8 (Ag)	58	Ag	91.9	8.82	33.7	7	1.58	6.2	1
GR9 (BK)	57	BK	45.2	5.41	22.5	5.1	1.61	5	0.8
Salmon 1	43	BD	83.6	8.74	31.5	5.8	1.25	4.9	0.7
Salmon 2	44	BD	43	4.93	18.1	3.3	0.8	2.7	0.4
Salmon 3	45	BD	38.6	4.5	16.2	3.1	0.75	2.4	0.4
Salmon 4	46	BD	36.2	4.26	15.2	2.9	0.74	2.4	0.4
Sample 5	47	BD	90.9	10.1	36	6.2	1	4.7	0.8
Salmon 6 (BK)	48	BK	66.6	7.74	28.7	5.3	1.08	4.5	0.7
Duplicate samples									
Salmon 5	189	BD	119	13.7	49.9	8.8	1.45	6.8	1
Salmon 6	190	BK	60.1	7.32	30	6.7	1.68	6.1	1
HC1	56	BD	65.9	8.04	35.5	9	2.53	9.4	1.6
HC2	54	BD	62.4	6.49	26	5.6	1.44	5.6	0.9
HC3	53	BD	29.8	3.94	18.3	4.8	1.54	5.4	0.9
HC4	52	BD	31.2	4.05	18.7	4.8	1.71	5.5	0.9
HC6	55	BD	34.3	4.21	18.7	4.9	1.49	5.2	0.9
HC5 (BK)	51	BK	61.7	7.65	33.3	8.1	2.32	8.6	1.5
HC7 (BK)	50	BK	55.9	6.66	27.1	6.2	1.62	6.1	1
HC8 (Ag)	49	Ag	29.2	3.7	16	3.9	1.25	4.2	0.7

Data in blue: Original

Agriculture soil							
Average	76.16	8.19	31.58	6.46	1.52	5.92	0.94
Std deviation	27.02	2.61	8.95	1.45	0.17	1.00	0.13
CV%	35.47	31.83	28.35	22.50	10.85	16.87	14.27
Bank soil Average	70.64	7.99	31.53	6.64	1.65	6.18	1.00
Std deviation	29.95	2.98	10.43	1.82	0.38	1.54	0.27
CV%	42.40	37.30	33.10	27.47	22.75	24.90	26.63
Bed soil Average	72.60	8.13	31.43	6.36	1.56	5.84	0.92
Std deviation	37.02	3.75	12.95	2.10	0.40	1.68	0.26
CV%	50.99	46.10	41.20	33.03	25.64	28.86	28.36

Location name	Sample ID	Sample type	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm
Potlatch 1	88	BD	6.3	1.2	3.5	0.5	3.2	0.55
Potlatch 2	87	BD	4.1	0.8	2.2	0.31	2.1	0.32
Potlatch 3	86	BD	5.3	1	3	0.42	2.8	0.46
Potlatch 4	85	BD	7.6	1.4	4.2	0.62	4	0.63
Potlatch 5	84	BD	6.1	1.2	3.5	0.5	3.4	0.55
Potlatch 6	83	BK	6	1.2	3.4	0.5	3.3	0.55
Potlatch 7	82	Ag	5.9	1.1	3.3	0.5	3.2	0.56
Clearwater1	73	BD	7.1	1.3	4	0.59	3.9	0.64
Clearwater2	72	BD	4	0.8	2.2	0.32	2.2	0.37
Clearwater3	71	BD	6.6	1.2	3.5	0.5	3.2	0.55
Clearwater4	70	BD	6.6	1.3	4	0.59	3.8	0.62
Clearwater5	69	BD	5	1	2.8	0.43	2.8	0.45
Clearwater6 (BK)	68	BK	7.5	1.4	4.1	0.59	3.9	0.66
Clearwater7 (Ag)	67	Ag	5.9	1.2	3.4	0.51	3.4	0.58
Clearwater8 (BK)	66	BK	3.4	0.6	1.9	0.26	1.9	0.3
Asotin1 (Ag)	81	Ag	5.6	1.1	3.2	0.46	3.1	0.5
Asotin 2 (Submerged)	80	BK	5.3	1	2.9	0.43	2.9	0.48
Asotin3	79	BD	5.3	1	2.8	0.41	2.7	0.43
Asotin4	78	BD	5.1	1	2.9	0.42	2.7	0.46
Asotin5	77	BD	5.3	1	3	0.44	3	0.5
Asotin6	76	BD	5.3	1	3	0.45	2.8	0.49
Asotin7	75	BD	5	1	3	0.43	2.8	0.49
Asotin8 (BK)	74	BK	6.7	1.3	3.7	0.54	3.5	0.57
GR1	65	BD	5.5	1.1	3	0.44	2.9	0.47

Data in blue: Original

Agriculture soil						
Average	5.40	1.06	3.04	0.45	3.00	0.50
Std deviation	0.75	0.15	0.48	0.07	0.46	0.09
CV%	13.86	14.31	15.88	15.91	15.46	18.06
Bank soil Average	5.72	1.12	3.20	0.47	3.08	0.51
Std deviation	1.34	0.27	0.74	0.11	0.64	0.11
CV%	23.49	24.10	23.23	23.04	20.74	22.05
Bed soil Average	5.31	1.03	2.97	0.43	2.84	0.47
Std deviation	1.49	0.28	0.82	0.12	0.74	0.12
CV%	28.13	27.34	27.51	26.51	25.97	25.36

Location name	Sample ID	Sample type	Hf ppm	Ta ppm	W ppm	Th ppm	U ppm
Potlatch 1	88	BD	7.2	1	388	11.8	3.1
Potlatch 2	87	BD	4	0.6	873	5.1	1.3
Potlatch 3	86	BD	4.5	0.7	803	6.7	1.6
Potlatch 4	85	BD	6.9	1	466	14.4	2.8
Potlatch 5	84	BD	7.4	1.1	403	10.7	2.7
Potlatch 6	83	BK	5.2	0.9	240	7.8	2.4
Potlatch 7	82	Ag	8.6	1.3	298	12.8	3.3
Clearwater1	73	BD	12	1.1	1400	25.1	3.7
Clearwater2	72	BD	5.8	0.7	1360	11.1	2.1
Clearwater3	71	BD	9.1	0.9	1760	23.1	3
Clearwater4	70	BD	5.6	1	1490	16.6	2.3
Clearwater5	69	BD	6.9	0.8	1420	15.5	2.4
Clearwater6 (BK)	68	BK	10.4	0.9	1280	24	3.7
Clearwater7 (Ag)	67	Ag	6.6	1	89	10.1	2.7
Clearwater8 (BK)	66	BK	4.4	0.7	1230	9.1	1.8
Asotin1 (Ag)	81	Ag	7.4	1.1	239	11.7	2.7
Asotin 2 (Submerged)	80	BK	7.1	1.1	356	8.9	2.4
Asotin3	79	BD	5.3	0.9	219	5.9	2
Asotin4	78	BD	5.6	0.9	303	6.5	2.4
Asotin5	77	BD	5.8	1	226	6.1	1.9
Asotin6	76	BD	5.7	0.9	304	6.9	2.3
Asotin7	75	BD	5.8	0.9	305	7	2.7
Asotin8 (BK)	74	BK	5.8	1	379	6	1.5

GR1	65	BD	4.5	0.7	362	5.9	1.6
GR2	64	BD	4.7	0.8	177	4.9	2
GR3	63	BD	4.6	0.8	362	4.7	1.6
GR4	62	BD	5.2	0.7	413	12	1.6
GR5	61	BD	4.9	0.9	191	5.6	3.5
GR6 (BK)	60	BK	9.6	0.8	469	5	1.7
GR7 (BK)	59	BK	4.3	0.7	803	10.8	1.5
GR8 (Ag)	58	Ag	7	1.1	81	10.4	2.9
GR9 (BK)	57	BK	5.1	0.8	466	4.7	1.7
Salmon 1	43	BD	3.2	1.3	1120	10.8	2.1
Salmon 2	44	BD	0.9	0.5	1060	6	1.4
Salmon 3	45	BD	2.7	0.7	1310	6.2	1.5
Salmon 4	46	BD	2.8	0.7	1230	6.1	1.5
Sample 5	47	BD	7.2	1.4	1410	13.8	2.7
Salmon 6 (BK)	48	BK	6.3	1.2	682	10	2.5
Duplicate samples							
Salmon 5	189	BD	6.9	0.9	1370	16.7	2.6
Salmon 6	190	BK	4.8	0.9	222	6.8	2.1
HC1	56	BD	6.3	1.4	145	4	1.3
HC2	54	BD	4.9	1.1	177	7.4	1.7
HC3	53	BD	3.3	0.5	352	2.1	0.7
HC4	52	BD	3.5	0.4	136	2	0.8
HC6	55	BD	3.1	0.5	126	2.5	0.9
HC5 (BK)	51	BK	6.7	1.1	66	5	1.3
HC7 (BK)	50	BK	5.3	0.9	104	7	1.9
HC8 (Ag)	49	Ag	2.5	0.5	108	2.2	1

Data in blue: Original

Agriculture soil					
Average	6.42	1.00	163.00	9.44	2.52
Std deviation	2.32	0.30	99.03	4.19	0.88
CV%	36.07	30.00	60.75	44.37	35.09
Bank soil Average	6.25	0.92	524.75	8.76	2.04
Std deviation	1.96	0.16	402.99	5.21	0.65
CV%	31.35	17.30	76.80	59.46	31.91
Bed soil Average	5.36	0.86	698.74	9.14	2.06
Std deviation	2.11	0.25	532.44	5.77	0.76
CV%	39.34	28.89	76.20	63.12	36.74

5b Original Core Data

Core Sample								
No		Depth (cm)	Sample ID	$\delta^{13}\text{C}$	C%	$\delta^{15}\text{N}$	N%	C/N (molar ratio)
19	Range 1	7 - 17	42	-26.65	4.3399	3.68	0.3407	14.9
19	Range 1	72 - 82	41	-26.47	2.9559	3.615	0.2417	14.3
19	Range 1	177 - 187	40	-26.13	2.6651	4.53	0.2201	14.1
20	Range 1	15 - 55	39	-26.34	4.3656	2.44	0.3356	15.2
20	Range 1	162 - 175	38	-26.2	2.7115	5.37	0.2354	13.4
20	Range 1	234 - 250	37	-26.11	2.6181	4.4	0.2249	13.6
21	Range 1	17 - 21	36	-26.1	1.7776	4.6	0.1355	15.3
22	Range 2	7 - 27	35	-26.56	4.5299	3.68	0.3308	16.0
22	Range 2	99 - 119	33	-26.19	3.586	4.74	0.3223	13.0
22	Range 2	165 - 171.5	34	-26.2	2.706	5.33	0.2338	13.5
23	Range 2	7 - 11	175	-26.56	4.2585	3.6	0.2771	17.9
23	Range 2	57 - 77	32	-26.35	2.9586	4.23	0.2156	16.0
23	Range 2	138 - 158	31	-26.23	2.6231	4.68	0.1978	15.5
25	Rang 3	27 - 34	27	-26.37	2.8605	4.39	0.223	15.0
26	Rang 3	7 - 20	30	-26.44	3.5721	3.67	0.2598	16.0
26	Rang 3	67 - 77	29	-26.37	4.0644	3.89	0.309	15.3
26	Rang 3	127 - 137	28	-26.27	3.4858	4.28	0.2868	14.2

27	Rang 3	7 - 27	26	-26.26	7.3042	2.77	0.4087	20.9
27	Rang 3	97 - 117	25	-26.29	4.0113	4.71	0.2956	15.8
27	Rang 3	157 - 177	24	-26.1	5.2323	3.24	0.3138	19.5
27	Rang 3	247 - 264	23	-26.13	4.3897	4.085	0.3685	13.9
28	Range 4	20 - 35	22	-26.05	5.6875	3.22	0.4171	15.9
28	Range 4	60 - 75	21	-26.33	5.9985	4.15	0.4344	16.1
28	Range 4	75 - 85	20	-26.35	4.5133	4.57	0.3384	15.6
29	Range 4	15 - 30	19	-26.35	4.7389	3.97	0.3128	17.7
29	Range 4	50 - 60	18	-26.27	4.8522	4.2	0.3948	14.3
31	Range 5	18 - 28	14	-26.21	4.4471	3.86	0.2865	18.1
31	Range 5	87 - 98	15	-26.07	4.7319	3.84	0.3277	16.8
31	Range 5	143 - 154	16	-25.91	6.0759	3.2	0.4428	16.0
32	Range 5	16 - 30	17	-26.3	7.1372	2.32	0.4465	18.6
32	Range 5	40 - 50	9	-26.27	6.9996	2.83	0.4188	19.5
34	Range 6	13 - 23	10	-26.09	6.5737	4.2	0.4195	18.3
34	Range 6	71 - 81	11	-25.73	1.9006	4.7	0.1275	17.4
34	Range 6	127 - 137	1	-26.01	5.8862	2.94	0.3887	17.7
34	Range 6	149 - 159	12	-26.17	4.3147	4.3	0.3475	14.5
34	Range 6	178 - 188	13	-26.125	2.1289	6.31	0.176	14.1
35-B	Range 6	0 - 2	174	-26.47	3.5318	6.22	0.3533	11.7
36	Range 6	0 - 3	173	-25.86	1.3455	3.48	0.0691	22.7

37	Range 7	0 - 4	172	-25.93	0.8521	5.34	0.0766	13.0
37-B	Range 7	6 - 10	8	-24.85	0.8847	6.94	0.0824	12.5
38-A	Range 7	10-15	7	-26.15	4.6633	3.64	0.2966	18.3
38-A	Range 7	38 - 41	6	-26.07	4.1233	3.8	0.3412	14.1
38-A	Range 7	45 - 50	5	-26.155	6.1622	3.195	0.472	15.2
38	Range 7	2 - 5	171	-25.45	0.4723	6.97	0.0451	12.2
38	Range 7	18 - 20	170	-26.09	3.6693	4.56	0.354	12.1
38	Range 7	66 - 69	169	-23.74	0.3247	4.28	0.015	25.3
38	Range 7	165 - 168	168	-26.55	3.5661	6.16	0.2605	16.0
39	Range 7	6 - 9	181	-25.99	1.487	4.1	0.1047	16.6
39	Range 7	5 - 10	4	-25.58	1.7051	3.01	0.1058	18.8
39	Range 7	21 - 26	3	-25.19	0.5712	4.77	0.0253	26.3
39	Range 7	26 - 32	166	-25.83	2.1405	5.64	0.1506	16.6
39	Range 7	41 - 47	2	-26.25	2.4983	3.74	0.1749	16.7
39	Range 7	93 - 97	164	-23.6	0.2866	5.39	0.024	13.9
39	Range 7	142 - 150	163	-26.24	2.6602	5.4	0.1831	17.0
40	Range 8	55-64	178	-20.95	0.1066	3.71	0.0188	6.6
40	Range 8	105 - 113	162	-26	3.7718	6.72	0.327	13.5
40	Range 8	128 - 132	161	-20.59	0.0966	8.37	0.0308	3.7
40	Range 8	146 - 150	160	-26.08	2.8994	4.88	0.2384	14.2
43	Range 9	8 - 12	159	-25.23	7.1188	4.92	0.6912	12.0
43	Range 9	21 - 26	158	-22.44	0.0945	3.79	0.0111	9.9
43	Range 9	45 - 51	157	-25.44	1.0653	4.56	0.1073	11.6

46	Range 10	40 - 47	156	-22.19	0.0917	4.54	0.0092	11.6
46	Range 10	103 - 108	182	-21.59	0.0783	4	0.0097	9.4
47	Range 10	0 - 2	155	-25.89	21.106	3.17	0.546	45.1
47	Range 10	57 - 65	154	-23.22	0.1623	4.05	0.0133	14.2
47	Range 10	115 - 120	153	-21.27	0.071	4.57	0.0083	10.0
49	Range 11	7 - 14	152	-20.2	0.0713	4.52	0.0085	9.8
49	Range 11	35 - 45	151	-26.17	3.1905	4.52	0.252	14.8
49	Range 11	91 - 96	150	-15.14	0.2235	5.13	0.0291	9.0
49	Range 11	103 - 113	149	-25.56	3.549	4.82	0.2176	19.0
50	Range 11	25 - 35	148	-20.33	0.05	3.47	0.005	12.62
50	Range 11	67 - 77	147	-20.06	0.0515	4.1	0.006	10.0
52	Range 11	7 - 17	146	-26.64	3.3753	6.3	0.2545	15.5
52	Range 11	96 - 106	145	-26.64	3.2102	6.08	0.2366	15.8
54	Range 12	7 - 17	144	-22.67	0.096	4.79	0.0072	15.6

54	Range 12	108 - 114	143	-26.18	0.6482	5.18	0.0452	16.7
60	Range 14	11 - 20	142	-21.19	0.0594	6.35	0.0069	10.0
60	Range 14	55 - 70	167	-24.18	0.7518	3.73	0.0336	26.1
62	Range 15	76-81	176	-20.77	0.0613	6.42	0.0071	10.1
62	Range 15	100 - 107	165	-21.96	0.0641	5.31	0.0072	10.4
63	Range 15	15 - 25	141	-21.87	0.0617	4.6	0.0062	11.6
65	Range 16	50 - 57	140	-21.7	0.0627	4.01	0.0065	11.3
65	Range 16	71 - 78	139	-19.58	0.0593	4.13	0.0051	13.6
65	Range 16	91 - 96	138	-20.63	0.0505	4.46	0.0053	11.1
66	Range 16	15 - 25	137	-24.17	0.102	4.52	0.0073	16.3
70	Range 17	9 - 18	136	-24.15	0.089	2.15	0.0122	8.5
70	Range 17	30 - 35	135	-24.48	0.0943	2.54	0.0115	9.6
70	Range 17	43 - 47	134	-24.44	0.1862	3.34	0.017	12.8
70	Range 17	54 - 62	133	-24.01	0.1954	4.32	0.0178	12.8

71	Range 17	7 - 17	132	-23.92	0.1006	2.99	0.0126	9.3
71	Range 17	48 - 52	131	-26.1	1.9602	5.12	0.1645	13.9
71	Range 17	95 - 105	130	-26.32	2.8816	6.16	0.2122	15.8
71-A	Range 17	18 - 22	129	-24.9	0.1232	2.44	0.0128	11.2
71-A	Range 17	36 - 38	128	-24.46	0.2127	2.64	0.0248	10.0
73	Range 18	0 - 2	127	-21.55	0.0539	5.45	0.0063	10.0
81	Range 21	0 - 3	126	-21.87	0.1096	4.18	0.0118	10.8
87	Range 23	0 - 19	125	-25.735	0.3153	5.29	0.0174	21.2
88	Range 23	0 - 3	124	-22.82	0.1043	8.57	0.0139	8.8
89	Range 23	0 - 3	123	-23.01	0.1423	6.45	0.0135	12.3
1	Range 24	14 - 20	122	-23.93	0.0712	2.76	0.0097	8.6
2	Range 24	67 - 71	121	-24.6	0.1805	4.14	0.0152	13.9
2	Range 24	87-91	180	-26.79	3.4644	4.52	0.2137	18.9

2	Range 24	112 - 117	120	-24.03	0.1939	5.87	0.0217	10.4
3	Range 24	7 - 17	119	-25.44	0.1648	2.37	0.0162	11.9
3	Range 24	33 - 43	118	-24.35	0.1233	3.94	0.012	12.0
3	Range 24	67 - 77	117	-26.59	3.2552	5.4	0.2212	17.2
3	Range 24	95 - 100	116	-25.245	0.1562	4.7275	0.0557	3.3
3	Range 24	128 - 134	115	-26.18	0.7619	5.52	0.0535	16.6
4	Range 25	18-22	179	-23.29	0.1713	3.4	0.0122	16.4
5	Range 25	7 - 12	114	-22.99	0.0691	1.73	0.0091	8.9
5	Range 25	24 - 30	113	-23.64	0.0406	2.5	0.007	6.8
5	Range 25	46 - 50	112	-25.32	0.1365	3.12	0.0108	14.7
9	Range 26	24 - 28	111	-26.4	1.765	5.9	0.1385	14.9
9	Range 26	45 - 48	110	-26.7	2.3152	5.3	0.1858	14.5
10	Range 27	6 - 9	109	-23.72	0.0418	0.81	0.0054	9.0
10	Range 27	13 - 17	108	-24.275	0.0999	1.32	0.0091	12.8

10	Range 27	31 - 34	107	-23.94	0.0439	4.18	0.0084	6.1
10	Range 27	47 - 50	106	-26.39	2.6218	6.71	0.1947	15.7
10	Range 27	55 - 58	105	-23.83	0.1026	3.77	0.0126	9.5
10	Range 27	70-74	177	-26.63	2.7519	6.43	0.2096	15.3
10	Range 27	73 - 76	104	-26.64	2.6622	6.48	0.2122	14.6
10	Range 27	83 - 86	103	-26.98	2.6146	6.41	0.2167	14.1
10	Range 27	99 - 102	102	-26.11	4.0237	4.59	0.312	15.0
10	Range 27	106 - 109	101	-23.05	0.0301	4.32	0.0063	5.6
11	Range 27	0 - 3	100	-23.92	0.0992	2.99	0.0117	9.9
12	Range 27	4 - 7	99	-23.56	0.0698	2.63	0.0099	8.2
12	Range 27	19 - 22	98	-23.48	0.044	1.83	0.0055	9.3
12	Range 27	22 - 26	97	-23.99	0.0931	2.32	0.0074	14.7
12	Range 27	32 - 35	96	-23.46	0.0487	1.36	0.0061	9.3
13	Range 28	0 - 4	95	-25.26	0.4679	2.75	0.0335	16.3
14	Range 28	7 - 17	94	-23.45	0.0479	1.98	0.0054	10.3

15	Range 28	7 - 15	93	-23.58	0.0612	2.29	0.007	10.2
15	Range 28	27 - 37	92	-25	0.1329	3.28	0.01	15.5
16	Range 29	0 - 3	91	-22.53	7.0882	2.44	0.665	12.4
17	Range 29	0 - 3	90	-23.78	3.1994	3.22	0.2905	12.8
18	Range 29	0 - 3	89	-27.67	1.7286	2.52	0.146	13.8
32	Range 5	40 - 50	183	-26.22	6.4354	2.22	0.4023	18.7
31	Range 5	87 - 98	184	-26.05	4.8339	3.45	0.3358	16.8
62	Range 15	100 - 107	187	-21.65	0.0455	6.1	0.0062	8.6
71 (duplicate)	Range 17	48 - 52	186	-22.29	0.0784	5	0.007	13.1
81 (duplicate)	Range 21	0 - 3	188	-26.07	2.0835	4.92	0.1721	14.1
18 (duplicate)	Range 29	0 - 3	185	-24.1	0.2959	2.69	0.027	12.8
Data in blue: Original								

0-5 cm depth					
Average		-24.51	2.67	4.46	0.16
Std deviation		1.81	5.26	1.87	0.21
CV%		-7.39	197.19	41.95	132.24
					57.99

5-10 cm depth					
Average	-24.91	1.77	3.67	0.14	13.91
Std deviation	1.23	2.41	1.89	0.22	4.84
CV%	-4.93	136.12	51.46	153.56	34.81
10-20 cm depth					
Average	-24.52	1.79	3.63	0.13	13.47
Std deviation	1.86	2.38	1.31	0.16	3.50
CV%	-7.57	133.34	35.95	125.06	25.99
20-30 cm depth					
Mean	-24.68	2.23	3.63	0.15	15.12
Std deviation	1.93	2.59	1.31	0.17	5.16
CV%	-7.83	115.81	36.02	113.24	34.14
30-40 cm depth					
Average	-25.06	1.52	3.31	0.12	12.15
Std deviation	1.09	1.87	1.03	0.15	3.25
CV%	-4.34	122.96	31.25	119.71	26.74
40-50 cm depth					
Average	-25.31	2.55	4.14	0.18	14.83
Std deviation	1.56	2.60	1.28	0.17	2.52
CV%	-6.15	101.96	31.01	93.35	16.99
50-60 cm depth					
Average	-23.35	1.06	4.00	0.09	10.90
Std deviation	2.10	2.12	0.26	0.17	3.00

CV%	-9.00	199.11	6.60	189.13	27.48
60-70 cm depth					
Mean	-24.74	1.73	4.10	0.12	18.59
Std deviation	1.32	2.35	0.20	0.17	5.57
CV%	-5.35	135.66	4.79	142.37	29.95
70-80 cm depth					
Average	-24.52	2.23	4.97	0.17	14.33
Std deviation	3.05	1.66	1.13	0.13	2.55
CV%	-12.43	74.65	22.63	74.65	17.77
80-90 cm depth					
Average	-26.89	3.04	5.47	0.22	16.49
Std deviation	0.13	0.60	1.34	0.00	3.42
CV%	-0.50	19.77	24.45	0.99	20.74
90-100 cm depth					
Mean	-23.29	1.88	4.74	0.14	12.40
Std deviation	4.12	2.22	0.93	0.15	5.00
CV%	-17.70	117.83	19.55	104.02	40.35
100-110 cm depth					
Average	-24.08	1.79	5.26	0.14	11.90
Std deviation	2.22	1.86	0.96	0.15	4.30
CV%	-9.23	104.01	18.24	104.71	36.12
110-120 cm					

depth					
Average	-24.44	1.23	5.08	0.09	13.24
Std deviation	2.36	1.87	0.59	0.14	3.53
CV%	-9.64	151.90	11.53	146.84	26.68
 120-130 cm depth					
Average	-20.59	0.10	8.37	0.03	3.66
Std deviation	-	-	-	-	-
CV%	-	-	-	-	-
 130-140 cm depth					
Average	-26.15	3.38	4.25	0.24	16.15
Std deviation	0.13	2.56	1.29	0.17	1.79
CV%	-0.50	75.90	30.38	70.72	11.07
 140-150 cm depth					
Average	-26.12	3.56	4.54	0.27	15.65
Std deviation	0.16	1.68	0.94	0.12	1.15
CV%	-0.59	47.09	20.78	45.37	7.36
 150-170 cm depth					
Average	-26.24	3.71	4.88	0.28	15.37
Std deviation	0.18	1.08	1.13	0.05	2.50
CV%	-0.67	29.28	23.15	18.14	16.28
 170-200 cm					

depth					
Average	-26.13	2.40	5.42	0.20	14.12
Std deviation	0.00	0.38	1.26	0.03	0.01
CV%	-0.01	15.82	23.22	15.77	0.05
200-250 cm					
depth					
Average	-26.12	3.50	4.24	0.30	13.74
Std deviation	0.01	1.25	0.22	0.10	0.23
CV%	-0.05	35.75	5.25	34.21	1.64

Core Sample No		Depth (cm)	Sample ID	Grain size%	Sc46 mg/g	La140 mg/g	SiO ₂ %	Al ₂ O ₃ %
				< 150 µm				
19	Range 1	7 - 17	42		0.02	0.06	54.87	13.54
19	Range 1	72 - 82	41		0.02	0.05	57.12	12.96
19	Range 1	177 - 187	40		0.02	0.06	57.90	13.66
20	Range 1	15 - 55	39	81.44	0.02	0.00	55.83	13.47
20	Range 1	162 - 175	38		0.03	0.04		
20	Range 1	234 - 250	37		0.02	0.05		
21	Range 1	17 - 21	36	85.35	0.02	0.04	60.32	13.31
22	Range 2	7 - 27	35	76.59	0.02	0.05	56.84	13.72
22	Range 2	99 - 119	33		0.02	0.04		
22	Range 2	165 - 171.5	34		0.02	0.04		
23	Range 2	7 - 11	175	86.30	0.01	0.06	56.75	13.10
23	Range 2	57 - 77	32		0.02	0.05		
23	Range 2	138 - 158	31		0.02	0.04		
25	Rang 3	27 - 34	27	83.95	0.02	0.05	58.00	13.32
26	Rang 3	7 - 20	30		0.02	0.03	57.57	13.37
26	Rang 3	67 - 77	29		0.02	0.05		
26	Rang 3	127 - 137	28		0.02	0.05		
27	Rang 3	7 - 27	26	80.00	0.02	0.05	53.65	13.40

27	Rang 3	97 - 117	25		0.02	0.05		
27	Rang 3	157 - 177	24		0.02	0.05		
27	Rang 3	247 - 264	23		0.02	0.05		
28	Range 4	20 - 35	22		0.02	0.05	54.44	12.93
28	Range 4	60 - 75	21		0.02	0.06	53.15	12.87
28	Range 4	75 - 85	20		0.02	0.04	55.27	12.89
29	Range 4	15 - 30	19	89.40	ND	0.05	55.59	13.13
29	Range 4	50 - 60	18		0.03	0.05		
31	Range 5	18 - 28	14	88.41	0.02	0.07	55.84	13.56
31	Range 5	87 - 98	15		0.02	0.06		
31	Range 5	143 - 154	16		0.02	0.06		
32	Range 5	16 - 30	17	75.78	0.02	0.05	52.20	13.07
32	Range 5	40 - 50	9		0.02	0.05		
34	Range 6	13 - 23	10	75.89	0.02	0.00	54.92	13.23
34	Range 6	71 - 81	11		0.02	0.04		
34	Range 6	127 - 137	1		0.02	0.03		
34	Range 6	149 - 159	12		0.02	0.04		
34	Range 6	178 - 188	13		0.03	0.00		
35-B	Range 6	0 - 2	174	77.19	0.01	0.05	61.07	12.35
36	Range 6	0 - 3	173		0.01	0.06	63.86	12.85
37	Range 7	0 - 4	172		0.03	0.14	65.97	12.74

37-B	Range 7	6 - 10	8		0.02	0.04		
38-A	Range 7	10-15	7	69.69	0.02	0.04	56.32	13.01
38-A	Range 7	38 - 41	6		0.02	0.05		
38-A	Range 7	45 - 50	5	69.06	0.03	0.04	51.84	13.48
38	Range 7	2 - 5	171		0.01	0.02		
38	Range 7	18 - 20	170		0.02	0.09		
38	Range 7	66 - 69	169		0.01	0.02		
38	Range 7	165 - 168	168		0.03	0.04		
39	Range 7	6 - 9	181	83.21	0.02	0.05	61.51	13.59
39	Range 7	5 - 10	4		0.01	0.05		
39	Range 7	21 - 26	3		0.01	0.03		
39	Range 7	26 - 32	166		0.02	0.04		
39	Range 7	41 - 47	2		0.02	0.05		
39	Range 7	93 - 97	164		0.01	0.14		
39	Range 7	142 - 150	163		0.03	0.04		
40	Range 8	55-64	178	56.22	0.02	0.04	66.90	13.37
40	Range 8	105 - 113	162		0.03	0.04		
40	Range 8	128 - 132	161		0.02	0.06		
40	Range 8	146 - 150	160		0.03	0.07		
43	Range 9	8 - 12	159		0.01	0.05	53.68	11.47
43	Range 9	21 - 26	158		0.02	0.03		
43	Range 9	45 - 51	157		0.01	0.05		
46	Range	40 - 47	156	4.31	0.01	0.05	70.50	13.50

		10						
46	Range 10	103 - 108	182		ND	0.04		
47	Range 10	0 - 2	155		0.01	0.04	61.54	12.39
47	Range 10	57 - 65	154		0.01	0.07		
47	Range 10	115 - 120	153		0.02	0.01		
49	Range 11	7 - 14	152		ND	0.06	68.68	12.90
49	Range 11	35 - 45	151		0.02	0.06		
49	Range 11	91 - 96	150		0.01	0.04		
49	Range 11	103 - 113	149		0.02	0.05		
50	Range 11	25 - 35	148	1.82	ND	0.06	71.73	12.55
50	Range 11	67 - 77	147		0.01	0.06		
52	Range 11	7 - 17	146		0.02	0.04	54.82	13.76
52	Range 11	96 - 106	145		0.03	0.05		
54	Range 12	7 - 17	144		0.01	0.01	73.05	11.97

54	Range 12	108 - 114	143		0.01	0.02	70.04	11.74
60	Range 14	11 - 20	142		ND	0.00	73.46	12.92
60	Range 14	55 - 70	167		0.01	0.01	71.86	12.51
62	Range 15	76-81	176		0.01	0.06	71.16	13.21
62	Range 15	100 - 107	165		0.02	0.11	69.70	12.89
63	Range 15	15 - 25	141		ND	ND	73.34	11.53
65	Range 16	50 - 57	140	2.56	0.01	ND	71.43	12.79
65	Range 16	71 - 78	139	1.66	ND	0.02	72.22	12.88
65	Range 16	91 - 96	138	0.94	0.01	0.02	73.34	12.20
66	Range 16	15 - 25	137	2.28	0.02	ND	71.99	11.80
70	Range 17	9 - 18	136	5.11	0.02	0.03	71.33	13.24
70	Range 17	30 - 35	135	7.60	0.03	0.14	71.17	13.00
70	Range 17	43 - 47	134	11.32	ND	0.05	69.44	13.15
70	Range 17	54 - 62	133	12.58	0.01	0.01	68.31	13.50

71	Range 17	7 - 17	132	6.47	0.01	0.06	70.82	13.18
71	Range 17	48 - 52	131	76.23	0.02	0.05	62.68	13.47
71	Range 17	95 - 105	130	84.36	0.03	0.04	55.85	14.02
71-A	Range 17	18 - 22	129	9.58	0.01	0.03	71.02	13.14
71-A	Range 17	36 - 38	128	16.99	0.03	0.10	69.05	13.57
73	Range 18	0 - 2	127	7.90	0.01	0.03	73.66	12.74
81	Range 21	0 - 3	126	1.92	0.01	0.03	70.74	12.47
87	Range 23	0 - 19	125	8.50	0.01	0.02	73.01	11.20
88	Range 23	0 - 3	124	24.88	0.02	0.07	71.07	12.64
89	Range 23	0 - 3	123	25.37	0.01	ND	69.97	12.82
1	Range 24	14 - 20	122	1.30	ND	ND	74.19	11.88
2	Range 24	67 - 71	121	7.83	0.02	0.00	69.26	13.32
2	Range 24	87-91	180	85.31	0.03	0.04	54.64	13.86

2	Range 24	112 - 117	120	33.48	0.02	0.06	65.28	14.16
3	Range 24	7 - 17	119	8.37	ND	0.16	70.45	13.49
3	Range 24	33 - 43	118	12.44	0.02	ND	69.93	12.98
3	Range 24	67 - 77	117	71.90	0.09	8.84	56.17	14.22
3	Range 24	95 - 100	116	33.67	0.02	0.03	64.34	13.87
3	Range 24	128 - 134	115	71.61	0.02	0.03	59.28	14.26
4	Range 25	18-22	179	0.64	0.01	0.01	74.26	11.44
5	Range 25	7 - 12	114	2.40	0.01	0.07	72.18	12.02
5	Range 25	24 - 30	113	0.36	0.01	0.02	74.07	11.69
5	Range 25	46 - 50	112	5.23	ND	0.03	71.26	12.51
9	Range 26	24 - 28	111		0.02	0.06		
9	Range 26	45 - 48	110		0.03	0.05		
10	Range 27	6 - 9	109	0.77	0.01	ND	78.11	10.29
10	Range 27	13 - 17	108	1.42	0.01	0.01		

10	Range 27	31 - 34	107		0.01	0.02		
10	Range 27	47 - 50	106		0.03	0.05		
10	Range 27	55 - 58	105		0.01	0.07		
10	Range 27	70-74	177		0.02	0.04		
10	Range 27	73 - 76	104		0.03	0.05		
10	Range 27	83 - 86	103		0.02	0.05		
10	Range 27	99 - 102	102		0.02	0.00		
10	Range 27	106 - 109	101		0.02	0.07		
11	Range 27	0 - 3	100	5.14	0.01	0.01	76.66	10.67
12	Range 27	4 - 7	99		0.01	0.01	75.99	11.04
12	Range 27	19 - 22	98		0.01	0.02		
12	Range 27	22 - 26	97		ND	0.02		
12	Range 27	32 - 35	96		0.01	0.01		
13	Range 28	0 - 4	95		ND	0.07	75.10	10.05
14	Range 28	7 - 17	94		0.02	ND	77.91	10.20

15	Range 28	7 - 15	93	0.01	ND	75.55	10.92
15	Range 28	27 - 37	92	ND	0.02	74.73	11.55
16	Range 29	0 - 3	91	0.02	0.05		
17	Range 29	0 - 3	90	0.01	0.06	64.47	11.20
18	Range 29	0 - 3	89	0.01	0.02	74.05	11.36
32	Range 5	40 - 50	183	0.03	0.06		
31	Range 5	87 - 98	184	0.02	0.06		
62	Range 15	100 - 107	187	ND	0.02	70.01	13.08
71 (duplicate)	Range 17	48 - 52	186	0.02	0.04	62.64	13.25
81 (duplicate)	Range 21	0 - 3	188	0.01	0.02	70.87	12.34
18 (duplicate)	Range 29	0 - 3	185	0.01	0.01	74.16	11.49

Data in blue: Original

0-5 cm depth						
Average		23.73	0.01	0.04	69.51	12.01
Std deviation		28.05	0.01	0.03	5.21	0.89
CV%		118.19	49.20	75.12	7.49	7.45

5-10 cm depth					
Average	36.24	0.01	0.04	67.32	11.82
Std deviation	44.40	0.00	0.02	9.82	1.17
CV%	122.53	34.61	44.19	14.59	9.93
10-20 cm depth					
Average	32.51	0.02	0.04	66.45	12.66
Std deviation	37.26	0.01	0.04	8.57	1.01
CV%	114.60	33.30	86.57	12.89	7.96
20-30 cm depth					
Mean	51.15	0.01	0.04	60.65	12.82
Std deviation	46.02	0.00	0.02	9.61	0.64
CV%	89.96	33.47	42.64	15.84	5.02
30-40 cm depth					
Average	40.48	0.02	0.05	66.45	12.98
Std deviation	38.69	0.01	0.05	7.67	0.74
CV%	95.56	43.57	93.72	11.54	5.71
40-50 cm depth					
Average	33.23	0.02	0.05	64.73	13.23
Std deviation	36.17	0.01	0.01	7.39	0.38
CV%	108.85	42.90	17.39	11.41	2.87
50-60 cm depth					
Average	23.79	0.02	0.04	68.88	13.22
Std deviation	28.53	0.01	0.02	2.32	0.38

CV%	119.95	34.40	52.76	3.37	2.86
60-70 cm depth					
Mean	7.83	0.02	0.03	64.76	12.90
Std deviation	#DIV/0!	0.01	0.03	10.14	0.41
CV%	-	36.48	77.40	15.65	3.15
70-80 cm depth					
Average	36.78	0.03	0.92	62.39	13.23
Std deviation	49.67	0.02	2.78	8.52	0.57
CV%	-	85.49	300.84	13.66	4.29
80-90 cm depth					
Average	85.31	0.02	0.05	54.64	13.86
Std deviation	-	0.00	0.00	-	-
CV%	-	11.79	7.60	-	-
90-100 cm depth					
Mean	39.66	0.02	0.05	64.51	13.36
Std deviation	42.03	0.01	0.04	8.75	1.01
CV%	105.99	51.09	72.91	13.56	7.56
100-110 cm depth					
Average	#DIV/0!	0.02	0.05	69.86	12.99
Std deviation	#DIV/0!	0.00	0.03	0.22	0.13
CV%	-	16.75	51.40	0.31	1.03
110-120 cm					

depth					
Average	33.48	0.02	0.03	67.66	12.95
Std deviation	#DIV/0!	0.00	0.02	3.37	1.71
CV%	-	23.97	60.18	4.97	13.21
 120-130 cm					
depth					
Average	-	0.02	0.06	-	-
Std deviation	-	-	-	-	-
CV%	-	-	-	-	-
 130-140 cm					
depth					
Average	71.61	0.02	0.04	59.28	14.26
Std deviation	-	0.00	0.01	-	-
CV%	-	7.05	26.05	-	-
 140-150 cm					
depth					
Average	-	0.02	0.05	-	-
Std deviation	-	0.01	0.01	-	-
CV%	-	27.08	25.08	-	-
 150-170 cm					
depth					
Average	-	0.02	0.04	-	-
Std deviation	-	0.00	0.00	-	-
CV%	-	13.75	5.93	-	-
 170-200 cm					

depth					
Average	-	0.03	0.03	57.90	13.66
Std deviation	-	0.01	0.04	-	-
CV%	-	38.07	126.79	-	-
200-250 cm					
depth					
Average	-	0.02	0.05	-	-
Std deviation	-	0.00	0.00	-	-
CV%	-	3.63	0.00	-	-

Core Sample

No		Depth (cm)	Sample ID	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O
				%	%	%	%	%	%
19	Range 1	7 - 17	42	6.64	0.11	1.87	2.86	1.90	2.05
19	Range 1	72 - 82	41	7.12	0.10	1.99	3.18	1.85	1.73
19	Range 1	177 - 187	40	6.69	0.09	1.91	2.80	1.89	1.99
20	Range 1	15 - 55	39	6.68	0.10	1.92	2.72	1.82	1.97
20	Range 1	162 - 175	38						
20	Range 1	234 - 250	37						
21	Range 1	17 - 21	36	6.44	0.11	1.92	3.06	2.21	2.01
22	Range 2	7 - 27	35	6.67	0.10	1.95	2.95	1.94	2.08
22	Range 2	99 - 119	33						
22	Range 2	165 - 171.5	34						
23	Range 2	7 - 11	175	6.32	0.09	1.88	3.05	2.06	1.97
23	Range 2	57 - 77	32						
23	Range 2	138 - 158	31						
25	Rang 3	27 - 34	27	6.69	0.09	2.03	3.16	2.07	1.90
26	Rang 3	7 - 20	30	6.11	0.10	1.88	3.17	2.24	2.18
26	Rang 3	67 - 77	29						
26	Rang 3	127 - 137	28						
27	Rang 3	7 - 27	26	6.53	0.12	1.88	2.95	1.92	1.98
27	Rang 3	97 - 117	25						

27	Rang 3	157 - 177	24						
27	Rang 3	247 - 264	23						
28	Range 4	20 - 35	22	6.13	0.11	1.87	2.96	1.97	2.06
28	Range 4	60 - 75	21	6.32	0.08	1.84	2.94	1.83	1.78
28	Range 4	75 - 85	20	6.43	0.09	1.91	3.16	2.02	1.81
29	Range 4	15 - 30	19	6.40	0.10	1.96	3.23	2.29	2.17
29	Range 4	50 - 60	18						
31	Range 5	18 - 28	14	5.80	0.11	1.80	2.96	2.21	2.29
31	Range 5	87 - 98	15						
31	Range 5	143 - 154	16						
32	Range 5	16 - 30	17	6.89	0.14	1.91	3.32	1.94	1.86
32	Range 5	40 - 50	9						
34	Range 6	13 - 23	10	6.85	0.14	1.94	3.57	2.13	1.89
34	Range 6	71 - 81	11						
34	Range 6	127 - 137	1						
34	Range 6	149 - 159	12						
34	Range 6	178 - 188	13						
35-B	Range 6	0 - 2	174	5.48	0.12	1.67	2.86	2.22	2.14
36	Range 6	0 - 3	173	4.95	0.08	1.62	3.00	2.79	2.58
37	Range 7	0 - 4	172	5.23	0.09	1.63	3.23	2.83	2.41
37-B	Range 7	6 - 10	8						

38-A	Range 7	10-15	7	6.26	0.12	1.90	3.38	2.39	2.08
38-A	Range 7	38 - 41	6						
38-A	Range 7	45 - 50	5	8.30	0.17	1.92	3.65	1.86	1.43
38	Range 7	2 - 5	171						
38	Range 7	18 - 20	170						
38	Range 7	66 - 69	169						
38	Range 7	165 - 168	168						
39	Range 7	6 - 9	181	5.88	0.09	2.08	3.40	2.68	2.42
39	Range 7	5 - 10	4						
39	Range 7	21 - 26	3						
39	Range 7	26 - 32	166						
39	Range 7	41 - 47	2						
39	Range 7	93 - 97	164						
39	Range 7	142 - 150	163						
40	Range 8	55-64	178	4.97	0.07	1.86	3.76	3.04	2.28
40	Range 8	105 - 113	162						
40	Range 8	128 - 132	161						
40	Range 8	146 - 150	160						
43	Range 9	8 - 12	159	5.57	0.13	1.52	2.69	1.58	1.63
43	Range 9	21 - 26	158						
43	Range 9	45 - 51	157						
46	Range 10	40 - 47	156	3.95	0.06	1.43	3.02	2.97	2.63

46	Range 10	103 - 108	182						
47	Range 10	0 - 2	155	4.73	0.09	1.48	2.84	2.51	2.48
47	Range 10	57 - 65	154						
47	Range 10	115 - 120	153						
49	Range 11	7 - 14	152	4.27	0.07	1.59	3.60	3.11	2.36
49	Range 11	35 - 45	151						
49	Range 11	91 - 96	150						
49	Range 11	103 - 113	149						
50	Range 11	25 - 35	148	3.36	0.05	1.19	2.82	3.06	2.60
50	Range 11	67 - 77	147						
52	Range 11	7 - 17	146	8.30	0.17	1.75	3.49	1.96	1.43
52	Range 11	96 - 106	145						
54	Range 12	7 - 17	144	3.34	0.05	1.12	2.53	2.85	2.59
54	Range 12	108 - 114	143	4.49	0.07	1.24	2.86	2.42	2.13

60	Range 14	11 - 20	142	3.10	0.05	1.04	2.50	3.13	2.81
60	Range 14	55 - 70	167	4.16	0.07	1.41	3.20	2.98	2.37
62	Range 15	76-81	176	3.37	0.05	1.21	2.74	3.17	2.72
62	Range 15	100 - 107	165	3.90	0.06	1.35	3.07	3.03	2.50
63	Range 15	15 - 25	141	3.17	0.05	1.01	2.36	2.76	2.60
65	Range 16	50 - 57	140	3.46	0.06	1.17	2.72	3.02	2.67
65	Range 16	71 - 78	139	3.59	0.06	1.22	2.77	3.07	2.70
65	Range 16	91 - 96	138	3.55	0.06	1.14	2.55	2.86	2.70
66	Range 16	15 - 25	137	3.18	0.05	1.09	2.57	2.82	2.51
70	Range 17	9 - 18	136	3.59	0.05	1.11	2.74	3.04	2.51
70	Range 17	30 - 35	135	3.90	0.06	1.24	3.05	3.03	2.30
70	Range 17	43 - 47	134	4.35	0.06	1.39	3.25	2.98	2.24
70	Range 17	54 - 62	133	4.41	0.06	1.27	2.96	2.94	2.32
71	Range 17	7 - 17	132	3.82	0.05	1.23	3.08	3.00	2.29

71	Range 17	48 - 52	131	5.46	0.09	1.29	2.46	2.08	1.85
71	Range 17	95 - 105	130	8.04	0.16	1.79	3.53	1.92	1.38
71-A	Range 17	18 - 22	129	4.11	0.06	1.29	3.12	2.92	2.32
71-A	Range 17	36 - 38	128	4.49	0.06	1.42	3.23	3.09	2.29
73	Range 18	0 - 2	127	3.15	0.05	1.14	2.67	3.13	2.68
81	Range 21	0 - 3	126	4.13	0.08	1.14	2.63	3.03	2.76
87	Range 23	0 - 19	125	3.50	0.06	1.14	2.67	2.58	2.38
88	Range 23	0 - 3	124	3.69	0.07	1.19	2.67	3.01	2.76
89	Range 23	0 - 3	123	3.42	0.06	1.15	2.59	2.98	2.77
1	Range 24	14 - 20	122	3.13	0.05	0.96	2.65	2.80	2.36
2	Range 24	67 - 71	121	4.74	0.07	1.39	3.26	2.88	2.09
2	Range 24	87-91	180	7.74	0.12	1.72	3.34	2.05	1.46
2	Range 24	112 - 117	120	6.49	0.11	1.93	4.14	2.95	1.80

3	Range 24	7 - 17	119	4.13	0.06	1.25	2.83	3.09	2.56
3	Range 24	33 - 43	118	5.08	0.08	1.48	3.42	2.97	2.12
3	Range 24	67 - 77	117	7.90	0.14	1.64	3.21	1.87	1.40
3	Range 24	95 - 100	116	6.90	0.11	2.04	4.29	2.83	1.71
3	Range 24	128 - 134	115	8.04	0.14	2.26	4.51	2.62	1.59
4	Range 25	18-22	179	2.75	0.04	0.81	2.37	2.65	2.40
5	Range 25	7 - 12	114	3.15	0.05	0.95	2.67	2.80	2.35
5	Range 25	24 - 30	113	2.85	0.04	0.86	2.53	2.74	2.34
5	Range 25	46 - 50	112	3.46	0.05	1.01	2.71	2.93	2.31
9	Range 26	24 - 28	111						
9	Range 26	45 - 48	110						
10	Range 27	6 - 9	109	2.23	0.03	0.64	2.06	2.42	2.42
10	Range 27	13 - 17	108						
10	Range 27	31 - 34	107						

10	Range 27	47 - 50	106						
10	Range 27	55 - 58	105						
10	Range 27	70-74	177						
10	Range 27	73 - 76	104						
10	Range 27	83 - 86	103						
10	Range 27	99 - 102	102						
10	Range 27	106 - 109	101						
11	Range 27	0 - 3	100	2.91	0.05	0.87	2.43	2.47	2.29
12	Range 27	4 - 7	99	2.45	0.04	0.76	2.25	2.66	2.51
12	Range 27	19 - 22	98						
12	Range 27	22 - 26	97						
12	Range 27	32 - 35	96						
13	Range 28	0 - 4	95	2.88	0.04	0.79	2.11	2.14	2.29
14	Range 28	7 - 17	94	2.43	0.04	0.67	2.05	2.36	2.40
15	Range	7 - 15	93	2.34	0.03	0.69	2.09	2.57	2.60

		28							
15	Range 28	27 - 37	92	2.56	0.04	0.76	2.23	2.71	2.61
16	Range 29	0 - 3	91						
17	Range 29	0 - 3	90	4.29	0.06	0.94	2.05	1.85	1.83
18	Range 29	0 - 3	89	2.88	0.05	0.90	2.51	2.66	2.30
32	Range 5	40 - 50	183						
31	Range 5	87 - 98	184						
62	Range 15	100 - 107	187	3.86	0.06	1.33	2.98	3.02	2.52
71 (duplicate)	Range 17	48 - 52	186	5.55	0.09	1.29	2.38	2.06	1.87
81 (duplicate)	Range 21	0 - 3	188	3.91	0.07	1.11	2.45	2.95	2.88
18 (duplicate)	Range 29	0 - 3	185	2.92	0.05	0.93	2.54	2.67	2.31
Data in blue:	Original								

0-5 cm depth

Average	3.90	0.07	1.18	2.61	2.66	2.46
Std deviation	0.92	0.02	0.30	0.32	0.38	0.29
CV%	23.73	31.83	25.49	12.09	14.34	11.94

5-10 cm depth

Average	4.16	0.07	1.28	2.68	2.40	2.24
Std deviation	1.72	0.04	0.56	0.45	0.43	0.32
CV%	41.34	52.19	43.52	16.83	18.08	14.29
10-20 cm depth						
Average	4.63	0.08	1.38	2.85	2.56	2.29
Std deviation	1.80	0.04	0.45	0.45	0.44	0.32
CV%	38.91	50.56	32.95	15.88	16.99	13.79
20-30 cm depth						
Mean	5.24	0.09	1.60	2.97	2.37	2.22
Std deviation	1.70	0.04	0.46	0.29	0.44	0.25
CV%	32.42	42.04	28.73	9.60	18.79	11.42
30-40 cm depth						
Average	4.90	0.07	1.48	2.97	2.62	2.20
Std deviation	1.62	0.02	0.46	0.43	0.54	0.26
CV%	32.97	33.01	31.44	14.47	20.68	11.78
40-50 cm depth						
Average	5.18	0.08	1.39	2.91	2.48	2.06
Std deviation	1.74	0.04	0.30	0.49	0.53	0.42
CV%	33.57	50.13	21.53	16.82	21.44	20.61
50-60 cm depth						
Average	4.28	0.06	1.43	3.15	3.00	2.42
Std deviation	0.76	0.01	0.37	0.54	0.05	0.21
CV%	17.84	15.34	26.01	17.31	1.76	8.85

60-70 cm depth						
Mean	5.07	0.08	1.55	3.13	2.56	2.08
Std deviation	1.12	0.01	0.25	0.17	0.64	0.30
CV%	22.04	8.39	16.44	5.43	24.85	14.19
70-80 cm depth						
Average	5.68	0.09	1.59	3.01	2.40	2.07
Std deviation	2.08	0.04	0.37	0.24	0.67	0.60
CV%	36.57	41.39	23.18	7.82	27.76	29.07
80-90 cm depth						
Average	7.74	0.12	1.72	3.34	2.05	1.46
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
90-100 cm depth						
Mean	6.16	0.11	1.66	3.46	2.54	1.93
Std deviation	2.33	0.05	0.46	0.87	0.53	0.69
CV%	37.87	48.62	28.04	25.24	21.06	35.59
100-110 cm depth						
Average	3.88	0.06	1.34	3.03	3.03	2.51
Std deviation	0.03	0.00	0.01	0.06	0.01	0.01
CV%	0.73	2.24	1.06	2.10	0.23	0.56
110-120 cm depth						
Average	5.49	0.09	1.59	3.50	2.69	1.97

Std deviation	1.41	0.03	0.49	0.91	0.37	0.23
CV%	25.76	31.43	30.78	25.86	13.96	11.88
120-130 cm depth						
Average	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
130-140 cm depth						
Average	8.04	0.14	2.26	4.51	2.62	1.59
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
140-150 cm depth						
Average	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
150-170 cm depth						
Average	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
170-200 cm depth						
Average	6.69	0.09	1.91	2.80	1.89	1.99

Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
200-250 cm depth						
Average	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-

Core Sample		Depth (cm)	Sample ID	TiO ₂ %	P ₂ O ₅ %	LO %	Sc ppm	V ppm	Co ppm	Ga ppm
No										
19	Range 1	7 - 17	42	0.94	0.30	13.91	16.00	135.00	37.00	19.00
19	Range 1	72 - 82	41	1.09	0.22	10.75	18.00	150.00	52.00	21.00
19	Range 1	177 - 187	40	1.02	0.25	10.24	17.00	139.00	35.00	19.00
20	Range 1	15 - 55	39	0.97	0.26	13.38	16.00	133.00	51.00	17.00
20	Range 1	162 - 175	38							
20	Range 1	234 - 250	37							
21	Range 1	17 - 21	36	1.01	0.22	7.55	16.00	139.00	58.00	17.00
22	Range 2	7 - 27	35	0.96	0.28	13.39	16.00	133.00	29.00	21.00
22	Range 2	99 - 119	33							
22	Range 2	165 - 171.5	34							
23	Range 2	7 - 11	175	0.97	0.24	12.22	15.00	135.00	59.00	19.00
23	Range 2	57 - 77	32							
23	Range 2	138 - 158	31							
25	Rang 3	27 - 34	27	1.08	0.22	10.31	17.00	148.00	38.00	18.00
26	Rang 3	7 - 20	30	0.97	0.26	10.86	15.00	134.00	40.00	18.00
26	Rang 3	67 - 77	29							
26	Rang 3	127 - 137	28							
27	Rang 3	7 - 27	26	0.96	0.29	16.38	16.00	135.00	37.00	20.00
27	Rang 3	97 - 117	25							

27	Rang 3	157 - 177	24							
27	Rang 3	247 - 264	23							
28	Range 4	20 - 35	22	0.93	0.26	15.30	15.00	129.00	66.00	19.00
28	Range 4	60 - 75	21	0.99	0.26	16.09	16.00	136.00	68.00	20.00
28	Range 4	75 - 85	20	1.04	0.25	12.87	16.00	144.00	75.00	18.00
29	Range 4	15 - 30	19	1.01	0.25	12.65	15.00	135.00	45.00	19.00
29	Range 4	50 - 60	18							
31	Range 5	18 - 28	14	0.89	0.24	12.67	14.00	119.00	46.00	18.00
31	Range 5	87 - 98	15							
31	Range 5	143 - 154	16							
32	Range 5	16 - 30	17	1.01	0.33	17.53	17.00	149.00	29.00	20.00
32	Range 5	40 - 50	9							
34	Range 6	13 - 23	10	1.04	0.31	14.79	17.00	150.00	43.00	17.00
34	Range 6	71 - 81	11							
34	Range 6	127 - 137	1							
34	Range 6	149 - 159	12							
34	Range 6	178 - 188	13							
35-B	Range 6	0 - 2	174	0.88	0.23	10.13	13.00	118.00	68.00	16.00
36	Range 6	0 - 3	173	0.77	0.17	5.57	11.00	101.00	68.00	17.00
37	Range 7	0 - 4	172	1.03	0.17	3.43	13.00	129.00	91.00	16.00
37-B	Range 7	6 - 10	8							

38-A	Range 7	10-15	7	0.97	0.24	12.13	15.00	138.00	56.00	17.00
38-A	Range 7	38 - 41	6							
38-A	Range 7	45 - 50	5	1.27	0.36	16.01	21.00	189.00	49.00	21.00
38	Range 7	2 - 5	171							
38	Range 7	18 - 20	170							
38	Range 7	66 - 69	169							
38	Range 7	165 - 168	168							
39	Range 7	6 - 9	181	0.88	0.19	6.48	13.00	115.00	90.00	17.00
39	Range 7	5 - 10	4							
39	Range 7	21 - 26	3							
39	Range 7	26 - 32	166							
39	Range 7	41 - 47	2							
39	Range 7	93 - 97	164							
39	Range 7	142 - 150	163							
40	Range 8	55-64	178	0.87	0.13	1.53	13.00	128.00	152.00	16.00
40	Range 8	105 - 113	162							
40	Range 8	128 - 132	161							
40	Range 8	146 - 150	160							
43	Range 9	8 - 12	159	0.77	0.37	20.34	14.00	114.00	62.00	14.00
43	Range 9	21 - 26	158							
43	Range 9	45 - 51	157							
46	Range 10	40 - 47	156	0.66	0.12	1.32	11.00	94.00	97.00	15.00

46	Range 10	103 - 108	182								
47	Range 10	0 - 2	155	0.72	0.18	9.51	11.00	97.00	109.00	15.00	
47	Range 10	57 - 65	154								
47	Range 10	115 - 120	153								
49	Range 11	7 - 14	152	0.77	0.15	1.42	12.00	110.00	139.00	16.00	
49	Range 11	35 - 45	151								
49	Range 11	91 - 96	150								
49	Range 11	103 - 113	149								
50	Range 11	25 - 35	148	0.54	0.10	0.87	9.00	79.00	120.00	15.00	
50	Range 11	67 - 77	147								
52	Range 11	7 - 17	146	1.47	0.25	12.35	21.00	205.00	52.00	18.00	
52	Range 11	96 - 106	145								
54	Range 12	7 - 17	144	0.51	0.10	1.36	9.00	78.00	151.00	14.00	
54	Range 12	108 - 114	143	0.72	0.13	3.10	11.00	104.00	107.00	14.00	

60	Range 14	11 - 20	142	0.48	0.08	1.17	8.00	69.00	126.00	15.00
60	Range 14	55 - 70	167	0.73	0.11	1.01	11.00	107.00	146.00	15.00
62	Range 15	76-81	176	0.53	0.08	1.30	9.00	76.00	168.00	15.00
62	Range 15	100 - 107	165	0.66	0.11	1.32	11.00	97.00	174.00	15.00
63	Range 15	15 - 25	141	0.47	0.10	1.23	8.00	73.00	142.00	14.00
65	Range 16	50 - 57	140	0.54	0.10	1.32	9.00	78.00	110.00	16.00
65	Range 16	71 - 78	139	0.55	0.10	1.10	9.00	82.00	61.00	15.00
65	Range 16	91 - 96	138	0.54	0.11	1.24	9.00	82.00	140.00	15.00
66	Range 16	15 - 25	137	0.51	0.07	1.21	9.00	77.00	157.00	14.00
70	Range 17	9 - 18	136	0.54	0.11	1.37	9.00	73.00	131.00	15.00
70	Range 17	30 - 35	135	0.65	0.12	1.17	10.00	85.00	119.00	15.00
70	Range 17	43 - 47	134	0.70	0.14	1.60	11.00	97.00	152.00	16.00
70	Range 17	54 - 62	133	0.65	0.12	2.06	10.00	92.00	170.00	16.00
71	Range 17	7 - 17	132	0.59	0.12	1.40	9.00	83.00	183.00	15.00

71	Range 17	48 - 52	131	1.04	0.19	7.90	14.00	122.00	75.00	17.00
71	Range 17	95 - 105	130	1.40	0.23	10.73	20.00	198.00	44.00	19.00
71-A	Range 17	18 - 22	129	0.70	0.12	1.39	11.00	87.00	190.00	16.00
71-A	Range 17	36 - 38	128	0.72	0.12	1.90	11.00	97.00	175.00	16.00
73	Range 18	0 - 2	127	0.49	0.09	1.05	9.00	72.00	243.00	15.00
81	Range 21	0 - 3	126	0.76	0.11	1.12	9.00	99.00	159.00	16.00
87	Range 23	0 - 19	125	0.53	0.10	1.51	9.00	82.00	149.00	14.00
88	Range 23	0 - 3	124	0.63	0.12	1.54	9.00	81.00	129.00	16.00
89	Range 23	0 - 3	123	0.59	0.09	1.70	9.00	78.00	202.00	15.00
1	Range 24	14 - 20	122	0.49	0.09	1.66	8.00	69.00	138.00	14.00
2	Range 24	67 - 71	121	0.76	0.15	2.38	12.00	114.00	122.00	16.00
2	Range 24	87-91	180	1.33	0.22	11.93	19.00	186.00	57.00	18.00
2	Range 24	112 - 117	120	1.07	0.18	2.60	16.00	164.00	108.00	18.00

3	Range 24	7 - 17	119	0.66	0.11	1.91	10.00	87.00	216.00	16.00
3	Range 24	33 - 43	118	0.91	0.13	1.64	12.00	122.00	162.00	16.00
3	Range 24	67 - 77	117	1.37	0.22	11.91	20.00	193.00	37.00	19.00
3	Range 24	95 - 100	116	1.17	0.18	2.76	17.00	176.00	131.00	20.00
3	Range 24	128 - 134	115	1.33	0.23	4.84	20.00	197.00	83.00	21.00
4	Range 25	18-22	179	0.41	0.08	1.34	7.00	61.00	143.00	15.00
5	Range 25	7 - 12	114	0.48	0.09	1.29	8.00	68.00	196.00	16.00
5	Range 25	24 - 30	113	0.44	0.09	1.03	7.00	64.00	192.00	15.00
5	Range 25	46 - 50	112	0.51	0.09	1.63	8.00	75.00	173.00	16.00
9	Range 26	24 - 28	111							
9	Range 26	45 - 48	110							
10	Range 27	6 - 9	109	0.35	0.07	0.72	6.00	54.00	290.00	11.00
10	Range 27	13 - 17	108							
10	Range 27	31 - 34	107							

10	Range 27	47 - 50	106							
10	Range 27	55 - 58	105							
10	Range 27	70-74	177							
10	Range 27	73 - 76	104							
10	Range 27	83 - 86	103							
10	Range 27	99 - 102	102							
10	Range 27	106 - 109	101							
11	Range 27	0 - 3	100	0.47	0.07	0.75	8.00	66.00	224.00	12.00
12	Range 27	4 - 7	99	0.37	0.05	0.64	6.00	56.00	193.00	12.00
12	Range 27	19 - 22	98							
12	Range 27	22 - 26	97							
12	Range 27	32 - 35	96							
13	Range 28	0 - 4	95	0.47	0.08	2.23	8.00	70.00	248.00	12.00
14	Range 28	7 - 17	94	0.38	0.06	0.76	6.00	58.00	237.00	13.00
15	Range	7 - 15	93	0.34	0.07	1.05	6.00	52.00	201.00	14.00

		28									
15	Range 28	27 - 37	92	0.37	0.07	1.13	7.00	56.00	283.00	15.00	
16	Range 29	0 - 3	91								
17	Range 29	0 - 3	90	0.69	0.19	11.02	10.00	88.00	131.00	16.00	
18	Range 29	0 - 3	89	0.42	0.08	1.29	8.00	64.00	176.00	13.00	
32	Range 5	40 - 50	183								
31	Range 5	87 - 98	184								
62	Range 15	100 - 107	187	0.63	0.10	1.40	10.00	91.00	181.00	18.00	
71 (duplicate)	Range 17	48 - 52	186	1.01	0.16	7.95	14.00	124.00	81.00	16.00	
81 (duplicate)	Range 21	0 - 3	188	0.70	0.09	1.07	9.00	92.00	143.00	15.00	
18 (duplicate)	Range 29	0 - 3	185	0.43	0.07	1.58	8.00	65.00	180.00	12.00	
Data in blue:	Original										

0-5 cm depth

Average	0.65	0.12	3.71	9.64	87.14	155.07	14.71
Std deviation	0.18	0.05	3.75	1.74	20.15	60.25	1.73
CV%	28.30	42.54	100.94	18.01	23.12	38.85	11.75

5-10 cm depth

Average	0.62	0.16	6.17	10.14	89.14	148.43	14.71
Std deviation	0.25	0.12	7.56	3.80	32.20	84.83	2.81
CV%	40.42	72.86	122.57	37.51	36.12	57.15	19.11
10-20 cm depth							
Average	0.72	0.16	5.65	11.62	102.19	119.33	16.10
Std deviation	0.29	0.09	5.87	4.31	39.87	66.88	2.17
CV%	40.63	55.22	103.84	37.07	39.02	56.05	13.46
20-30 cm depth							
Mean	0.80	0.21	10.01	12.83	112.50	83.00	17.67
Std deviation	0.25	0.10	7.25	3.92	33.55	62.08	2.16
CV%	30.92	45.26	72.43	30.55	29.82	74.79	12.23
30-40 cm depth							
Average	0.78	0.15	4.92	12.17	106.83	138.00	16.17
Std deviation	0.26	0.07	5.46	3.76	33.96	90.44	1.17
CV%	32.61	46.60	110.89	30.94	31.79	65.54	7.23
40-50 cm depth							
Average	0.86	0.18	6.07	13.17	116.83	104.50	16.83
Std deviation	0.28	0.10	5.80	4.45	39.88	47.97	2.14
CV%	32.98	54.37	95.51	33.77	34.13	45.91	12.69
50-60 cm depth							
Average	0.69	0.12	1.64	10.67	99.33	144.00	16.00
Std deviation	0.16	0.02	0.38	2.08	25.79	30.79	0.00
CV%	24.03	13.09	23.30	19.52	25.97	21.38	0.00

60-70 cm depth							
Mean	0.83	0.17	6.49	13.00	119.00	112.00	17.00
Std deviation	0.14	0.08	8.34	2.65	15.13	39.95	2.65
CV%	17.09	44.81	128.43	20.35	12.72	35.67	15.56
70-80 cm depth							
Average	0.91	0.17	7.59	14.40	129.00	78.60	17.60
Std deviation	0.36	0.08	5.88	5.13	49.45	51.85	2.61
CV%	39.89	44.81	77.49	35.61	38.33	65.97	14.82
80-90 cm depth							
Average	1.33	0.22	11.93	19.00	186.00	57.00	18.00
Std deviation	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-
90-100 cm depth							
Mean	1.04	0.17	4.91	15.33	152.00	105.00	18.00
Std deviation	0.44	0.06	5.10	5.69	61.61	53.02	2.65
CV%	42.76	34.78	103.81	37.08	40.53	50.49	14.70
100-110 cm depth							
Average	0.64	0.11	1.36	10.50	94.00	177.50	16.50
Std deviation	0.02	0.01	0.06	0.71	4.24	4.95	2.12
CV%	3.19	6.73	4.16	6.73	4.51	2.79	12.86
110-120 cm depth							
Average	0.90	0.16	2.85	13.50	134.00	107.50	16.00

Std deviation	0.25	0.04	0.35	3.54	42.43	0.71	2.83
CV%	27.72	22.81	12.41	26.19	31.66	0.66	17.68
120-130 cm depth							
Average							
Std deviation	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-
130-140 cm depth							
Average	1.33	0.23	4.84	20.00	197.00	83.00	21.00
Std deviation	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-
140-150 cm depth							
Average	-	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-
150-170 cm depth							
Average	-	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-
170-200 cm depth							
Average	1.02	0.25	10.24	17.00	139.00	35.00	19.00

Std deviation	-	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-	-
200-250 cm depth								
Average	-	-	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-	-

Core Sample		Depth (cm)	Sample ID	Rb	Sr	Y	Zr	Nb	Cs	Ba
No										
19	Range 1	7 - 17	42	80.00	259.00	35.00	147.00	14.00	4.90	675.00
19	Range 1	72 - 82	41	68.00	248.00	31.00	182.00	13.00	3.90	630.00
19	Range 1	177 - 187	40	76.00	238.00	29.00	170.00	11.00	4.40	672.00
20	Range 1	15 - 55	39	74.00	245.00	34.00	172.00	17.00	5.40	661.00
20	Range 1	162 - 175	38							
20	Range 1	234 - 250	37							
21	Range 1	17 - 21	36	71.00	282.00	28.00	201.00	13.00	4.10	713.00
22	Range 2	7 - 27	35	85.00	259.00	34.00	186.00	19.00	5.10	684.00
22	Range 2	99 - 119	33							
22	Range 2	165 - 171.5	34							
23	Range 2	7 - 11	175	75.00	268.00	31.00	189.00	16.00	4.50	688.00
23	Range 2	57 - 77	32							
23	Range 2	138 - 158	31							
25	Rang 3	27 - 34	27	70.00	273.00	30.00	198.00	16.00	4.10	685.00
26	Rang 3	7 - 20	30	77.00	290.00	31.00	210.00	15.00	4.30	729.00
26	Rang 3	67 - 77	29							
26	Rang 3	127 - 137	28							
27	Rang 3	7 - 27	26	84.00	263.00	36.00	196.00	17.00	5.20	671.00

27	Rang 3	97 - 117	25							
27	Rang 3	157 - 177	24							
27	Rang 3	247 - 264	23							
28	Range 4	20 - 35	22	77.00	263.00	35.00	167.00	13.00	4.70	685.00
28	Range 4	60 - 75	21	70.00	253.00	35.00	168.00	10.00	4.30	619.00
28	Range 4	75 - 85	20	65.00	275.00	31.00	186.00	9.00	3.60	660.00
29	Range 4	15 - 30	19	79.00	300.00	33.00	207.00	18.00	4.40	728.00
29	Range 4	50 - 60	18							
31	Range 5	18 - 28	14	85.00	291.00	33.00	224.00	16.00	5.10	721.00
31	Range 5	87 - 98	15							
31	Range 5	143 - 154	16							
32	Range 5	16 - 30	17	74.00	270.00	36.00	196.00	17.00	4.50	659.00
32	Range 5	40 - 50	9							
34	Range 6	13 - 23	10	65.00	301.00	34.00	217.00	13.00	4.00	680.00
34	Range 6	71 - 81	11							
34	Range 6	127 - 137	1							
34	Range 6	149 - 159	12							
34	Range 6	178 - 188	13							
35-B	Range 6	0 - 2	174	72.00	291.00	28.00	254.00	16.00	3.80	719.00
36	Range 6	0 - 3	173	83.00	340.00	26.00	242.00	16.00	3.50	819.00
37	Range 7	0 - 4	172	69.00	347.00	30.00	346.00	19.00	2.60	822.00

37-B	Range 7	6 - 10	8							
38-A	Range 7	10-15	7	72.00	326.00	30.00	200.00	15.00	4.00	753.00
38-A	Range 7	38 - 41	6							
38-A	Range 7	45 - 50	5	59.00	255.00	38.00	188.00	15.00	3.10	655.00
38	Range 7	2 - 5	171							
38	Range 7	18 - 20	170							
38	Range 7	66 - 69	169							
38	Range 7	165 - 168	168							
39	Range 7	6 - 9	181	79.00	339.00	27.00	211.00	16.00	3.70	787.00
39	Range 7	5 - 10	4							
39	Range 7	21 - 26	3							
39	Range 7	26 - 32	166							
39	Range 7	41 - 47	2							
39	Range 7	93 - 97	164							
39	Range 7	142 - 150	163							
40	Range 8	55-64	178	63.00	392.00	20.00	181.00	13.00	2.20	808.00
40	Range 8	105 - 113	162							
40	Range 8	128 - 132	161							
40	Range 8	146 - 150	160							
43	Range 9	8 - 12	159	57.00	236.00	28.00	166.00	11.00	4.30	571.00
43	Range 9	21 - 26	158							
43	Range 9	45 - 51	157							
46	Range	40 - 47	156	74.00	382.00	18.00	181.00	13.00	2.30	851.00

46	Range 10	103 - 108	182								
47	Range 10	0 - 2	155	77.00	330.00	24.00	191.00	13.00	3.40	777.00	
47	Range 10	57 - 65	154								
47	Range 10	115 - 120	153								
49	Range 11	7 - 14	152	66.00	369.00	20.00	172.00	11.00	1.70	769.00	
49	Range 11	35 - 45	151								
49	Range 11	91 - 96	150								
49	Range 11	103 - 113	149								
50	Range 11	25 - 35	148	71.00	373.00	14.00	122.00	10.00	1.90	881.00	
50	Range 11	67 - 77	147								
52	Range 11	7 - 17	146	52.00	262.00	35.00	189.00	9.00	2.50	664.00	
52	Range 11	96 - 106	145								
54	Range 12	7 - 17	144	73.00	335.00	14.00	113.00	7.00	1.60	886.00	

54	Range 12	108 - 114	143	63.00	309.00	18.00	148.00	9.00	1.70	785.00
60	Range 14	11 - 20	142	77.00	380.00	13.00	120.00	8.00	1.80	930.00
60	Range 14	55 - 70	167	63.00	358.00	19.00	155.00	10.00	1.50	819.00
62	Range 15	76-81	176	75.00	381.00	14.00	119.00	8.00	1.80	899.00
62	Range 15	100 - 107	165	71.00	368.00	16.00	144.00	9.00	1.70	843.00
63	Range 15	15 - 25	141	73.00	311.00	13.00	99.00	6.00	1.60	897.00
65	Range 16	50 - 57	140	78.00	366.00	14.00	130.00	9.00	1.90	886.00
65	Range 16	71 - 78	139	76.00	361.00	15.00	133.00	8.00	1.90	909.00
65	Range 16	91 - 96	138	75.00	333.00	15.00	120.00	7.00	1.70	903.00
66	Range 16	15 - 25	137	70.00	335.00	14.00	114.00	7.00	1.60	831.00
70	Range 17	9 - 18	136	62.00	413.00	15.00	127.00	5.00	1.50	902.00
70	Range 17	30 - 35	135	58.00	401.00	19.00	170.00	7.00	1.40	840.00
70	Range 17	43 - 47	134	59.00	401.00	19.00	168.00	8.00	1.50	820.00
70	Range 17	54 - 62	133	63.00	402.00	16.00	140.00	6.00	1.70	861.00

71	Range 17	7 - 17	132	59.00	408.00	15.00	152.00	7.00	1.50	832.00
71	Range 17	48 - 52	131	67.00	268.00	29.00	236.00	11.00	2.90	689.00
71	Range 17	95 - 105	130	54.00	261.00	33.00	240.00	13.00	2.70	641.00
71-A	Range 17	18 - 22	129	61.00	406.00	21.00	185.00	8.00	1.50	823.00
71-A	Range 17	36 - 38	128	59.00	394.00	20.00	176.00	8.00	1.60	833.00
73	Range 18	0 - 2	127	71.00	364.00	14.00	107.00	6.00	1.70	894.00
81	Range 21	0 - 3	126	78.00	340.00	19.00	225.00	10.00	1.90	911.00
87	Range 23	0 - 19	125	68.00	307.00	15.00	126.00	7.00	1.70	787.00
88	Range 23	0 - 3	124	83.00	338.00	18.00	186.00	12.00	2.20	862.00
89	Range 23	0 - 3	123	80.00	363.00	17.00	153.00	9.00	2.10	864.00
1	Range 24	14 - 20	122	58.00	364.00	14.00	134.00	5.00	1.30	872.00
2	Range 24	67 - 71	121	56.00	370.00	16.00	142.00	7.00	1.50	813.00
2	Range 24	87-91	180	53.00	276.00	31.00	224.00	10.00	2.60	656.00

2	Range 24	112 - 117	120	49.00	402.00	23.00	182.00	9.00	1.50	733.00
3	Range 24	7 - 17	119	66.00	410.00	20.00	155.00	7.00	1.70	914.00
3	Range 24	33 - 43	118	54.00	401.00	29.00	217.00	8.00	1.40	797.00
3	Range 24	67 - 77	117	54.00	259.00	33.00	221.00	11.00	2.80	655.00
3	Range 24	95 - 100	116	53.00	391.00	25.00	222.00	11.00	1.40	703.00
3	Range 24	128 - 134	115	55.00	365.00	26.00	226.00	12.00	1.80	668.00
4	Range 25	18-22	179	66.00	370.00	11.00	113.00	5.00	1.20	856.00
5	Range 25	7 - 12	114	65.00	382.00	14.00	128.00	6.00	1.30	831.00
5	Range 25	24 - 30	113	64.00	376.00	11.00	120.00	5.00	1.10	837.00
5	Range 25	46 - 50	112	65.00	392.00	14.00	128.00	6.00	1.40	819.00
9	Range 26	24 - 28	111							
9	Range 26	45 - 48	110							
10	Range 27	6 - 9	109	55.00	337.00	10.00	93.00	4.00	1.00	895.00
10	Range 27	13 - 17	108							

10	Range 27	31 - 34	107							
10	Range 27	47 - 50	106							
10	Range 27	55 - 58	105							
10	Range 27	70-74	177							
10	Range 27	73 - 76	104							
10	Range 27	83 - 86	103							
10	Range 27	99 - 102	102							
10	Range 27	106 - 109	101							
11	Range 27	0 - 3	100	53.00	348.00	13.00	114.00	5.00	1.00	849.00
12	Range 27	4 - 7	99	56.00	367.00	9.00	95.00	4.00	1.10	928.00
12	Range 27	19 - 22	98							
12	Range 27	22 - 26	97							
12	Range 27	32 - 35	96							
13	Range 28	0 - 4	95	59.00	304.00	11.00	109.00	5.00	1.10	827.00
14	Range 28	7 - 17	94	61.00	325.00	11.00	108.00	4.00	1.00	871.00

15	Range 28	7 - 15	93	69.00	356.00	10.00	100.00	4.00	1.20	914.00
15	Range 28	27 - 37	92	71.00	374.00	10.00	105.00	5.00	1.20	912.00
16	Range 29	0 - 3	91							
17	Range 29	0 - 3	90	65.00	258.00	22.00	176.00	9.00	2.30	675.00
18	Range 29	0 - 3	89	54.00	364.00	16.00	105.00	5.00	1.20	848.00
32	Range 5	40 - 50	183							
31	Range 5	87 - 98	184							
62	Range 15	100 - 107	187	79.00	360.00	17.00	141.00	11.00	1.80	841.00
71 (duplicate)	Range 17	48 - 52	186	64.00	268.00	29.00	213.00	13.00	3.10	715.00
81 (duplicate)	Range 21	0 - 3	188	77.00	357.00	19.00	217.00	16.00	2.10	937.00
18 (duplicate)	Range 29	0 - 3	185	52.00	374.00	16.00	110.00	6.00	1.20	865.00
Data in blue: Original										

0-5 cm depth									
	Average		69.50	337.00	19.50	181.07	10.50	2.15	833.50
	Std deviation		11.15	32.39	5.75	71.47	4.86	0.91	70.91
	CV%		16.05	9.61	29.48	39.47	46.32	42.46	8.51

5-10 cm depth							
Average	65.00	319.43	19.14	144.00	9.14	2.51	783.86
Std deviation	9.57	52.65	9.23	45.79	5.24	1.58	122.39
CV%	14.73	16.48	48.20	31.80	57.33	62.82	15.61
10-20 cm depth							
Average	68.90	334.48	21.62	154.19	9.48	2.54	803.14
Std deviation	8.68	53.19	9.61	40.05	4.57	1.49	94.91
CV%	12.59	15.90	44.45	25.98	48.20	58.67	11.82
20-30 cm depth							
Mean	75.00	312.17	27.00	172.67	13.17	3.62	751.83
Std deviation	7.18	50.13	11.33	44.12	4.96	1.68	87.80
CV%	9.58	16.06	41.97	25.55	37.64	46.35	11.68
30-40 cm depth							
Average	64.33	348.00	23.67	173.00	10.17	2.52	788.00
Std deviation	8.31	70.21	8.91	37.96	5.04	1.78	96.88
CV%	12.92	20.17	37.67	21.94	49.54	70.83	12.29
40-50 cm depth							
Average	64.67	327.67	24.50	185.67	11.00	2.38	758.17
Std deviation	5.61	70.53	9.01	37.27	3.41	0.78	81.77
CV%	8.67	21.52	36.76	20.07	30.96	32.76	10.79
50-60 cm depth							
Average	68.00	386.67	16.67	150.33	9.33	1.93	851.67
Std deviation	8.66	18.58	3.06	27.02	3.51	0.25	39.83

CV%	12.74	4.81	18.33	17.98	37.63	13.02	4.68
60-70 cm depth							
Mean	63.00	327.00	23.33	155.00	9.00	2.43	750.33
Std deviation	7.00	64.37	10.21	13.00	1.73	1.62	113.78
CV%	11.11	19.68	43.78	8.39	19.25	66.43	15.16
70-80 cm depth							
Average	67.60	304.80	24.80	168.20	9.80	2.80	750.60
Std deviation	8.91	61.60	9.44	41.70	2.17	0.96	140.54
CV%	13.17	20.21	38.08	24.79	22.12	34.16	18.72
80-90 cm depth							
Average	53.00	276.00	31.00	224.00	10.00	2.60	656.00
Std deviation	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-
90-100 cm depth							
Mean	60.67	328.33	24.33	194.00	10.33	1.93	749.00
Std deviation	12.42	65.13	9.02	64.71	3.06	0.68	136.92
CV%	20.48	19.84	37.06	33.36	29.57	35.21	18.28
100-110 cm depth							
Average	75.00	364.00	16.50	142.50	10.00	1.75	842.00
Std deviation	5.66	5.66	0.71	2.12	1.41	0.07	1.41
CV%	7.54	1.55	4.29	1.49	14.14	4.04	0.17
110-120 cm							

depth								
Average	56.00	355.50	20.50	165.00	9.00	1.60	759.00	
Std deviation	9.90	65.76	3.54	24.04	0.00	0.14	36.77	
CV%	17.68	18.50	17.25	14.57	0.00	8.84	4.84	
120-130 cm								
depth								
Average	-	-	-	-	-	-	-	
Std deviation	-	-	-	-	-	-	-	
CV%	-	-	-	-	-	-	-	
130-140 cm								
depth								
Average	55.00	365.00	26.00	226.00	12.00	1.80	668.00	
Std deviation	-	-	-	-	-	-	-	
CV%	-	-	-	-	-	-	-	
140-150 cm								
depth								
Average	-	-	-	-	-	-	-	
Std deviation	-	-	-	-	-	-	-	
CV%	-	-	-	-	-	-	-	
150-170 cm								
depth								
Average	-	-	-	-	-	-	-	
Std deviation	-	-	-	-	-	-	-	
CV%	-	-	-	-	-	-	-	
170-200 cm								

depth							
Average	76.00	238.00	29.00	170.00	11.00	4.40	672.00
Std deviation	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-
200-250 cm							
depth							
Average	-	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-

Core Sample		Depth (cm)	Sample ID	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm
No											
19	Range 1	7 - 17	42	36.10	69.20	8.94	35.60	7.50	1.57	6.90	1.10
19	Range 1	72 - 82	41	138.00	228.00	23.80	83.50	15.70	4.32	15.10	2.50
19	Range 1	177 - 187	40	35.50	69.40	8.58	34.00	7.00	1.55	6.10	1.00
20	Range 1	15 - 55	39	43.90	84.50	9.88	38.00	8.00	1.64	7.10	1.10
20	Range 1	162 - 175	38								
20	Range 1	234 - 250	37								
21	Range 1	17 - 21	36	36.70	72.50	8.24	31.60	6.60	1.43	5.60	0.90
22	Range 2	7 - 27	35	42.90	76.80	9.92	36.30	7.60	1.56	7.00	1.10
22	Range 2	99 - 119	33								
22	Range 2	165 - 171.5	34								
23	Range 2	7 - 11	175	41.00	79.80	9.30	35.40	7.60	1.61	6.80	1.10
23	Range 2	57 - 77	32								
23	Range 2	138 - 158	31								
25	Rang 3	27 - 34	27	38.50	75.50	8.61	33.20	7.00	1.60	6.30	1.00
26	Rang 3	7 - 20	30	42.30	81.30	9.36	35.70	7.40	1.52	6.60	1.00
26	Rang 3	67 - 77	29								
26	Rang 3	127 - 137	28								
27	Rang 3	7 - 27	26	41.30	78.90	10.30	38.90	8.30	1.68	7.20	1.10

27	Rang 3	97 - 117	25								
27	Rang 3	157 - 177	24								
27	Rang 3	247 - 264	23								
28	Range 4	20 - 35	22	38.10	72.90	9.49	37.50	7.90	1.62	6.90	1.10
28	Range 4	60 - 75	21	113.00	189.00	20.70	73.50	14.10	3.63	13.30	2.20
28	Range 4	75 - 85	20	32.20	62.40	8.04	32.30	6.80	1.52	6.00	1.00
29	Range 4	15 - 30	19	42.30	82.10	9.59	36.50	7.50	1.59	6.70	1.00
29	Range 4	50 - 60	18								
31	Range 5	18 - 28	14	49.30	93.80	10.90	41.30	8.50	1.61	7.10	1.10
31	Range 5	87 - 98	15								
31	Range 5	143 - 154	16								
32	Range 5	16 - 30	17	41.90	74.70	9.91	37.20	7.80	1.60	7.30	1.20
32	Range 5	40 - 50	9								
34	Range 6	13 - 23	10	40.40	77.00	9.34	35.80	7.60	1.64	6.70	1.10
34	Range 6	71 - 81	11								
34	Range 6	127 - 137	1								
34	Range 6	149 - 159	12								
34	Range 6	178 - 188	13								
35-B	Range 6	0 - 2	174	42.50	82.30	9.19	34.70	6.90	1.36	5.90	0.90
36	Range 6	0 - 3	173	40.50	77.70	8.48	31.50	6.10	1.22	5.20	0.80
37	Range 7	0 - 4	172	53.70	104.00	11.20	40.00	7.50	1.35	6.00	1.00

37-B	Range 7	6 - 10	8								
38-A	Range 7	10-15	7	38.00	71.10	8.55	33.30	7.00	1.55	6.20	1.00
38-A	Range 7	38 - 41	6								
38-A	Range 7	45 - 50	5	37.80	69.10	9.32	36.10	7.90	1.91	7.70	1.20
38	Range 7	2 - 5	171								
38	Range 7	18 - 20	170								
38	Range 7	66 - 69	169								
38	Range 7	165 - 168	168								
39	Range 7	6 - 9	181	36.20	70.40	8.04	30.20	6.10	1.30	5.30	0.90
39	Range 7	5 - 10	4								
39	Range 7	21 - 26	3								
39	Range 7	26 - 32	166								
39	Range 7	41 - 47	2								
39	Range 7	93 - 97	164								
39	Range 7	142 - 150	163								
40	Range 8	55-64	178	31.00	60.10	6.61	24.40	4.80	1.13	4.10	0.70
40	Range 8	105 - 113	162								
40	Range 8	128 - 132	161								
40	Range 8	146 - 150	160								
43	Range 9	8 - 12	159	33.20	64.90	7.62	29.60	6.00	1.34	5.50	0.90
43	Range 9	21 - 26	158								
43	Range 9	45 - 51	157								
46	Range	40 - 47	156	28.00	53.30	5.82	21.60	4.30	1.01	3.60	0.60

			10									
46	Range 10	103 - 108		182								
47	Range 10	0 - 2		155	36.50	68.10	7.66	28.40	5.50	1.12	4.60	0.80
47	Range 10	57 - 65		154								
47	Range 10	115 - 120		153								
49	Range 11	7 - 14		152	29.60	57.00	6.68	25.20	4.90	1.12	4.00	0.60
49	Range 11	35 - 45		151								
49	Range 11	91 - 96		150								
49	Range 11	103 - 113		149								
50	Range 11	25 - 35		148	23.20	44.80	4.88	18.20	3.70	0.92	3.00	0.50
50	Range 11	67 - 77		147								
52	Range 11	7 - 17		146	34.00	68.80	8.31	33.50	7.20	1.79	6.70	1.10
52	Range 11	96 - 106		145								
54	Range 12	7 - 17		144	17.80	33.60	4.06	15.30	3.10	0.83	2.70	0.40

54	Range 12	108 - 114	143	21.90	43.10	4.89	19.00	4.00	1.03	3.60	0.60
60	Range 14	11 - 20	142	17.70	33.40	4.05	15.20	3.10	0.81	2.60	0.40
60	Range 14	55 - 70	167	25.70	49.00	5.78	21.70	4.20	0.98	3.60	0.60
62	Range 15	76-81	176	18.10	34.80	4.24	16.10	3.30	0.83	2.70	0.40
62	Range 15	100 - 107	165	22.10	42.20	5.09	19.20	3.90	0.94	3.20	0.50
63	Range 15	15 - 25	141	15.80	29.80	3.75	14.40	2.90	0.77	2.50	0.40
65	Range 16	50 - 57	140	20.00	37.40	4.55	17.00	3.30	0.88	3.00	0.50
65	Range 16	71 - 78	139	19.40	36.80	4.46	17.10	3.30	0.86	2.80	0.50
65	Range 16	91 - 96	138	17.60	32.90	4.08	15.70	3.20	0.81	2.80	0.50
66	Range 16	15 - 25	137	17.90	34.00	4.13	15.60	3.10	0.79	2.70	0.40
70	Range 17	9 - 18	136	18.90	37.20	4.57	17.70	3.50	0.91	2.90	0.50
70	Range 17	30 - 35	135	31.50	62.90	7.49	28.30	5.30	1.08	4.40	0.70
70	Range 17	43 - 47	134	26.10	51.60	6.30	24.20	4.70	1.09	3.90	0.60
70	Range 17	54 - 62	133	20.10	39.60	4.94	19.00	3.80	0.97	3.40	0.50

71	Range 17	7 - 17	132	22.70	45.00	5.52	21.30	4.20	1.01	3.40	0.50
71	Range 17	48 - 52	131	32.70	63.90	7.99	31.60	6.40	1.47	5.70	0.90
71	Range 17	95 - 105	130	30.40	64.40	7.89	31.90	6.90	1.68	6.30	1.00
71-A	Range 17	18 - 22	129	33.10	65.30	7.80	29.80	5.70	1.14	4.70	0.70
71-A	Range 17	36 - 38	128	28.00	55.70	6.77	25.80	5.10	1.10	4.10	0.60
73	Range 18	0 - 2	127	16.80	31.90	3.91	15.20	3.00	0.80	2.60	0.40
81	Range 21	0 - 3	126	30.10	57.50	6.67	24.70	4.50	0.92	3.70	0.60
87	Range 23	0 - 19	125	16.70	31.80	3.95	15.40	3.20	0.79	2.90	0.50
88	Range 23	0 - 3	124	27.10	51.70	6.11	22.80	4.30	0.95	3.70	0.60
89	Range 23	0 - 3	123	24.20	46.70	5.50	20.50	3.90	0.92	3.20	0.50
1	Range 24	14 - 20	122	17.80	35.60	4.28	16.80	3.20	0.84	2.80	0.40
2	Range 24	67 - 71	121	19.70	40.60	4.91	19.60	3.90	1.03	3.50	0.50
2	Range 24	87-91	180	29.80	61.90	7.73	31.20	6.70	1.56	6.20	1.00

2	Range 24	112 - 117	120	23.60	48.80	6.00	23.60	5.00	1.26	4.50	0.70
3	Range 24	7 - 17	119	27.80	55.60	6.62	25.10	4.80	1.02	3.90	0.60
3	Range 24	33 - 43	118	42.20	85.20	10.00	37.70	7.20	1.30	6.00	0.90
3	Range 24	67 - 77	117	29.00	62.20	7.50	30.60	6.70	1.65	6.20	1.00
3	Range 24	95 - 100	116	32.20	64.70	8.07	30.60	6.20	1.39	5.30	0.80
3	Range 24	128 - 134	115	33.60	66.10	8.20	30.90	6.50	1.48	5.60	0.90
4	Range 25	18-22	179	24.50	42.30	4.80	16.90	2.80	0.80	2.20	0.40
5	Range 25	7 - 12	114	23.90	44.80	5.48	20.20	3.70	0.90	3.00	0.40
5	Range 25	24 - 30	113	20.70	37.80	4.67	17.00	3.10	0.82	2.50	0.40
5	Range 25	46 - 50	112	19.50	37.40	4.68	17.40	3.40	0.87	2.90	0.40
9	Range 26	24 - 28	111								
9	Range 26	45 - 48	110								
10	Range 27	6 - 9	109	11.40	22.40	2.61	10.00	2.00	0.65	1.80	0.30
10	Range 27	13 - 17	108								

10	Range 27	31 - 34	107								
10	Range 27	47 - 50	106								
10	Range 27	55 - 58	105								
10	Range 27	70-74	177								
10	Range 27	73 - 76	104								
10	Range 27	83 - 86	103								
10	Range 27	99 - 102	102								
10	Range 27	106 - 109	101								
11	Range 27	0 - 3	100	19.60	38.10	4.15	15.20	3.00	0.80	2.60	0.40
12	Range 27	4 - 7	99	14.30	28.00	3.29	12.20	2.50	0.71	2.10	0.30
12	Range 27	19 - 22	98								
12	Range 27	22 - 26	97								
12	Range 27	32 - 35	96								
13	Range 28	0 - 4	95	15.90	30.90	3.43	12.90	2.70	0.80	2.40	0.40
14	Range 28	7 - 17	94	18.80	33.80	4.25	15.30	2.70	0.72	2.10	0.30

15	Range 28	7 - 15	93	17.60	30.80	3.84	13.80	2.60	0.71	1.90	0.30	
15	Range 28	27 - 37	92	21.10	37.10	4.45	15.90	2.80	0.81	2.10	0.30	
16	Range 29	0 - 3	91									
17	Range 29	0 - 3	90	31.20	57.40	7.41	27.90	5.20	1.22	4.50	0.70	
18	Range 29	0 - 3	89	21.60	42.40	4.69	17.20	3.30	0.94	2.80	0.50	
32	Range 5	40 - 50	183									
31	Range 5	87 - 98	184									
62	Range 15	100 - 107	187	33.10	54.40	7.07	25.30	4.30	0.99	3.40	0.50	
71 (duplicate)	Range 17	48 - 52	186	39.50	77.50	8.97	33.80	6.80	1.51	5.90	1.00	
81 (duplicate)	Range 21	0 - 3	188	32.00	61.00	6.51	23.60	4.30	0.91	3.60	0.60	
18 (duplicate)	Range 29	0 - 3	185	23.10	42.70	4.99	18.90	3.50	0.93	3.10	0.50	
Data in blue: Original												
0-5 cm depth												
				Average	29.63	56.60	6.42	23.82	4.55	1.02	3.85	0.62
				Std deviation	10.80	20.82	2.21	7.97	1.50	0.20	1.21	0.19
				CV%	36.44	36.78	34.48	33.45	33.05	19.49	31.45	31.04

5-10 cm depth								
Average	25.24	48.87	5.76	21.86	4.44	1.04	3.91	0.63
Std deviation	11.67	22.81	2.60	9.93	2.12	0.37	1.93	0.33
CV%	46.25	46.67	45.18	45.42	47.73	35.57	49.35	52.54
10-20 cm depth								
Average	28.18	53.76	6.54	24.91	5.04	1.15	4.35	0.68
Std deviation	9.86	19.04	2.35	9.17	2.07	0.38	1.95	0.31
CV%	34.98	35.41	35.92	36.82	41.06	32.65	44.90	46.12
20-30 cm depth								
Mean	35.92	67.68	8.24	31.28	6.42	1.36	5.58	0.88
Std deviation	11.43	21.83	2.73	10.74	2.37	0.38	2.21	0.34
CV%	31.83	32.26	33.14	34.32	36.88	28.01	39.57	38.83
30-40 cm depth								
Average	34.20	66.82	7.87	29.82	5.90	1.26	5.00	0.77
Std deviation	8.88	18.70	2.11	8.40	1.89	0.32	1.83	0.29
CV%	25.95	27.98	26.77	28.17	32.09	25.74	36.53	38.40
40-50 cm depth								
Average	30.60	58.80	7.18	27.45	5.58	1.31	4.95	0.78
Std deviation	7.56	14.30	1.86	7.46	1.72	0.39	1.80	0.30
CV%	24.70	24.31	25.92	27.17	30.72	29.71	36.31	38.23
50-60 cm depth								
Average	23.70	45.70	5.37	20.13	3.97	0.99	3.50	0.57
Std deviation	6.32	12.52	1.09	3.83	0.76	0.13	0.56	0.12

CV%	26.68	27.39	20.39	19.01	19.25	12.75	15.91	20.38
60-70 cm depth								
Mean	52.80	92.87	10.46	38.27	7.40	1.88	6.80	1.10
Std deviation	52.22	83.36	8.88	30.53	5.80	1.52	5.63	0.95
CV%	98.90	89.76	84.83	79.78	78.44	80.63	82.79	86.72
70-80 cm depth								
Average	47.34	84.84	9.61	35.92	7.16	1.84	6.56	1.08
Std deviation	51.04	81.12	8.12	27.62	5.08	1.44	5.06	0.84
CV%	107.82	95.62	84.50	76.90	70.90	78.31	77.13	77.85
80-90 cm depth								
Average	29.80	61.90	7.73	31.20	6.70	1.56	6.20	1.00
Std deviation	-	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-	-
90-100 cm depth								
Mean	26.73	54.00	6.68	26.07	5.43	1.29	4.80	0.77
Std deviation	7.96	18.27	2.25	9.00	1.97	0.44	1.80	0.25
CV%	29.78	33.84	33.73	34.53	36.18	34.25	37.56	32.83
100-110 cm depth								
Average	27.60	48.30	6.08	22.25	4.10	0.97	3.30	0.50
Std deviation	7.78	8.63	1.40	4.31	0.28	0.04	0.14	0.00
CV%	28.18	17.86	23.03	19.39	6.90	3.66	4.29	0.00
110-120 cm								

depth								
Average	22.75	45.95	5.45	21.30	4.50	1.15	4.05	0.65
Std deviation	1.20	4.03	0.78	3.25	0.71	0.16	0.64	0.07
CV%	5.28	8.77	14.41	15.27	15.71	14.20	15.71	10.88
120-130 cm								
depth								
Average	-	-	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-	-
130-140 cm								
depth								
Average	33.60	66.10	8.20	30.90	6.50	1.48	5.60	0.90
Std deviation	-	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-	-
140-150 cm								
depth								
Average	-	-	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-	-
150-170 cm								
depth								
Average	-	-	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-	-	-
CV%	-	-	-	-	-	-	-	-
170-200 cm								

depth		35.50	69.40	8.58	34.00	7.00	1.55	6.10	1.00
Average		-	-	-	-	-	-	-	-
Std deviation		-	-	-	-	-	-	-	-
CV%		-	-	-	-	-	-	-	-
200-250 cm									
depth		-	-	-	-	-	-	-	-
Average		-	-	-	-	-	-	-	-
Std deviation		-	-	-	-	-	-	-	-
CV%		-	-	-	-	-	-	-	-

Core Sample

No		Depth (cm)	Sample ID	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm
19	Range 1	7 - 17	42	6.10	1.10	3.40	0.47	3.30	0.56
19	Range 1	72 - 82	41	14.50	2.70	7.60	1.06	6.40	1.02
19	Range 1	177 - 187	40	5.40	1.10	3.10	0.46	3.00	0.52
20	Range 1	15 - 55	39	6.10	1.20	3.40	0.51	3.40	0.54
20	Range 1	162 - 175	38						
20	Range 1	234 - 250	37						
21	Range 1	17 - 21	36	5.20	1.00	2.90	0.45	3.00	0.47
22	Range 2	7 - 27	35	6.30	1.20	3.50	0.51	3.50	0.57
22	Range 2	99 - 119	33						
22	Range 2	165 - 171.5	34						
23	Range 2	7 - 11	175	6.00	1.10	3.30	0.49	3.30	0.54
23	Range 2	57 - 77	32						
23	Range 2	138 - 158	31						
25	Rang 3	27 - 34	27	5.60	1.20	3.20	0.48	3.30	0.51
26	Rang 3	7 - 20	30	5.80	1.10	3.30	0.50	3.30	0.54
26	Rang 3	67 - 77	29						
26	Rang 3	127 - 137	28						
27	Rang 3	7 - 27	26	6.40	1.30	3.60	0.54	3.40	0.56
27	Rang 3	97 - 117	25						

27	Rang 3	157 - 177	24						
27	Rang 3	247 - 264	23						
28	Range 4	20 - 35	22	6.10	1.20	3.30	0.49	3.30	0.57
28	Range 4	60 - 75	21	12.40	2.40	6.60	0.93	5.80	0.91
28	Range 4	75 - 85	20	5.60	1.10	3.10	0.47	3.00	0.52
29	Range 4	15 - 30	19	5.80	1.20	3.20	0.51	3.30	0.52
29	Range 4	50 - 60	18						
31	Range 5	18 - 28	14	6.20	1.20	3.40	0.53	3.40	0.54
31	Range 5	87 - 98	15						
31	Range 5	143 - 154	16						
32	Range 5	16 - 30	17	6.60	1.30	3.60	0.52	3.60	0.59
32	Range 5	40 - 50	9						
34	Range 6	13 - 23	10	6.00	1.20	3.40	0.52	3.40	0.53
34	Range 6	71 - 81	11						
34	Range 6	127 - 137	1						
34	Range 6	149 - 159	12						
34	Range 6	178 - 188	13						
35-B	Range 6	0 - 2	174	5.10	1.00	2.90	0.44	2.90	0.47
36	Range 6	0 - 3	173	4.60	0.90	2.60	0.39	2.60	0.42
37	Range 7	0 - 4	172	5.50	1.10	3.10	0.48	3.10	0.51
37-B	Range 7	6 - 10	8						

38-A	Range 7	10-15	7	5.40	1.10	3.00	0.46	3.00	0.51
38-A	Range 7	38 - 41	6						
38-A	Range 7	45 - 50	5	7.10	1.40	4.10	0.62	4.10	0.69
38	Range 7	2 - 5	171						
38	Range 7	18 - 20	170						
38	Range 7	66 - 69	169						
38	Range 7	165 - 168	168						
39	Range 7	6 - 9	181	4.80	0.90	2.60	0.42	2.70	0.43
39	Range 7	5 - 10	4						
39	Range 7	21 - 26	3						
39	Range 7	26 - 32	166						
39	Range 7	41 - 47	2						
39	Range 7	93 - 97	164						
39	Range 7	142 - 150	163						
40	Range 8	55-64	178	3.70	0.70	2.10	0.31	2.00	0.31
40	Range 8	105 - 113	162						
40	Range 8	128 - 132	161						
40	Range 8	146 - 150	160						
43	Range 9	8 - 12	159	4.90	1.00	2.70	0.42	2.70	0.44
43	Range 9	21 - 26	158						
43	Range 9	45 - 51	157						
46	Range 10	40 - 47	156	3.20	0.60	1.80	0.27	1.80	0.29

46	Range 10	103 - 108	182						
47	Range 10	0 - 2	155	4.10	0.80	2.40	0.36	2.20	0.37
47	Range 10	57 - 65	154						
47	Range 10	115 - 120	153						
49	Range 11	7 - 14	152	3.80	0.70	2.10	0.32	2.00	0.34
49	Range 11	35 - 45	151						
49	Range 11	91 - 96	150						
49	Range 11	103 - 113	149						
50	Range 11	25 - 35	148	2.80	0.50	1.50	0.23	1.60	0.25
50	Range 11	67 - 77	147						
52	Range 11	7 - 17	146	6.30	1.20	3.60	0.53	3.60	0.62
52	Range 11	96 - 106	145						
54	Range 12	7 - 17	144	2.50	0.50	1.50	0.22	1.40	0.25
54	Range 12	108 - 114	143	3.40	0.60	2.00	0.30	1.90	0.32

60	Range 14	11 - 20	142	2.40	0.50	1.30	0.20	1.40	0.23
60	Range 14	55 - 70	167	3.30	0.60	1.90	0.29	1.90	0.34
62	Range 15	76-81	176	2.60	0.50	1.40	0.21	1.40	0.23
62	Range 15	100 - 107	165	2.90	0.60	1.60	0.25	1.70	0.28
63	Range 15	15 - 25	141	2.30	0.50	1.40	0.20	1.30	0.23
65	Range 16	50 - 57	140	2.60	0.50	1.50	0.22	1.50	0.26
65	Range 16	71 - 78	139	2.60	0.50	1.50	0.23	1.50	0.26
65	Range 16	91 - 96	138	2.70	0.50	1.50	0.23	1.60	0.25
66	Range 16	15 - 25	137	2.50	0.50	1.50	0.22	1.50	0.24
70	Range 17	9 - 18	136	2.50	0.50	1.40	0.22	1.50	0.23
70	Range 17	30 - 35	135	3.70	0.70	2.10	0.31	2.00	0.33
70	Range 17	43 - 47	134	3.50	0.70	1.80	0.28	1.90	0.32
70	Range 17	54 - 62	133	3.00	0.60	1.60	0.26	1.60	0.28
71	Range 17	7 - 17	132	3.00	0.50	1.60	0.23	1.60	0.26

71	Range 17	48 - 52	131	5.10	1.00	3.00	0.44	2.90	0.50
71	Range 17	95 - 105	130	6.00	1.20	3.40	0.51	3.50	0.60
71-A	Range 17	18 - 22	129	4.00	0.80	2.20	0.34	2.20	0.37
71-A	Range 17	36 - 38	128	3.70	0.70	2.00	0.30	1.90	0.33
73	Range 18	0 - 2	127	2.40	0.40	1.40	0.20	1.40	0.22
81	Range 21	0 - 3	126	3.50	0.70	2.00	0.32	2.10	0.37
87	Range 23	0 - 19	125	2.60	0.50	1.60	0.23	1.50	0.27
88	Range 23	0 - 3	124	3.30	0.60	2.00	0.29	2.00	0.34
89	Range 23	0 - 3	123	2.90	0.60	1.80	0.27	1.80	0.31
1	Range 24	14 - 20	122	2.50	0.50	1.40	0.21	1.40	0.26
2	Range 24	67 - 71	121	3.10	0.60	1.70	0.26	1.80	0.28
2	Range 24	87-91	180	5.80	1.10	3.20	0.50	3.30	0.55
2	Range 24	112 - 117	120	4.10	0.80	2.20	0.33	2.10	0.38

3	Range 24	7 - 17	119	3.50	0.70	2.00	0.30	2.00	0.33
3	Range 24	33 - 43	118	5.20	1.00	2.90	0.44	2.90	0.49
3	Range 24	67 - 77	117	5.90	1.20	3.40	0.50	3.40	0.58
3	Range 24	95 - 100	116	4.70	0.90	2.60	0.39	2.60	0.43
3	Range 24	128 - 134	115	5.10	1.00	2.90	0.41	2.80	0.45
4	Range 25	18-22	179	2.00	0.40	1.10	0.16	1.10	0.17
5	Range 25	7 - 12	114	2.50	0.50	1.50	0.21	1.40	0.23
5	Range 25	24 - 30	113	2.20	0.40	1.20	0.18	1.20	0.19
5	Range 25	46 - 50	112	2.50	0.50	1.40	0.21	1.40	0.22
9	Range 26	24 - 28	111						
9	Range 26	45 - 48	110						
10	Range 27	6 - 9	109	1.60	0.30	1.00	0.15	1.00	0.16
10	Range 27	13 - 17	108						
10	Range 27	31 - 34	107						

10	Range 27	47 - 50	106						
10	Range 27	55 - 58	105						
10	Range 27	70-74	177						
10	Range 27	73 - 76	104						
10	Range 27	83 - 86	103						
10	Range 27	99 - 102	102						
10	Range 27	106 - 109	101						
11	Range 27	0 - 3	100	2.40	0.50	1.40	0.21	1.40	0.24
12	Range 27	4 - 7	99	1.80	0.40	1.00	0.14	1.00	0.16
12	Range 27	19 - 22	98						
12	Range 27	22 - 26	97						
12	Range 27	32 - 35	96						
13	Range 28	0 - 4	95	2.10	0.40	1.20	0.18	1.20	0.18
14	Range 28	7 - 17	94	1.90	0.40	1.10	0.16	1.10	0.18
15	Range	7 - 15	93	1.70	0.30	1.00	0.14	0.90	0.15

		28							
15	Range 28	27 - 37	92	1.90	0.40	1.10	0.15	1.10	0.17
16	Range 29	0 - 3	91						
17	Range 29	0 - 3	90	4.10	0.80	2.40	0.35	2.30	0.37
18	Range 29	0 - 3	89	2.80	0.60	1.70	0.24	1.60	0.25
32	Range 5	40 - 50	183						
31	Range 5	87 - 98	184						
62	Range 15	100 - 107	187	3.00	0.60	1.70	0.25	1.70	0.27
71 (duplicate)	Range 17	48 - 52	186	5.30	1.10	3.00	0.47	3.10	0.48
81 (duplicate)	Range 21	0 - 3	188	3.50	0.70	2.10	0.34	2.20	0.35
18 (duplicate)	Range 29	0 - 3	185	2.80	0.50	1.50	0.23	1.50	0.24
Data in blue:	Original								

0-5 cm depth

Average	3.51	0.69	2.04	0.31	2.02	0.33
Std deviation	1.05	0.21	0.58	0.09	0.58	0.10
CV%	29.85	31.26	28.68	29.88	28.66	29.35

5-10 cm depth

Average	3.46	0.67	1.96	0.29	1.94	0.32
Std deviation	1.74	0.32	0.91	0.14	0.94	0.15
CV%	50.37	47.66	46.35	49.20	48.18	47.38
10-20 cm depth						
Average	3.91	0.76	2.20	0.33	2.19	0.36
Std deviation	1.74	0.33	0.97	0.15	0.96	0.16
CV%	44.55	43.82	43.99	44.20	43.99	43.63
20-30 cm depth						
Mean	4.95	0.97	2.70	0.41	2.73	0.44
Std deviation	1.92	0.40	1.06	0.16	1.05	0.18
CV%	38.88	41.72	39.20	39.05	38.28	39.63
30-40 cm depth						
Average	4.37	0.87	2.45	0.37	2.43	0.40
Std deviation	1.56	0.32	0.87	0.14	0.91	0.14
CV%	35.76	36.97	35.65	37.44	37.46	36.22
40-50 cm depth						
Average	4.45	0.88	2.52	0.38	2.53	0.42
Std deviation	1.70	0.34	1.02	0.16	1.01	0.17
CV%	38.18	38.83	40.71	40.64	40.00	41.53
50-60 cm depth						
Average	3.10	0.60	1.73	0.26	1.70	0.28
Std deviation	0.56	0.10	0.32	0.05	0.26	0.03
CV%	17.96	16.67	18.55	17.12	15.56	8.88

60-70 cm depth

Mean	6.27	1.20	3.40	0.49	3.17	0.51
Std deviation	5.31	1.04	2.77	0.38	2.28	0.35
CV%	84.77	86.60	81.56	76.72	72.03	68.18

70-80 cm depth

Average	6.24	1.20	3.40	0.49	3.14	0.52
Std deviation	4.88	0.90	2.52	0.34	2.03	0.32
CV%	78.20	75.00	74.03	69.49	64.55	60.98

80-90 cm depth

Average	5.80	1.10	3.20	0.50	3.30	0.55
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-

**90-100 cm
depth**

Mean	4.47	0.87	2.50	0.38	2.57	0.43
Std deviation	1.66	0.35	0.95	0.14	0.95	0.18
CV%	37.22	40.52	38.16	37.29	37.03	41.02

**100-110 cm
depth**

Average	2.95	0.60	1.65	0.25	1.70	0.28
Std deviation	0.07	0.00	0.07	0.00	0.00	0.01
CV%	2.40	0.00	4.29	0.00	0.00	2.57

**110-120 cm
depth**

Average	3.75	0.70	2.10	0.32	2.00	0.35
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Std deviation	0.49	0.14	0.14	0.02	0.14	0.04
CV%	13.20	20.20	6.73	6.73	7.07	12.12
120-130 cm depth						
Average						
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
130-140 cm depth						
Average	5.10	1.00	2.90	0.41	2.80	0.45
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
140-150 cm depth						
Average	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
150-170 cm depth						
Average	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
170-200 cm depth						
Average	5.40	1.10	3.10	0.46	3.00	0.52

Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-
200-250 cm depth						
Average	-	-	-	-	-	-
Std deviation	-	-	-	-	-	-
CV%	-	-	-	-	-	-

Core Sample No		Depth (cm)	Sample ID	Hf	Ta	W	Th	U
				ppm	ppm	ppm	ppm	ppm
19	Range 1	7 - 17	42	3.60	1.20	125.0	9.60	7.30
19	Range 1	72 - 82	41	4.40	1.00	216.0	34.50	4.80
19	Range 1	177 - 187	40	4.10	1.10	99.00	9.40	4.40
20	Range 1	15 - 55	39	4.50	1.30	262.0	11.90	9.00
20	Range 1	162 - 175	38			0		
20	Range 1	234 - 250	37					
21	Range 1	17 - 21	36	4.80	1.10	347.0	9.60	4.70
22	Range 2	7 - 27	35	4.90	1.30	85.00	12.00	8.00
22	Range 2	99 - 119	33					
22	Range 2	165 - 171.5	34					
23	Range 2	7 - 11	175	5.10	1.20	321.0	11.00	6.80
23	Range 2	57 - 77	32			0		
23	Range	138 - 158	31					

2

25	Rang 3	27 - 34	27	5.10	1.20	185.0	10.00	5.70
26	Rang 3	7 - 20	30	5.10	1.40	224.0	11.40	6.40
26	Rang 3	67 - 77	29			0		
26	Rang 3	127 - 137	28					
27	Rang 3	7 - 27	26	4.70	1.30	153.0	11.80	12.20
27	Rang 3	97 - 117	25			0		
27	Rang 3	157 - 177	24					
27	Rang 3	247 - 264	23					
28	Range 4	20 - 35	22	3.90	1.20	341.0	9.80	9.70
28	Range 4	60 - 75	21	3.80	1.00	362.0	29.20	7.80
28	Range 4	75 - 85	20	4.10	1.00	457.0	8.40	4.90
29	Range 4	15 - 30	19	5.40	1.30	240.0	11.20	9.20
29	Range 4	50 - 60	18			0		

31	Range 5	18 - 28	14	4.90	1.40	227.0 0	12.90	12.40
31	Range 5	87 - 98	15					
31	Range 5	143 - 154	16					
32	Range 5	16 - 30	17	5.00	1.20	77.00	10.80	12.60
32	Range 5	40 - 50	9					
34	Range 6	13 - 23	10	4.70	1.10	233.0 0	8.80	9.10
34	Range 6	71 - 81	11					
34	Range 6	127 - 137	1					
34	Range 6	149 - 159	12					
34	Range 6	178 - 188	13					
35-B	Range 6	0 - 2	174	6.30	1.20	524.0 0	12.00	3.90
36	Range 6	0 - 3	173	6.00	1.20	570.0 0	11.10	3.50
37	Range 7	0 - 4	172	8.10	1.40	730.0 0	15.30	3.60
37-B	Range 7	6 - 10	8					

38-A	Range 7	10-15	7	5.00	1.20	371.0 0	9.40	9.20
38-A	Range 7	38 - 41	6					
38-A	Range 7	45 - 50	5	5.30	0.90	200.0 0	8.30	7.70
38	Range 7	2 - 5	171					
38	Range 7	18 - 20	170					
38	Range 7	66 - 69	169					
38	Range 7	165 - 168	168					
39	Range 7	6 - 9	181	5.10	1.20	614.0 0	9.90	5.40
39	Range 7	5 - 10	4					
39	Range 7	21 - 26	3					
39	Range 7	26 - 32	166					
39	Range 7	41 - 47	2					
39	Range 7	93 - 97	164					
39	Range 7	142 - 150	163					
40	Range	55-64	178	4.60	1.00	1120.	8.30	2.10

		8					00	
40	Range	105 - 113	162					
		8						
40	Range	128 - 132	161					
		8						
40	Range	146 - 150	160					
		8						
43	Range	8 - 12	159	3.80	0.80	401.0	8.00	6.20
		9				0		
43	Range	21 - 26	158					
		9						
43	Range	45 - 51	157					
		9						
46	Range	40 - 47	156	4.00	1.00	791.0	7.80	2.10
		10				0		
46	Range	103 - 108	182					
		10						
47	Range	0 - 2	155	4.40	1.10	831.0	11.00	5.20
		10				0		
47	Range	57 - 65	154					
		10						
47	Range	115 - 120	153					
		10						
49	Range	7 - 14	152	4.00	1.00	942.0	7.30	1.80
		11				0		
49	Range	35 - 45	151					
		11						
49	Range	91 - 96	150					
		11						

49	Range 11	103 - 113	149						
50	Range 11	25 - 35	148	3.10	0.80	985.0	6.50	1.80	0
50	Range 11	67 - 77	147						
52	Range 11	7 - 17	146	4.80	0.90	172.0	7.90	2.80	0
52	Range 11	96 - 106	145						
54	Range 12	7 - 17	144	2.60	0.70	1000.	5.10	1.40	00
54	Range 12	108 - 114	143	3.50	0.80	787.0	5.50	1.70	0
60	Range 14	11 - 20	142	2.80	0.70	836.0	5.20	1.50	0
60	Range 14	55 - 70	167	3.60	0.90	1030.	6.90	1.60	00
62	Range 15	76-81	176	2.80	0.80	1140.	5.30	1.40	00
62	Range 15	100 - 107	165	3.40	0.90	1150.	6.10	1.60	00
63	Range 15	15 - 25	141	2.40	0.60	937.0	4.90	1.40	0
65	Range 16	50 - 57	140	3.10	0.80	798.0	5.80	1.50	0
65	Range	71 - 78	139	3.10	0.80	496.0	5.40	1.50	

		16				0		
65	Range	91 - 96	138	2.80	0.70	1010.	5.20	1.40
		16				00		
66	Range	15 - 25	137	2.70	0.60	1070.	5.10	1.40
		16				00		
70	Range	9 - 18	136	2.80	0.50	999.0	4.50	1.30
		17				0		
70	Range	30 - 35	135	3.90	0.60	931.0	8.70	1.60
		17				0		
70	Range	43 - 47	134	3.90	0.60	1080.	6.50	1.60
		17				00		
70	Range	54 - 62	133	3.10	0.50	1190.	5.20	1.50
		17				00		
71	Range	7 - 17	132	3.40	0.60	1270.	5.80	1.40
		17				00		
71	Range	48 - 52	131	5.50	1.00	484.0	8.10	2.80
		17				0		
71	Range	95 - 105	130	5.90	1.00	152.0	7.60	3.20
		17				0		
71-A	Range	18 - 22	129	4.20	0.70	1350.	8.60	1.90
		17				00		
71-A	Range	36 - 38	128	3.80	0.60	1240.	7.50	1.70
		17				00		
73	Range	0 - 2	127	2.50	0.70	1670.	5.00	1.30
		18				00		
81	Range	0 - 3	126	4.90	1.00	965.0	9.00	2.10
		21				0		

87	Range 23	0 - 19	125	2.80	0.70	918.0	5.00	1.40
88	Range 23	0 - 3	124	4.20	1.00	811.0	8.10	1.90
89	Range 23	0 - 3	123	3.40	0.90	1350.00	7.10	1.70
1	Range 24	14 - 20	122	3.00	0.50	941.0	4.60	1.20
2	Range 24	67 - 71	121	3.40	0.60	762.0	4.70	1.20
2	Range 24	87-91	180	5.30	0.90	276.0	7.40	3.30
2	Range 24	112 - 117	120	4.10	0.60	698.0	6.00	1.50
3	Range 24	7 - 17	119	3.40	0.60	1430.00	7.50	1.60
3	Range 24	33 - 43	118	4.80	0.80	1080.00	11.70	2.10
3	Range 24	67 - 77	117	5.20	1.00	94.00	7.20	2.80
3	Range 24	95 - 100	116	5.30	0.70	836.0	8.10	1.80
3	Range 24	128 - 134	115	5.40	0.70	442.0	7.60	2.00
4	Range 25	18-22	179	2.70	0.30	958.0	4.00	1.00
5	Range 25	7 - 12	114	3.10	0.40	1360.00	6.10	1.20

5	Range 25	24 - 30	113	2.80	0.30	1330. 00	4.80	1.00
5	Range 25	46 - 50	112	3.10	0.40	1100. 00	4.90	1.20
9	Range 26	24 - 28	111					
9	Range 26	45 - 48	110					
10	Range 27	6 - 9	109	2.30	0.20	2320. 00	3.20	1.00
10	Range 27	13 - 17	108					
10	Range 27	31 - 34	107					
10	Range 27	47 - 50	106					
10	Range 27	55 - 58	105					
10	Range 27	70-74	177					
10	Range 27	73 - 76	104					
10	Range 27	83 - 86	103					
10	Range 27	99 - 102	102					
10	Range 27	106 - 109	101					
11	Range 27	0 - 3	100	2.80	0.40	1890. 00	4.60	1.20

12	Range 27	4 - 7	99	2.30	0.30	1690. 00	4.10	1.10
12	Range 27	19 - 22	98					
12	Range 27	22 - 26	97					
12	Range 27	32 - 35	96					
13	Range 28	0 - 4	95	3.10	0.40	1620. 00	3.90	1.30
14	Range 28	7 - 17	94	2.60	0.20	1610. 00	4.20	0.90
15	Range 28	7 - 15	93	2.30	0.20	1400. 00	3.80	0.80
15	Range 28	27 - 37	92	2.60	0.30	1840. 00	4.60	1.00
16	Range 29	0 - 3	91					
17	Range 29	0 - 3	90	4.30	0.60	836.0 0	7.20	3.00
18	Range 29	0 - 3	89	2.80	0.40	1550. 00	5.40	1.30
32	Range 5	40 - 50	183					
31	Range 5	87 - 98	184					
62	Range	100 - 107	187	3.40	0.80	1170. 00	8.00	1.60

		15		00					
71 (duplicate)	Range	48 - 52	186	5.80	1.00	601.0	9.40	3.30	
		17				0			
81 (duplicate)	Range	0 - 3	188	5.60	1.50	1310.	9.90	2.70	
		21				00			
18 (duplicate)	Range	0 - 3	185	3.00	0.40	1500.	5.40	1.50	
		29				00			
Data in blue:	Origi nal								
0-5 cm depth									
Average			4.39	0.87	1154.	8.21	2.44		
					07				
Std deviation			1.64	0.39	450.7	3.33	1.24		
					2				
CV%			37.40	44.66	39.05	40.55	50.61		
5-10 cm depth									
Average			3.50	0.69	1089.	6.76	3.30		
					14				
Std deviation			1.21	0.41	738.0	2.96	2.68		
					2				
CV%			34.48	59.79	67.76	43.84	81.33		
10-20 cm depth									
Average			3.64	0.80	783.4	7.20	3.68		
					8				
Std deviation			1.00	0.37	499.5	2.72	3.50		
					3				
CV%			27.55	46.62	63.76	37.84	95.09		

20-30 cm depth					
Mean	4.18	1.03	533.3	9.33	7.78
			3		
Std deviation	1.08	0.41	502.7	3.07	5.14
			5		
CV%	25.81	39.98	94.27	32.90	66.02
30-40 cm depth					
Average	4.12	0.80	923.0	9.07	3.52
			0		
Std deviation	0.90	0.38	624.1	2.77	3.17
			2		
CV%	21.80	48.09	67.62	30.55	90.06
40-50 cm depth					
Average	4.60	0.82	709.3	7.50	3.12
			3		
Std deviation	1.08	0.26	351.7	1.58	2.37
			4		
CV%	23.49	31.38	49.59	21.05	76.13
50-60 cm depth					
Average	3.60	0.77	1036.	6.43	1.70
			00		
Std deviation	0.87	0.25	209.0	1.64	0.35
			6		
CV%	24.06	32.83	20.18	25.56	20.38
60-70 cm depth					
Mean	3.60	0.83	718.0	13.60	3.53
			0		
Std	0.20	0.21	336.1	13.55	3.70

deviation					
CV%					
	5.56	24.98	46.82	99.67	104.7
				3	
70-80 cm depth					
Average	3.92	0.92	480.6	12.16	3.08
			0		
Std	0.98	0.11	404.6	12.56	1.71
deviation			8		
CV%	24.96	11.91	84.20	103.2	55.45
			5		
80-90 cm depth					
Average	5.30	0.90	276.0	7.40	3.30
			0		
Std	-	-	-	-	-
deviation					
CV%	-	-	-	-	-
90-100 cm depth					
Mean	4.67	0.80	666.0	6.97	2.13
			0		
Std	1.64	0.17	453.5	1.55	0.95
deviation			6		
CV%	35.23	21.65	68.10	22.25	44.30
100-110 cm depth					
Average	3.40	0.85	1160.	7.05	1.60
			00		
Std	0.00	0.07	14.14	1.34	0.00
deviation					
CV%	0.00	8.32	1.22	19.06	0.00

110-120 cm depth					
Average	3.80	0.70	742.5	5.75	1.60
			0		
Std deviation	0.42	0.14	62.93	0.35	0.14
CV%	11.16	20.20	8.48	6.15	8.84
120-130 cm depth					
Average	-	-	-	-	-
Std deviation	-	-	-	-	-
CV%	-	-	-	-	-
130-140 cm depth					
Average	5.40	0.70	442.0	7.60	2.00
			0		
Std deviation	-	-	-	-	-
CV%	-	-	-	-	-
140-150 cm depth					
Average	-	-	-	-	-
Std deviation	-	-	-	-	-
CV%	-	-	-	-	-
150-170 cm depth					
Average	-	-	-	-	-
Std deviation	-	-	-	-	-
CV%	-	-	-	-	-
170-200 cm depth					

Average	4.10	1.10	99.00	9.40	4.40
Std	-	-	-	-	-
deviation					
CV%	-	-	-	-	-

5c Processed Cores 0-10 cm Core Sample Data

Location name			ID	$\delta^{13}\text{C}$	C%	$\delta^5\text{N}$
73	Range 18	0 - 2	127	-21.55	0.05	5.45
81	Range 21	0 - 3	126	-21.87	0.11	4.18
81 (duplicate)	Range 21	0 - 3	188	-26.07	2.08	4.92
87	Range 23	0 - 19	125	-25.74	0.32	5.29
88	Range 23	0 - 3	124	-22.82	0.10	8.57
89	Range 23	0 - 3	123	-23.01	0.14	6.45
		Average		-23.51	0.47	5.81
		Std deviation		1.94	0.80	1.54
		CV%		-8.24	170.12	26.53
5	Range 25	7 - 12	114	-22.99	0.07	1.73
10	Range 27	6 - 9	109	-23.72	0.04	0.81
11	Range 27	0 - 3	100	-23.92	0.10	2.99
12	Range 27	4 - 7	99	-23.56	0.07	2.63
13	Range 28	0 - 4	95	-25.26	0.47	2.75
17	Range 29	0 - 3	90	-23.78	3.20	3.22
18	Range 29	0 - 3	89	-27.67	1.73	2.52
18 (duplicate)	Range 29	0 - 3	185	-24.10	0.30	2.69
		Average		-24.38	0.75	2.42
		Std deviation		1.48	1.14	0.78

		CV%		-6.06	152.70	32.30
23	Range 2	7 - 11	175	-26.56	4.26	3.60
35-B	Range 6	0 - 2	174	-26.47	3.53	6.22
36	Range 6	0 - 3	173	-25.86	1.35	3.48
37	Range 7	0 - 4	172	-25.93	0.85	5.34
39	Range 7	6 - 9	181	-25.99	1.49	4.10
43	Range 9	8 - 12	159	-25.23	7.12	4.92
47	Range 10	0 - 2	155	-25.89	21.11	3.17
Average				-25.90	5.91	4.54
Std deviation				0.40	7.80	1.17
CV%				-1.53	132.01	25.70
total surface samples (n=21)			Average	-24.67	2.31	4.05
Std deviation				1.68	4.68	1.80
CV%				-6.80	202.62	44.35
R^2 (n=21)			$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$			
1			$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	1.00	C%	
2			C%	-0.32	1.00	$\delta^{15}\text{N}_{\text{air}} \times 1000$
3			$\delta^{15}\text{N}_{\text{air}} \times 1000$	0.34	-0.05	1.00
4			N%	-0.50	0.79	-0.17
5			C/N	-0.38	0.84	-0.35
6			Sc46	-0.04	-0.13	0.48
7			La140	-0.22	0.00	0.22

8	SiO ₂	0.33	-0.55	-0.17
9	Al ₂ O ₃	0.17	0.12	0.64
10	Fe ₂ O ₃	-0.31	0.40	0.26
11	MnO	-0.30	0.45	0.38
12	MgO	-0.28	0.32	0.39
13	CaO	-0.20	0.18	0.36
14	Na ₂ O	0.36	-0.31	0.47
15	K ₂ O	0.32	-0.21	0.48
16	TiO ₂	-0.22	0.28	0.36
17	P ₂ O ₅	-0.31	0.47	0.19
18	LO	-0.32	0.56	-0.09
19	Sc	-0.35	0.39	0.29
20	V	-0.27	0.31	0.32
21	Co	0.45	-0.39	-0.22
22	Ga	0.10	0.13	0.54
23	Rb	0.22	0.16	0.65
24	Sr	0.11	-0.31	0.06
25	Y	-0.40	0.40	0.22
26	Zr	-0.26	0.17	0.36
27	Nb	-0.35	0.28	0.42
28	Cs	-0.30	0.51	0.32
29	Ba	0.31	-0.42	0.14
30	La	-0.42	0.34	0.22
31	Ce	-0.43	0.32	0.23
32	Pr	-0.36	0.33	0.25
33	Nd	-0.34	0.34	0.26
34	Sm	-0.37	0.36	0.25
35	Eu	-0.45	0.37	0.13

36	Gd	-0.38	0.37	0.24
37	Tb	-0.44	0.42	0.20
38	Dy	-0.40	0.36	0.22
39	Ho	-0.46	0.37	0.17
40	Er	-0.40	0.38	0.27
41	Tm	-0.39	0.36	0.27
42	Yb	-0.36	0.31	0.32
43	Lu	-0.28	0.31	0.36
44	Hf	-0.37	0.15	0.29
45	Ta	-0.20	0.27	0.51
46	W	0.21	-0.35	-0.35
47	Th	-0.36	0.35	0.33
48	U	-0.43	0.63	0.05

Location name			ID	N%	C/N (molar ratio)	Sc46	La140
73	Range 18	0 - 2	127	0.01	9.98	0.01	0.03
81	Range 21	0 - 3	126	0.01	10.84	0.01	0.03
81 (duplicate)	Range 21	0 - 3	188	0.17	14.12	0.01	0.02
87	Range 23	0 - 19	125	0.02	21.20	0.01	0.02
88	Range 23	0 - 3	124	0.01	8.75	0.02	0.07
89	Range 23	0 - 3	123	0.01	12.30	0.01	ND
				Average	0.04	12.87	0.01
				Std deviation	0.07	4.49	0.00
				CV%	166.58	34.88	25.28
							62.36
5	Range 25	7 - 12	114	0.01	8.86	0.01	0.07
10	Range 27	6 - 9	109	0.01	9.03	0.01	ND
11	Range 27	0 - 3	100	0.01	9.89	0.01	0.01
12	Range 27	4 - 7	99	0.01	8.23	0.01	0.01
13	Range 28	0 - 4	95	0.03	16.30	ND	0.07
17	Range 29	0 - 3	90	0.29	12.85	0.01	0.06
18	Range 29	0 - 3	89	0.15	13.81	0.01	0.02
18 (duplicate)	Range 29	0 - 3	185	0.03	12.79	0.01	0.01
				Average	0.07	11.47	0.01
				Std deviation	0.10	2.88	0.00
				CV%	152.60	25.14	30.68
							82.00
23	Range 2	7 - 11	175	0.28	17.93	0.01	0.06

35-B	Range 6	0 - 2	174	0.35	11.66	0.01	0.05
36	Range 6	0 - 3	173	0.07	22.72	0.01	0.06
37	Range 7	0 - 4	172	0.08	12.98	0.03	0.14
39	Range 7	6 - 9	181	0.10	16.57	0.02	0.05
43	Range 9	8 - 12	159	0.69	12.02	0.01	0.05
47	Range 10	0 - 2	155	0.55	45.10	0.01	0.04
			Average	0.31	20.17	0.02	0.06
			Std deviation	0.27	12.90	0.01	0.04
			CV%	87.15	63.92	47.37	57.80
total surface samples (n=21)		Average	0.14	14.66	0.01	0.04	
		Std deviation	0.19	8.01	0.01	0.03	
		CV%	140.04	54.65	46.58	69.22	

R² (n=21)

1	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$					
2	C%					
3	$\delta^{15}\text{N}_{\text{air}} \times 1000$	N%				
4	N%	1.00	C/N			
5	C/N	0.71	1.00	Sc46		
6	Sc46	-0.12	-0.16	1.00	La140	
7	La140	0.06	0.04	0.73	1.00	
8	SiO ₂	-0.73	-0.51	-0.20	-0.41	
9	Al ₂ O ₃	0.06	0.11	0.44	0.14	
10	Fe ₂ O ₃	0.54	0.33	0.41	0.57	

11	MnO	0.55	0.27	0.34	0.37
12	MgO	0.39	0.35	0.46	0.49
13	CaO	0.09	0.24	0.62	0.41
14	Na ₂ O	-0.49	-0.17	0.32	-0.15
15	K ₂ O	-0.38	-0.01	0.12	-0.19
16	TiO ₂	0.35	0.16	0.58	0.66
17	P ₂ O ₅	0.68	0.35	0.26	0.53
18	LO	0.83	0.49	-0.07	0.28
19	Sc	0.51	0.27	0.50	0.64
20	V	0.39	0.19	0.54	0.65
21	Co	-0.53	-0.32	-0.42	-0.47
22	Ga	0.24	0.09	0.38	0.42
23	Rb	0.12	0.22	0.20	0.19
24	Sr	-0.49	-0.09	0.15	-0.37
25	Y	0.52	0.31	0.52	0.58
26	Zr	0.24	0.11	0.66	0.68
27	Nb	0.35	0.24	0.55	0.56
28	Cs	0.62	0.48	0.20	0.36
29	Ba	-0.64	-0.26	0.02	-0.34
30	La	0.42	0.27	0.62	0.64
31	Ce	0.40	0.24	0.62	0.65
32	Pr	0.43	0.23	0.61	0.65
33	Nd	0.45	0.23	0.58	0.63
34	Sm	0.47	0.26	0.55	0.64
35	Eu	0.54	0.24	0.45	0.61
36	Gd	0.50	0.26	0.51	0.62
37	Tb	0.54	0.34	0.56	0.65
38	Dy	0.49	0.24	0.54	0.62

39	Ho	0.49	0.24	0.52	0.59
40	Er	0.51	0.25	0.54	0.60
41	Tm	0.48	0.24	0.54	0.59
42	Yb	0.43	0.16	0.56	0.60
43	Lu	0.40	0.16	0.57	0.57
44	Hf	0.26	0.10	0.61	0.69
45	Ta	0.28	0.22	0.46	0.40
46	W	-0.46	-0.28	-0.40	-0.56
47	Th	0.41	0.30	0.62	0.60
48	U	0.81	0.70	0.24	0.41

Location name			ID	SiO ₂ %	Al ₂ O ₃ %	Fe ₂ O ₃ %	MnO %	MgO %	CaO %
73	Range 18	0 - 2	127	73.66	12.74	3.15	0.05	1.14	2.67
81	Range 21	0 - 3	126	70.74	12.47	4.13	0.08	1.14	2.63
81 (duplicate)	Range 21	0 - 3	188	70.87	12.34	3.91	0.07	1.11	2.45
87	Range 23	0 - 19	125	73.01	11.20	3.50	0.06	1.14	2.67
88	Range 23	0 - 3	124	71.07	12.64	3.69	0.07	1.19	2.67
89	Range 23	0 - 3	123	69.97	12.82	3.42	0.06	1.15	2.59
		Average		71.55	12.37	3.63	0.07	1.15	2.61
		Std deviation		1.44	0.60	0.35	0.01	0.03	0.09
		CV%		2.02	4.84	9.72	12.39	2.26	3.30
5	Range 25	7 - 12	114	72.18	12.02	3.15	0.05	0.95	2.67
10	Range 27	6 - 9	109	78.11	10.29	2.23	0.03	0.64	2.06
11	Range 27	0 - 3	100	76.66	10.67	2.91	0.05	0.87	2.43
12	Range 27	4 - 7	99	75.99	11.04	2.45	0.04	0.76	2.25
13	Range 28	0 - 4	95	75.10	10.05	2.88	0.04	0.79	2.11
17	Range 29	0 - 3	90	64.47	11.20	4.29	0.06	0.94	2.05
18	Range 29	0 - 3	89	74.05	11.36	2.88	0.05	0.90	2.51
18 (duplicate)	Range 29	0 - 3	185	74.16	11.49	2.92	0.05	0.93	2.54
		Average		73.84	11.02	2.96	0.04	0.85	2.33
		Std deviation		4.19	0.65	0.61	0.01	0.11	0.24
		CV%		5.68	5.91	20.62	20.90	12.86	10.37
23	Range 2	7 - 11	175	56.75	13.10	6.32	0.09	1.88	3.05

35-B	Range 6	0 - 2	174	61.07	12.35	5.48	0.12	1.67	2.86
36	Range 6	0 - 3	173	63.86	12.85	4.95	0.08	1.62	3.00
37	Range 7	0 - 4	172	65.97	12.74	5.23	0.09	1.63	3.23
39	Range 7	6 - 9	181	61.51	13.59	5.88	0.09	2.08	3.40
43	Range 9	8 - 12	159	53.68	11.47	5.57	0.13	1.52	2.69
47	Range 10	0 - 2	155	61.54	12.39	4.73	0.09	1.48	2.84
			Average	61.27	12.57	5.31	0.10	1.67	3.00
			Std deviation	4.16	0.70	0.42	0.02	0.21	0.27
			CV%	6.79	5.56	7.97	21.00	12.89	8.86
total surface samples (n=21)			Average	68.78	11.94	3.98	0.07	1.22	2.64
			Std deviation	6.91	0.97	1.21	0.03	0.39	0.36
			CV%	10.04	8.12	30.30	38.49	32.35	13.53

R² (n=21)

1	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$					
2	C%					
3	$\delta^{15}\text{N}_{\text{air}} \times 1000$					
4	N%					
5	C/N					
6	Sc46					
7	La140	SiO_2				
8	SiO_2	1.00	Al_2O_3			
9	Al_2O_3	-0.49	1.00	$\text{Fe}_2\text{O}_3(\text{T})$		
10	Fe_2O_3	-0.92	0.55	1.00	MnO	

11	MnO	-0.83	0.58	0.92	1.00	MgO	
12	MgO	-0.81	0.74	0.90	0.88	1.00	CaO
13	CaO	-0.48	0.75	0.64	0.67	0.87	1.00
14	Na ₂ O	0.27	0.69	-0.12	-0.02	0.18	0.49
15	K ₂ O	0.21	0.61	-0.09	0.01	0.15	0.33
16	TiO ₂	-0.78	0.57	0.94	0.86	0.83	0.64
17	P ₂ O ₅	-0.95	0.36	0.92	0.83	0.77	0.43
18	LO	-0.86	0.05	0.69	0.58	0.47	0.08
19	Sc	-0.87	0.52	0.95	0.88	0.91	0.70
20	V	-0.79	0.55	0.95	0.89	0.86	0.67
21	Co	0.86	-0.52	-0.90	-0.85	-0.81	-0.61
22	Ga	-0.74	0.79	0.79	0.68	0.73	0.51
23	Rb	-0.54	0.81	0.56	0.54	0.62	0.45
24	Sr	0.52	0.31	-0.43	-0.29	-0.08	0.34
25	Y	-0.89	0.57	0.96	0.87	0.89	0.70
26	Zr	-0.70	0.58	0.90	0.81	0.89	0.69
27	Nb	-0.75	0.65	0.89	0.83	0.86	0.69
28	Cs	-0.95	0.62	0.92	0.88	0.91	0.61
29	Ba	0.66	0.21	-0.49	-0.37	-0.27	0.07
30	La	-0.81	0.53	0.94	0.84	0.86	0.72
31	Ce	-0.79	0.53	0.93	0.84	0.86	0.73
32	Pr	-0.84	0.54	0.95	0.84	0.85	0.68
33	Nd	-0.86	0.55	0.96	0.86	0.86	0.67
34	Sm	-0.88	0.53	0.97	0.88	0.88	0.68
35	Eu	-0.89	0.37	0.91	0.79	0.78	0.54
36	Gd	-0.89	0.50	0.97	0.88	0.88	0.65
37	Tb	-0.88	0.49	0.96	0.87	0.87	0.67
38	Dy	-0.87	0.52	0.97	0.87	0.86	0.66

39	Ho	-0.85	0.47	0.94	0.85	0.82	0.63
40	Er	-0.89	0.55	0.96	0.87	0.85	0.64
41	Tm	-0.86	0.55	0.96	0.88	0.85	0.64
42	Yb	-0.84	0.57	0.96	0.87	0.85	0.65
43	Lu	-0.83	0.61	0.95	0.89	0.85	0.67
44	Hf	-0.69	0.50	0.89	0.80	0.80	0.65
45	Ta	-0.64	0.76	0.78	0.77	0.80	0.65
46	W	0.89	-0.56	-0.92	-0.84	-0.80	-0.54
47	Th	-0.79	0.64	0.93	0.87	0.90	0.77
48	U	-0.93	0.43	0.89	0.81	0.79	0.52

Location name			ID	Na ₂ O	K ₂ O	TiO ₂	P ₂ O ₅	LO	Sc
				%	%	%	%	%	ppm
73	Range 18	0 - 2	127	3.13	2.68	0.49	0.09	1.05	9.00
81	Range 21	0 - 3	126	3.03	2.76	0.76	0.11	1.12	9.00
81 (duplicate)	Range 21	0 - 3	188	2.95	2.88	0.70	0.09	1.07	9.00
87	Range 23	0 - 19	125	2.58	2.38	0.53	0.10	1.51	9.00
88	Range 23	0 - 3	124	3.01	2.76	0.63	0.12	1.54	9.00
89	Range 23	0 - 3	123	2.98	2.77	0.59	0.09	1.70	9.00
		Average		2.95	2.71	0.62	0.10	1.33	9.00
		Std deviation		0.19	0.17	0.10	0.01	0.28	0.00
		CV%		6.44	6.34	16.78	12.65	21.33	0.00
5	Range 25	7 - 12	114	2.80	2.35	0.48	0.09	1.29	8.00
10	Range 27	6 - 9	109	2.42	2.42	0.35	0.07	0.72	6.00
11	Range 27	0 - 3	100	2.47	2.29	0.47	0.07	0.75	8.00
12	Range 27	4 - 7	99	2.66	2.51	0.37	0.05	0.64	6.00
13	Range 28	0 - 4	95	2.14	2.29	0.47	0.08	2.23	8.00
17	Range 29	0 - 3	90	1.85	1.83	0.69	0.19	11.02	10.00
18	Range 29	0 - 3	89	2.66	2.30	0.42	0.08	1.29	8.00
18 (duplicate)	Range 29	0 - 3	185	2.67	2.31	0.43	0.07	1.58	8.00
		Average		2.46	2.29	0.46	0.09	2.44	7.75
		Std deviation		0.32	0.20	0.11	0.04	3.51	1.28
		CV%		13.01	8.76	23.02	49.16	143.73	16.54
23	Range 2	7 - 11	175	2.06	1.97	0.97	0.24	12.22	15.00
35-B	Range 6	0 - 2	174	2.22	2.14	0.88	0.23	10.13	13.00

36	Range 6	0 - 3	173	2.79	2.58	0.77	0.17	5.57	11.00		
37	Range 7	0 - 4	172	2.83	2.41	1.03	0.17	3.43	13.00		
39	Range 7	6 - 9	181	2.68	2.42	0.88	0.19	6.48	13.00		
43	Range 9	8 - 12	159	1.58	1.63	0.77	0.37	20.34	14.00		
47	Range 10	0 - 2	155	2.51	2.48	0.72	0.18	9.51	11.00		
				Average	2.44	2.28	0.84	0.22	9.24	12.50	
				Std deviation	0.47	0.35	0.11	0.08	5.98	1.22	
				CV%	19.48	15.32	13.56	35.53	64.72	9.80	
total surface samples (n=21)					Average	2.57	2.39	0.64	0.14	4.53	9.81
					Std deviation	0.41	0.31	0.20	0.08	5.26	2.52
					CV%	15.89	13.14	31.67	57.53	116.13	25.71

R² (n=21)

1	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$
2	C%
3	$\delta^{15}\text{N}_{\text{air}} \times 1000$
4	N%
5	C/N
6	Sc46
7	La140
8	SiO ₂
9	Al ₂ O ₃
10	Fe ₂ O ₃
11	MnO
12	MgO

13		CaO	Na ₂ O					
14		Na ₂ O	K ₂ O					
15		K ₂ O	0.90	1.00	TiO ₂			
16		TiO ₂	0.02	0.03	1.00	P ₂ O ₅		
17		P ₂ O ₅	-0.40	-0.38	0.78	1.00	LOI	
18		LO	-0.67	-0.60	0.48	0.89	1.00	Sc
19		Sc	-0.14	-0.18	0.90	0.90	0.66	1.00
20		V	-0.01	0.01	0.99	0.80	0.50	0.93
21		Co	0.09	0.10	-0.81	-0.83	-0.63	-0.81
22		Ga	0.23	0.25	0.78	0.70	0.44	0.68
23		Rb	0.46	0.63	0.56	0.41	0.17	0.42
24		Sr	0.82	0.66	-0.33	-0.66	-0.78	-0.37
25		Y	-0.09	-0.14	0.91	0.88	0.65	0.94
26		Zr	0.11	0.11	0.98	0.69	0.35	0.85
27		Nb	0.16	0.22	0.92	0.69	0.39	0.83
28		Cs	-0.08	0.00	0.78	0.89	0.73	0.87
29		Ba	0.83	0.83	-0.32	-0.77	-0.91	-0.54
30		La	-0.02	-0.07	0.95	0.79	0.52	0.92
31		Ce	-0.01	-0.05	0.95	0.78	0.50	0.92
32		Pr	-0.06	-0.11	0.95	0.83	0.57	0.92
33		Nd	-0.08	-0.12	0.95	0.86	0.60	0.93
34		Sm	-0.12	-0.16	0.94	0.88	0.64	0.96
35		Eu	-0.32	-0.40	0.82	0.92	0.76	0.92
36		Gd	-0.17	-0.20	0.92	0.91	0.68	0.96
37		Tb	-0.14	-0.17	0.92	0.88	0.65	0.94
38		Dy	-0.12	-0.17	0.93	0.88	0.64	0.94
39		Ho	-0.14	-0.18	0.93	0.85	0.61	0.92
40		Er	-0.11	-0.14	0.93	0.88	0.64	0.93

41	Tm	-0.07	-0.08	0.96	0.84	0.59	0.92
42	Yb	-0.05	-0.07	0.96	0.84	0.57	0.92
43	Lu	0.01	-0.02	0.96	0.82	0.54	0.90
44	Hf	0.04	0.05	0.96	0.69	0.37	0.85
45	Ta	0.37	0.47	0.84	0.53	0.23	0.70
46	W	0.10	0.06	-0.84	-0.88	-0.67	-0.81
47	Th	0.13	0.12	0.96	0.74	0.44	0.90
48	U	-0.22	-0.13	0.76	0.86	0.78	0.83

Location name			ID	V	Co	Ga	Rb	Sr	Y
				ppm	ppm	ppm	ppm	ppm	ppm
73	Range 18	0 - 2	127	72.00	243.00	15.00	71.00	364.00	14.00
81	Range 21	0 - 3	126	99.00	159.00	16.00	78.00	340.00	19.00
81 (duplicate)	Range 21	0 - 3	188	92.00	143.00	15.00	77.00	357.00	19.00
87	Range 23	0 - 19	125	82.00	149.00	14.00	68.00	307.00	15.00
88	Range 23	0 - 3	124	81.00	129.00	16.00	83.00	338.00	18.00
89	Range 23	0 - 3	123	78.00	202.00	15.00	80.00	363.00	17.00
		Average		84.00	170.83	15.17	76.17	344.83	17.00
		Std deviation		9.82	43.18	0.75	5.64	21.66	2.10
		CV%		11.69	25.27	4.96	7.40	6.28	12.34
5	Range 25	7 - 12	114	68.00	196.00	16.00	65.00	382.00	14.00
10	Range 27	6 - 9	109	54.00	290.00	11.00	55.00	337.00	10.00
11	Range 27	0 - 3	100	66.00	224.00	12.00	53.00	348.00	13.00
12	Range 27	4 - 7	99	56.00	193.00	12.00	56.00	367.00	9.00
13	Range 28	0 - 4	95	70.00	248.00	12.00	59.00	304.00	11.00
17	Range 29	0 - 3	90	88.00	131.00	16.00	65.00	258.00	22.00
18	Range 29	0 - 3	89	64.00	176.00	13.00	54.00	364.00	16.00
18 (duplicate)	Range 29	0 - 3	185	65.00	180.00	12.00	52.00	374.00	16.00
		Average		66.38	204.75	13.00	57.38	341.75	13.88
		Std deviation		10.36	48.70	1.93	5.15	41.91	4.19
		CV%		15.61	23.78	14.82	8.98	12.26	30.20
23	Range 2	7 - 11	175	135.00	59.00	19.00	75.00	268.00	31.00
35-B	Range 6	0 - 2	174	118.00	68.00	16.00	72.00	291.00	28.00

36	Range 6	0 - 3	173	101.00	68.00	17.00	83.00	340.00	26.00	
37	Range 7	0 - 4	172	129.00	91.00	16.00	69.00	347.00	30.00	
39	Range 7	6 - 9	181	115.00	90.00	17.00	79.00	339.00	27.00	
43	Range 9	8 - 12	159	114.00	62.00	14.00	57.00	236.00	28.00	
47	Range 10	0 - 2	155	97.00	109.00	15.00	77.00	330.00	24.00	
				Average	112.33	81.33	15.83	72.83	313.83	27.17
				Std deviation	11.69	18.24	1.17	9.22	43.03	2.04
				CV%	10.41	22.43	7.38	12.66	13.71	7.51
total surface samples (n=21)				Average	87.81	152.86	14.71	68.00	331.14	19.38
				Std deviation	24.00	67.29	2.08	10.63	39.82	6.86
				CV%	27.33	44.02	14.12	15.64	12.02	35.39

 R^2 (n=21)

1	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$
2	C%
3	$\delta^{15}\text{N}_{\text{air}} \times 1000$
4	N%
5	C/N
6	Sc46
7	La140
8	SiO ₂
9	Al ₂ O ₃
10	Fe ₂ O ₃
11	MnO
12	MgO

13		CaO						
14		Na ₂ O						
15		K ₂ O						
16		TiO ₂						
17		P ₂ O ₅						
18		LO						
19	Sc	V						
20	V	1.00	Co					
21	Co	-0.81	1.00	Ga				
22	Ga	0.74	-0.72	1.00	Rb			
23	Rb	0.52	-0.49	0.84	1.00	Sr		
24	Sr	-0.32	0.31	-0.28	-0.04	1.00	Y	
25	Y	0.92	-0.93	0.74	0.45	-0.30	1.00	
26	Zr	0.97	-0.81	0.74	0.54	-0.20	0.89	
27	Nb	0.91	-0.86	0.75	0.65	-0.14	0.88	
28	Cs	0.79	-0.86	0.78	0.67	-0.37	0.87	
29	Ba	-0.33	0.45	-0.22	0.11	0.83	-0.49	
30	La	0.95	-0.90	0.68	0.43	-0.23	0.98	
31	Ce	0.95	-0.89	0.67	0.42	-0.21	0.97	
32	Pr	0.95	-0.91	0.73	0.45	-0.30	0.98	
33	Nd	0.95	-0.92	0.74	0.46	-0.32	0.99	
34	Sm	0.95	-0.92	0.73	0.45	-0.35	0.99	
35	Eu	0.84	-0.89	0.64	0.28	-0.48	0.96	
36	Gd	0.93	-0.93	0.72	0.43	-0.40	0.99	
37	Tb	0.93	-0.93	0.69	0.42	0.43	0.99	
38	Dy	0.94	-0.93	0.73	0.43	-0.36	0.99	
39	Ho	0.93	-0.91	0.69	0.39	-0.34	0.98	
40	Er	0.93	-0.93	0.77	0.48	-0.36	0.99	

41	Tm	0.95	-0.92	0.75	0.49	-0.33	0.98
42	Yb	0.95	-0.92	0.78	0.51	-0.33	0.98
43	Lu	0.95	-0.91	0.80	0.55	-0.30	0.96
44	Hf	0.96	-0.83	0.68	0.47	-0.23	0.89
45	Ta	0.83	-0.71	0.76	0.78	0.00	0.74
46	W	-0.83	0.93	-0.84	-0.64	0.46	-0.89
47	Th	0.96	-0.87	0.72	0.56	-0.14	0.94
48	U	0.78	-0.82	0.60	0.47	-0.39	0.86

Location name			ID	Zr	Nb	Cs	Ba	La	Ce
				ppm	ppm	ppm	ppm	ppm	ppm
73	Range 18	0 - 2	127	107.00	6.00	1.70	894.00	16.80	31.90
81	Range 21	0 - 3	126	225.00	10.00	1.90	911.00	30.10	57.50
81 (duplicate)	Range 21	0 - 3	188	217.00	16.00	2.10	937.00	32.00	61.00
87	Range 23	0 - 19	125	126.00	7.00	1.70	787.00	16.70	31.80
88	Range 23	0 - 3	124	186.00	12.00	2.20	862.00	27.10	51.70
89	Range 23	0 - 3	123	153.00	9.00	2.10	864.00	24.20	46.70
Average				169.00	10.00	1.95	875.83	24.48	46.77
Std deviation				48.33	3.63	0.22	52.02	6.55	12.55
CV%				28.60	36.33	11.12	5.94	26.76	26.83
5	Range 25	7 - 12	114	128.00	6.00	1.30	831.00	23.90	44.80
10	Range 27	6 - 9	109	93.00	4.00	1.00	895.00	11.40	22.40
11	Range 27	0 - 3	100	114.00	5.00	1.00	849.00	19.60	38.10
12	Range 27	4 - 7	99	95.00	4.00	1.10	928.00	14.30	28.00
13	Range 28	0 - 4	95	109.00	5.00	1.10	827.00	15.90	30.90
17	Range 29	0 - 3	90	176.00	9.00	2.30	675.00	31.20	57.40
18	Range 29	0 - 3	89	105.00	5.00	1.20	848.00	21.60	42.40
18 (duplicate)	Range 29	0 - 3	185	110.00	6.00	1.20	865.00	23.10	42.70
Average				116.25	5.50	1.28	839.75	20.13	38.34
Std deviation				26.52	1.60	0.43	74.65	6.28	11.06
CV%				22.81	29.16	33.47	8.89	31.21	28.86
23	Range 2	7 - 11	175	189.00	16.00	4.50	688.00	41.00	79.80

35-B	Range 6	0 - 2	174	254.00	16.00	3.80	719.00	42.50	82.30
36	Range 6	0 - 3	173	242.00	16.00	3.50	819.00	40.50	77.70
37	Range 7	0 - 4	172	346.00	19.00	2.60	822.00	53.70	104.00
39	Range 7	6 - 9	181	211.00	16.00	3.70	787.00	36.20	70.40
43	Range 9	8 - 12	159	166.00	11.00	4.30	571.00	33.20	64.90
47	Range 10	0 - 2	155	191.00	13.00	3.40	777.00	36.50	68.10
			Average	235.00	15.17	3.55	749.17	40.43	77.90
			Std deviation	63.25	2.79	0.56	94.91	7.29	14.30
			CV%	26.92	18.37	15.81	12.67	18.04	18.35
total surface samples (n=21)			Average	168.71	10.05	2.27	816.95	28.17	54.02
			Std deviation	65.35	4.90	1.15	91.31	11.01	21.25
			CV%	38.73	48.81	50.60	11.18	39.08	39.34

R² (n=21)

1	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$
2	C%
3	$\delta^{15}\text{N}_{\text{air}} \times 1000$
4	N%
5	C/N
6	Sc46
7	La140
8	SiO ₂
9	Al ₂ O ₃
10	Fe ₂ O ₃

11		MnO						
12		MgO						
13		CaO						
14		Na ₂ O						
15		K ₂ O						
16		TiO ₂						
17		P ₂ O ₅						
18		LO						
19		Sc						
20		V						
21		Co						
22		Ga						
23		Rb						
24		Sr						
25	Y	Zr						
26	Zr	1.00	Nb					
27	Nb	0.94	1.00	Cs				
28	Cs	0.71	0.81	1.00	Ba			
29	Ba	-0.20	-0.16	-0.49	1.00	La		
30	La	0.95	0.92	0.79	-0.37	1.00	Ce	
31	Ce	0.96	0.92	0.78	-0.35	1.00		1.00
32	Pr	0.95	0.90	0.80	-0.43	0.99		0.99
33	Nd	0.94	0.90	0.83	-0.46	0.98		0.98
34	Sm	0.92	0.89	0.85	-0.50	0.97		0.98
35	Eu	0.79	0.76	0.81	-0.69	0.97		0.90
36	Gd	0.89	0.87	0.87	-0.55	0.96		0.96
37	Tb	0.90	0.88	0.85	-0.51	0.79		0.97
38	Dy	0.92	0.89	0.84	-0.50	-0.84		0.98

39	Ho	0.91	0.87	0.81	-0.49	0.98	0.98
40	Er	0.91	0.90	0.85	-0.50	0.82	0.97
41	Tm	0.94	0.92	0.83	-0.43	0.98	0.98
42	Yb	0.95	0.92	0.83	-0.42	0.97	0.97
43	Lu	0.95	0.92	0.82	-0.38	0.97	0.97
44	Hf	0.99	0.94	0.70	-0.22	0.96	0.96
45	Ta	0.86	0.95	0.74	0.07	0.79	0.79
46	W	-0.81	-0.81	-0.88	0.50	-0.84	-0.83
47	Th	0.96	0.96	0.81	-0.23	0.98	0.98
48	U	0.70	0.77	0.89	-0.53	0.82	0.80

Location name			ID	Pr	Nd	Sm	Eu	Gd	Tb
				ppm	ppm	ppm	ppm	ppm	ppm
73	Range 18	0 - 2	127	3.91	15.20	3.00	0.80	2.60	0.40
81	Range 21	0 - 3	126	6.67	24.70	4.50	0.92	3.70	0.60
81 (duplicate)	Range 21	0 - 3	188	6.51	23.60	4.30	0.91	3.60	0.60
87	Range 23	0 - 19	125	3.95	15.40	3.20	0.79	2.90	0.50
88	Range 23	0 - 3	124	6.11	22.80	4.30	0.95	3.70	0.60
89	Range 23	0 - 3	123	5.50	20.50	3.90	0.92	3.20	0.50
			Average	5.44	20.37	3.87	0.88	3.28	0.53
			Std deviation	1.24	4.16	0.63	0.07	0.46	0.08
			CV%	22.76	20.43	16.25	7.77	14.08	15.31
5	Range 25	7 - 12	114	5.48	20.20	3.70	0.90	3.00	0.40
10	Range 27	6 - 9	109	2.61	10.00	2.00	0.65	1.80	0.30
11	Range 27	0 - 3	100	4.15	15.20	3.00	0.80	2.60	0.40
12	Range 27	4 - 7	99	3.29	12.20	2.50	0.71	2.10	0.30
13	Range 28	0 - 4	95	3.43	12.90	2.70	0.80	2.40	0.40
17	Range 29	0 - 3	90	7.41	27.90	5.20	1.22	4.50	0.70
18	Range 29	0 - 3	89	4.69	17.20	3.30	0.94	2.80	0.50
18 (duplicate)	Range 29	0 - 3	185	4.99	18.90	3.50	0.93	3.10	0.50
			Average	4.51	16.81	3.24	0.87	2.79	0.44
			Std deviation	1.51	5.66	0.97	0.18	0.82	0.13
			CV%	33.56	33.68	29.90	20.21	29.42	29.77
23	Range 2	7 - 11	175	9.30	35.40	7.60	1.61	6.80	1.10
35-B	Range 6	0 - 2	174	9.19	34.70	6.90	1.36	5.90	0.90

36	Range 6	0 - 3	173	8.48	31.50	6.10	1.22	5.20	0.80
37	Range 7	0 - 4	172	11.20	40.00	7.50	1.35	6.00	1.00
39	Range 7	6 - 9	181	8.04	30.20	6.10	1.30	5.30	0.90
43	Range 9	8 - 12	159	7.62	29.60	6.00	1.34	5.50	0.90
47	Range 10	0 - 2	155	7.66	28.40	5.50	1.12	4.60	0.80
			Average	8.70	32.40	6.35	1.28	5.42	0.88
			Std deviation	1.36	4.30	0.72	0.09	0.51	0.08
			CV%	15.61	13.28	11.35	7.36	9.44	8.52
total surface samples (n=21)			Average	6.20	23.17	4.51	1.03	3.87	0.62
			Std deviation	2.31	8.47	1.68	0.26	1.44	0.24
			CV%	37.20	36.56	37.21	25.23	37.19	38.24

R² (n=21)

1	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$
2	C%
3	$\delta^{15}\text{N}_{\text{air}} \times 1000$
4	N%
5	C/N
6	Sc46
7	La140
8	SiO ₂
9	Al ₂ O ₃
10	Fe ₂ O ₃
11	MnO
12	MgO

13		CaO						
14		Na ₂ O						
15		K ₂ O						
16		TiO ₂						
17		P ₂ O ₅						
18		LO						
19		Sc						
20		V						
21		Co						
22		Ga						
23		Rb						
24		Sr						
25		Y						
26		Zr						
27		Nb						
28		Cs						
29		Ba						
30		La						
31	Ce	Pr						
32	Pr	1.00	Nd					
33	Nd	1.00	1.00	Sm				
34	Sm	0.99	0.99	1.00	Eu			
35	Eu	0.93	0.94	0.96	1.00	Gd		
36	Gd	0.98	0.99	1.00	0.97	1.00	Tb	
37	Tb	0.98	0.99	0.99	0.95	0.99	1.00	
38	Dy	0.99	1.00	1.00	0.96	0.99	0.99	
39	Ho	0.98	0.98	0.98	0.95	0.97	0.98	
40	Er	0.99	0.99	0.99	0.95	0.98	0.98	

41	Tm	0.99	0.99	0.98	0.92	0.97	0.98
42	Yb	0.99	0.99	0.98	0.92	0.97	0.97
43	Lu	0.98	0.98	0.97	0.89	0.96	0.95
44	Hf	0.94	0.93	0.92	0.81	0.90	0.91
45	Ta	0.76	0.76	0.74	0.55	0.71	0.73
46	W	-0.87	-0.89	-0.89	-0.86	-0.91	-0.89
47	Th	0.96	0.95	0.95	0.82	0.92	0.95
48	U	0.81	0.82	0.84	0.80	0.84	0.87

Location name			ID	Dy	Ho	Er	Tm	Yb	Lu	
				ppm	ppm	ppm	ppm	ppm	ppm	
73	Range 18	0 - 2	127	2.40	0.40	1.40	0.20	1.40	0.22	
81	Range 21	0 - 3	126	3.50	0.70	2.00	0.32	2.10	0.37	
81 (duplicate)	Range 21	0 - 3	188	3.50	0.70	2.10	0.34	2.20	0.35	
87	Range 23	0 - 19	125	2.60	0.50	1.60	0.23	1.50	0.27	
88	Range 23	0 - 3	124	3.30	0.60	2.00	0.29	2.00	0.34	
89	Range 23	0 - 3	123	2.90	0.60	1.80	0.27	1.80	0.31	
				Average	3.03	0.58	1.82	0.28	1.83	0.31
				Std deviation	0.47	0.12	0.27	0.05	0.33	0.06
				CV%	15.56	20.04	14.94	19.34	17.81	18.13
5	Range 25	7 - 12	114	2.50	0.50	1.50	0.21	1.40	0.23	
10	Range 27	6 - 9	109	1.60	0.30	1.00	0.15	1.00	0.16	
11	Range 27	0 - 3	100	2.40	0.50	1.40	0.21	1.40	0.24	
12	Range 27	4 - 7	99	1.80	0.40	1.00	0.14	1.00	0.16	
13	Range 28	0 - 4	95	2.10	0.40	1.20	0.18	1.20	0.18	
17	Range 29	0 - 3	90	4.10	0.80	2.40	0.35	2.30	0.37	
18	Range 29	0 - 3	89	2.80	0.60	1.70	0.24	1.60	0.25	
18 (duplicate)	Range 29	0 - 3	185	2.80	0.50	1.50	0.23	1.50	0.24	
				Average	2.51	0.50	1.46	0.21	1.43	0.23
				Std deviation	0.78	0.15	0.45	0.07	0.42	0.07
				CV%	30.86	30.24	31.00	30.72	29.24	29.78
23	Range 2	7 - 11	175	6.00	1.10	3.30	0.49	3.30	0.54	
35-B	Range 6	0 - 2	174	5.10	1.00	2.90	0.44	2.90	0.47	

36	Range 6	0 - 3	173	4.60	0.90	2.60	0.39	2.60	0.42
37	Range 7	0 - 4	172	5.50	1.10	3.10	0.48	3.10	0.51
39	Range 7	6 - 9	181	4.80	0.90	2.60	0.42	2.70	0.43
43	Range 9	8 - 12	159	4.90	1.00	2.70	0.42	2.70	0.44
47	Range 10	0 - 2	155	4.10	0.80	2.40	0.36	2.20	0.37
			Average	4.83	0.95	2.72	0.42	2.70	0.44
			Std deviation	0.47	0.10	0.25	0.04	0.30	0.05
			CV%	9.76	11.04	9.14	9.85	11.23	10.76
total surface samples (n=21)			Average	3.49	0.68	2.01	0.30	2.00	0.33
			Std deviation	1.27	0.25	0.69	0.11	0.69	0.11
			CV%	36.50	36.16	34.11	35.87	34.81	34.88

R² (n=21)

1	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$
2	C%
3	$\delta^{15}\text{N}_{\text{air}} \times 1000$
4	N%
5	C/N
6	Sc46
7	La140
8	SiO ₂
9	Al ₂ O ₃
10	Fe ₂ O ₃
11	MnO
12	MgO

13		CaO				
14		Na ₂ O				
15		K ₂ O				
16		TiO ₂				
17		P ₂ O ₅				
18		LO				
19		Sc				
20		V				
21		Co				
22		Ga				
23		Rb				
24		Sr				
25		Y				
26		Zr				
27		Nb				
28		Cs				
29		Ba				
30		La				
31		Ce				
32		Pr				
33		Nd				
34		Sm				
35		Eu				
36		Gd				
37	Tb	Dy				
38	Dy	1.00	Ho			
39	Ho	0.99	1.00	Er		
40	Er	0.99	0.99	1.00	Tm	

41	Tm	0.99	0.99	0.99	1.00	Yb	
42	Yb	0.99	0.98	0.99	1.00	1.00	Lu
43	Lu	0.97	0.97	0.98	0.99	0.99	1.00
44	Hf	0.92	0.92	0.91	0.94	0.95	0.93
45	Ta	0.74	0.72	0.76	0.81	0.80	0.81
46	W	-0.89	-0.86	-0.90	-0.88	-0.89	-0.90
47	Th	0.94	0.93	0.94	0.96	0.95	0.96
48	U	0.83	0.82	0.84	0.83	0.79	0.78

Location name			ID	Hf ppm	Ta ppm	W ppm	Th ppm	U ppm
73	Range 18	0 - 2	127	2.50	0.70	1670.0 0	5.00	1.30
81	Range 21	0 - 3	126	4.90	1.00	965.00 1310.0	9.00	2.10
81 (duplicate)	Range 21	0 - 3	188	5.60	1.50	0	9.90	2.70
87	Range 23	0 - 19	125	2.80	0.70	918.00	5.00	1.40
88	Range 23	0 - 3	124	4.20	1.00	811.00	8.10	1.90
89	Range 23	0 - 3	123	3.40	0.90	1350.0 0	7.10	1.70
		Average		3.90	0.97	1170.6 7	7.35	1.85
		Std deviation		1.22	0.29	327.54	2.04	0.51
		CV%		31.19	30.45	27.98	27.81	27.72
5	Range 25	7 - 12	114	3.10	0.40	1360.0 0	6.10	1.20
10	Range 27	6 - 9	109	2.30	0.20	2320.0 0	3.20	1.00
11	Range 27	0 - 3	100	2.80	0.40	1890.0 0	4.60	1.20
12	Range 27	4 - 7	99	2.30	0.30	1690.0 0	4.10	1.10
13	Range 28	0 - 4	95	3.10	0.40	1620.0 0	3.90	1.30
17	Range 29	0 - 3	90	4.30	0.60	836.00	7.20	3.00
18	Range 29	0 - 3	89	2.80	0.40	1550.0 0	5.40	1.30
18 (duplicate)	Range 29	0 - 3	185	3.00	0.40	1500.0 0	5.40	1.50

							1595.7	
		Average		2.96	0.39	5	4.99	1.45
		Std deviation		0.63	0.11	425.05	1.30	0.64
		CV%		21.19	29.06	26.64	26.02	44.39
23	Range 2	7 - 11	175	5.10	1.20	321.00	11.00	6.80
35-B	Range 6	0 - 2	174	6.30	1.20	524.00	12.00	3.90
36	Range 6	0 - 3	173	6.00	1.20	570.00	11.10	3.50
37	Range 7	0 - 4	172	8.10	1.40	730.00	15.30	3.60
39	Range 7	6 - 9	181	5.10	1.20	614.00	9.90	5.40
43	Range 9	8 - 12	159	3.80	0.80	401.00	8.00	6.20
47	Range 10	0 - 2	155	4.40	1.10	831.00	11.00	5.20
		Average		5.62	1.15	611.67	11.22	4.63
		Std deviation		1.54	0.20	152.26	2.43	1.12
		CV%		27.38	17.17	24.89	21.63	24.14
total surface samples (n=21)						1132.4		
		Average		4.09	0.81	3	7.73	2.73
		Std deviation		1.54	0.40	544.46	3.22	1.82
		CV%		37.63	48.93	48.08	41.60	66.84
R^2 (n=21)								
1		$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$						
2		C%						
3		$\delta^{15}\text{N}_{\text{air}} \times 1000$						
4		N%						

5	C/N
6	Sc46
7	La140
8	SiO ₂
9	Al ₂ O ₃
10	Fe ₂ O ₃
11	MnO
12	MgO
13	CaO
14	Na ₂ O
15	K ₂ O
16	TiO ₂
17	P ₂ O ₅
18	LO
19	Sc
20	V
21	Co
22	Ga
23	Rb
24	Sr
25	Y
26	Zr
27	Nb
28	Cs
29	Ba
30	La
31	Ce
32	Pr

33		Nd						
34		Sm						
35		Eu						
36		Gd						
37		Tb						
38		Dy						
39		Ho						
40		Er						
41		Tm						
42		Yb						
43	Lu	Hf						
44	Hf	1.00	Ta					
45	Ta	0.84	1.00	W				
46	W	-0.79	-0.69	1.00	Th			
47	Th	0.95	0.88	-0.83	1.00	U		
48	U	0.70	0.68	-0.80	0.82	1.00		

5d Processed Cores 10-30cm Core Sample Data

Core Sample No		Depth (cm)	Sample ID	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	C%	$\delta^{15}\text{N}_{\text{air}} \times 1000$
15	Range 28	7 - 15	93	-23.58	0.0612	2.29
1	Range 24	14 - 20	122	-23.93	0.07	2.76
3	Range 24	7 - 17	119	-25.44	0.16	2.37
4	Range 25	18-22	179	-23.29	0.17	3.40
5	Range 25	24 - 30	113	-23.64	0.0406	2.5
Agriculture soil						
		Average		-23.98	0.10	2.66
		Std deviation		0.85	0.06	0.45
		CV%		-3.54	60.40	16.83
71-A	Range 17	18 - 22	129	-24.90	0.12	2.44
71	Range 17	7 - 17	132	-23.92	0.1006	2.99
70	Range 17	9 - 18	136	-24.15	0.09	2.15
66	Range 16	15 - 25	137	-24.17	0.10	4.52
63	Range 15	15 - 25	141	-21.87	0.06	4.60
60	Range 14	11 - 20	142	-21.19	0.06	6.35
54	Range 12	7 - 17	144	-22.67	0.10	4.79
52	Range 11	7 - 17	146	-26.64	3.38	6.30
50	Range 11	25 - 35	148	-20.33	0.05	3.47
49	Range 11	7 - 14	152	-20.20	0.07	4.52
38-A	Range 7	10-15	7	-26.15	4.66	3.64
34	Range 6	13 - 23	10	-26.09	6.57	4.20
Agriculture soil						
		Average		-23.52	1.28	4.16

		Std deviation		2.26	2.27	1.33
		CV%		-9.61	177.32	31.84
31	Range 5	18 - 28	14	-26.21	4.45	3.86
32	Range 5	16 - 30	17	-26.30	7.14	2.32
28	Range 4	20 - 35	22	-26.05	5.69	3.22
29	Range 4	15 - 30	19	-26.35	4.74	3.97
25	Rang 3	27 - 34	27	-26.37	2.86	4.39
26	Rang 3	7 - 20	30	-26.44	3.57	3.67
27	Rang 3	7 - 27	26	-26.26	7.30	2.77
22	Range 2	7 - 27	35	-26.56	4.53	3.68
19	Range 1	7 - 17	42	-26.65	4.34	3.68
21	Range 1	17 - 21	36	-26.10	1.78	4.60

Agriculture soil				
Average		-26.33	4.64	3.62
Std deviation		0.19	1.73	0.69
CV%		-0.72	37.39	19.15

R^2 (n=27)	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	C%	$\delta^{15}\text{N}_{\text{air}} \times 1000$
		1.00	C%	
		0.73	1.00	
	$\delta^{15}\text{N}_{\text{air}} \times 1000$	0.15	-0.02	1.00
	N%	-0.76	0.99	0.01
	C/N	-0.61	0.80	0.18
	Sc46	-0.80	0.67	0.36
	La140	-0.17	-0.01	-0.35
	SiO ₂	0.79	-0.94	-0.12

Al ₂ O ₃	-0.57	0.55	0.14
Fe ₂ O ₃	-0.79	0.85	0.23
MnO	-0.72	0.87	0.26
MgO	-0.71	0.84	0.18
CaO	-0.43	0.56	0.17
Na ₂ O	0.81	-0.87	-0.73
K ₂ O	0.75	-0.73	-0.13
TiO ₂	-0.73	0.76	0.31
P ₂ O ₅	-0.76	0.95	0.06
LO	-0.79	0.98	0.05
Sc	-0.75	0.82	0.28
V	-0.71	0.78	0.33
Co	0.63	-0.85	-0.28
Ga	-0.73	0.87	-0.02
Rb	-0.23	0.51	0.05
Sr	0.63	-0.79	-0.31
Y	-0.80	0.92	0.11
Zr	-0.71	0.74	0.06
Nb	-0.62	0.84	0.10
Cs	-0.74	0.90	0.06
Ba	0.74	-0.86	-0.14
La	-0.76	0.85	-0.01
Ce	-0.76	0.82	0.02
Pr	-0.79	0.88	-0.02
Nd	-0.80	0.88	0.00
Sm	-0.79	0.90	0.04
Eu	-0.79	0.89	0.14
Gd	-0.80	0.91	0.07

Tb	-0.80	0.92	0.08
Dy	-0.79	0.90	0.11
Ho	-0.79	0.91	0.12
Er	-0.80	0.90	0.13
Tm	-0.79	0.89	0.14
Yb	-0.80	0.89	0.14
Lu	-0.79	0.89	0.15
Hf	-0.72	0.76	0.11
Ta	-0.60	0.81	0.21
W	0.66	0.87	-0.31
Th	-0.71	0.82	0.01
U	-0.68	0.95	-0.08

Core Sample No		Depth (cm)	Sample ID	N%	C/N (molar ratio)	Sc46 mg/g
15	Range 28	7 - 15	93	0.007	10.2	0.005
1	Range 24	14 - 20	122	0.01	8.56	ND
3	Range 24	7 - 17	119	0.02	11.87	ND
4	Range 25	18-22	179	0.01	16.38	0.01
5	Range 25	24 - 30	113	0.007	6.8	0.006
Agriculture soil						
		Average		0.01	10.76	0.01
		Std deviation		0.00	3.67	0.00
		CV%		37.32	34.13	49.38
71-A	Range 17	18 - 22	129	0.01	11.23	0.01
71	Range 17	7 - 17	132	0.0126	9.3	0.013
70	Range 17	9 - 18	136	0.01	8.51	0.02
66	Range 16	15 - 25	137	0.01	16.30	0.02
63	Range 15	15 - 25	141	0.01	11.61	ND
60	Range 14	11 - 20	142	0.01	10.04	ND
54	Range 12	7 - 17	144	0.01	15.56	0.01
52	Range 11	7 - 17	146	0.25	15.47	0.02
50	Range 11	25 - 35	148	0.00	12.62	ND
49	Range 11	7 - 14	152	0.01	9.79	ND
38-A	Range 7	10-15	7	0.30	18.34	0.02
34	Range 6	13 - 23	10	0.42	18.28	0.02
Agriculture soil						
		Average		0.09	13.09	0.02

		Std deviation		0.15	3.54	0.00
		CV%		168.13	27.05	28.02
31	Range 5	18 - 28	14	0.29	18.11	0.02
32	Range 5	16 - 30	17	0.45	18.65	0.02
28	Range 4	20 - 35	22	0.42	15.91	0.02
29	Range 4	15 - 30	19	0.31	17.67	ND
25	Rang 3	27 - 34	27	0.22	14.97	0.02
26	Rang 3	7 - 20	30	0.26	16.04	0.02
27	Rang 3	7 - 27	26	0.41	20.85	0.02
22	Range 2	7 - 27	35	0.33	15.98	0.02
19	Range 1	7 - 17	42	0.34	14.86	0.02
21	Range 1	17 - 21	36	0.14	15.31	0.02
Agriculture soil						
		Average		0.32	16.83	0.02
		Std deviation		0.10	1.94	0.00
		CV%		30.18	11.50	17.90

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	C%		
$\delta^{15}\text{N}_{\text{air}} \times 1000$	N%		
N%	1.00	C/N	
C/N	0.78	1.00	Sc46
Sc46	0.70	0.62	1.00
La140	0.00	-0.04	0.46
SiO ₂	-0.96	-0.77	-0.80

Al ₂ O ₃	0.58	0.36	0.76
Fe ₂ O ₃	0.88	0.69	0.78
MnO	0.88	0.71	0.74
MgO	0.86	0.70	0.83
CaO	0.57	0.39	0.66
Na ₂ O	-0.90	-0.73	-0.61
K ₂ O	-0.76	-0.55	-0.59
TiO ₂	0.79	0.63	0.74
P ₂ O ₅	0.96	0.73	0.74
LO	0.99	0.78	0.73
Sc	0.85	0.68	0.78
V	0.81	0.65	0.74
Co	-0.88	-0.74	-0.84
Ga	0.89	0.66	0.66
Rb	0.51	0.55	0.36
Sr	-0.83	-0.74	-0.65
Y	0.94	0.74	0.78
Zr	0.74	0.61	0.66
Nb	0.85	0.74	0.73
Cs	0.92	0.76	0.75
Ba	-0.89	-0.69	-0.74
La	0.86	0.72	0.66
Ce	0.84	0.70	0.68
Pr	0.89	0.71	0.69
Nd	0.90	0.70	0.71
Sm	0.92	0.72	0.74
Eu	0.91	0.71	0.76
Gd	0.93	0.72	0.76

Tb	0.94	0.73	0.77
Dy	0.93	0.73	0.77
Ho	0.93	0.75	0.78
Er	0.92	0.74	0.78
Tm	0.91	0.74	0.14
Yb	0.92	0.73	0.14
Lu	0.92	0.71	0.15
Hf	0.77	0.64	0.12
Ta	0.83	0.72	0.12
W	-0.89	-0.76	0.13
Th	0.83	0.70	0.26
U	0.94	0.79	0.07

Core Sample No		Depth (cm)	Sample ID	La140 mg/g	SiO ₂ %	Al ₂ O ₃ %
15	Range 28	7 - 15	93	ND	75.55	10.92
1	Range 24	14 - 20	122	ND	74.19	11.88
3	Range 24	7 - 17	119	0.16	70.45	13.49
4	Range 25	18-22	179	0.01	74.26	11.44
5	Range 25	24 - 30	113	0.021	74.07	11.69
Agriculture soil						
		Average		0.07	73.70	11.88
		Std deviation		0.08	1.92	0.97
		CV%		127.16	2.60	8.14
71-A	Range 17	18 - 22	129	0.03	71.02	13.14
71	Range 17	7 - 17	132	0.063	70.82	13.18
70	Range 17	9 - 18	136	0.03	71.33	13.24
66	Range 16	15 - 25	137	ND	71.99	11.80
63	Range 15	15 - 25	141	ND	73.34	11.53
60	Range 14	11 - 20	142	0.00	73.46	12.92
54	Range 12	7 - 17	144	0.01	73.05	11.97
52	Range 11	7 - 17	146	0.04	54.82	13.76
50	Range 11	25 - 35	148	0.06	71.73	12.55
49	Range 11	7 - 14	152	0.06	68.68	12.90
38-A	Range 7	10-15	7	0.04	56.32	13.01
34	Range 6	13 - 23	10	0.00	54.92	13.23
Agriculture soil						
		Average		0.03	67.62	12.77
		Std deviation		0.02	7.52	0.67

		CV%		67.96	11.12	5.27
31	Range 5	18 - 28	14	0.07	55.84	13.56
32	Range 5	16 - 30	17	0.05	52.20	13.07
28	Range 4	20 - 35	22	0.05	54.44	12.93
29	Range 4	15 - 30	19	0.05	55.59	13.13
25	Rang 3	27 - 34	27	0.05	58.00	13.32
26	Rang 3	7 - 20	30	0.03	57.57	13.37
27	Rang 3	7 - 27	26	0.05	53.65	13.40
22	Range 2	7 - 27	35	0.05	56.84	13.72
19	Range 1	7 - 17	42	0.06	54.87	13.54
21	Range 1	17 - 21	36	0.04	60.32	13.31

Agriculture soil

Average	0.05	55.93	13.34
Std deviation	0.01	2.35	0.24
CV%	18.52	4.20	1.81

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

La140

1.00

SiO₂

SiO₂

-0.09

1.00

Al₂O₃

Al₂O₃

0.42

-0.71

1.00

Fe ₂ O ₃	0.10	-0.96	0.77
MnO	0.02	-0.94	0.69
MgO	0.14	-0.95	0.79
CaO	0.12	-0.69	0.74
Na ₂ O	0.07	0.89	-0.43
K ₂ O	0.03	0.83	-0.57
TiO ₂	0.11	-0.91	0.77
P ₂ O ₅	0.04	0.04	0.70
LO	0.03	0.03	0.61
Sc	0.07	0.07	0.77
V	0.06	0.06	0.73
Co	0.16	0.16	-0.60
Ga	0.20	0.20	0.72
Rb	0.06	0.06	0.21
Sr	0.08	0.08	-0.36
Y	0.15	-0.99	0.76
Zr	0.14	-0.84	0.77
Nb	0.12	-0.89	0.67
Cs	0.10	-0.94	0.65
Ba	0.02	0.94	-0.63
La	0.18	-0.92	0.73
Ce	0.22	-0.91	0.77
Pr	0.21	-0.94	0.76
Nd	0.21	-0.95	0.21
Sm	0.19	-0.97	0.19
Eu	0.11	-0.98	0.11
Gd	0.15	-0.98	0.15
Tb	0.13	-0.99	0.13

Dy	0.15	-0.98	0.15
Ho	0.13	-0.98	0.13
Er	0.15	-0.98	0.15
Tm	0.14	-0.98	0.77
Yb	0.14	-0.98	0.78
Lu	0.15	-0.98	0.77
Hf	0.12	-0.88	0.75
Ta	0.12	-0.90	0.74
W	0.13	0.93	-0.61
Th	0.26	-0.89	0.75
U	0.07	-0.90	0.54

Core Sample No		Depth (cm)	Sample ID	Fe ₂ O ₃ (T) %	MnO %	MgO %
15	Range 28	7 - 15	93	2.34	0.03	0.69
1	Range 24	14 - 20	122	3.13	0.05	0.96
3	Range 24	7 - 17	119	4.13	0.06	1.25
4	Range 25	18-22	179	2.75	0.04	0.81
5	Range 25	24 - 30	113	2.85	0.04	0.86
Agriculture soil						
		Average		3.04	0.04	0.91
		Std deviation		0.67	0.01	0.21
		CV%		22.11	21.67	23.14
71-A	Range 17	18 - 22	129	4.11	0.06	1.29
71	Range 17	7 - 17	132	3.82	0.05	1.23
70	Range 17	9 - 18	136	3.59	0.05	1.11
66	Range 16	15 - 25	137	3.18	0.05	1.09
63	Range 15	15 - 25	141	3.17	0.05	1.01
60	Range 14	11 - 20	142	3.10	0.05	1.04
54	Range 12	7 - 17	144	3.34	0.05	1.12
52	Range 11	7 - 17	146	8.30	0.17	1.75
50	Range 11	25 - 35	148	3.36	0.05	1.19
49	Range 11	7 - 14	152	4.27	0.07	1.59
38-A	Range 7	10-15	7	6.26	0.12	1.90
34	Range 6	13 - 23	10	6.85	0.14	1.94
Agriculture soil						
		Average		4.45	0.08	1.36

		Std deviation		1.72	0.04	0.34
		CV%		38.74	54.21	25.38
31	Range 5	18 - 28	14	5.80	0.11	1.80
32	Range 5	16 - 30	17	6.89	0.14	1.91
28	Range 4	20 - 35	22	6.13	0.11	1.87
29	Range 4	15 - 30	19	6.40	0.10	1.96
25	Rang 3	27 - 34	27	6.69	0.09	2.03
26	Rang 3	7 - 20	30	6.11	0.10	1.88
27	Rang 3	7 - 27	26	6.53	0.12	1.88
22	Range 2	7 - 27	35	6.67	0.10	1.95
19	Range 1	7 - 17	42	6.64	0.11	1.87
21	Range 1	17 - 21	36	6.44	0.11	1.92
Agriculture soil						
		Average		6.43	0.11	1.91
		Std deviation		0.33	0.01	0.06
		CV%		5.14	13.96	3.30

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

	Al ₂ O ₃	Fe ₂ O ₃ (T)	
Fe ₂ O ₃	1.00	MnO	
MnO	0.96	1.00	MgO
MgO	0.95	0.87	1.00
CaO	0.76	0.75	0.79
Na ₂ O	-0.85	-0.82	-0.77
K ₂ O	-0.90	-0.89	-0.77
TiO ₂	0.98	0.95	0.91
P ₂ O ₅	0.94	0.92	0.93
LO	0.91	0.91	0.89
Sc	0.99	0.96	0.94
V	0.98	0.96	0.91
Co	-0.87	-0.84	-0.88
Ga	0.88	0.80	0.88
Rb	0.28	0.22	0.44
Sr	-0.80	-0.78	-0.76
Y	0.97	0.93	0.95
Zr	0.85	0.81	0.89
Nb	0.83	0.74	0.93
Cs	0.85	0.79	0.91
Ba	-0.93	-0.89	-0.91
La	0.87	0.82	0.91
Ce	0.88	0.82	0.92
Pr	0.90	0.85	0.93
Nd	0.92	0.87	0.94
Sm	0.94	0.89	0.95
Eu	0.98	0.94	0.96
Gd	0.96	0.91	0.96

Tb	0.97	0.93	0.95
Dy	0.97	0.93	0.96
Ho	0.96	0.92	0.96
Er	0.97	0.93	0.96
Tm	0.97	0.93	0.97
Yb	0.98	0.93	0.97
Lu	0.98	0.94	0.95
Hf	0.89	0.83	0.92
Ta	0.85	0.79	0.95
W	-0.90	-0.87	-0.89
Th	0.84	0.76	0.92
U	0.77	0.77	0.82

Core Sample No		Depth (cm)	Sample ID	CaO	Na ₂ O	K ₂ O
				%	%	%
15	Range 28	7 - 15	93	2.09	2.57	2.60
1	Range 24	14 - 20	122	2.65	2.80	2.36
3	Range 24	7 - 17	119	2.83	3.09	2.56
4	Range 25	18-22	179	2.37	2.65	2.40
5	Range 25	24 - 30	113	2.53	2.74	2.34
Agriculture soil						
		Average		2.49	2.77	2.45
		Std deviation		0.28	0.20	0.12
		CV%		11.29	7.19	4.88
71-A	Range 17	18 - 22	129	3.12	2.92	2.32
71	Range 17	7 - 17	132	3.08	3.00	2.29
70	Range 17	9 - 18	136	2.74	3.04	2.51
66	Range 16	15 - 25	137	2.57	2.82	2.51
63	Range 15	15 - 25	141	2.36	2.76	2.60
60	Range 14	11 - 20	142	2.50	3.13	2.81
54	Range 12	7 - 17	144	2.53	2.85	2.59
52	Range 11	7 - 17	146	3.49	1.96	1.43
50	Range 11	25 - 35	148	2.82	3.06	2.60
49	Range 11	7 - 14	152	3.60	3.11	2.36
38-A	Range 7	10-15	7	3.38	2.39	2.08
34	Range 6	13 - 23	10	3.57	2.13	1.89
Agriculture soil						
		Average		2.98	2.76	2.33

		Std deviation		0.45	0.39	0.38
		CV%		15.18	14.21	16.23
31	Range 5	18 - 28	14	2.96	2.21	2.29
32	Range 5	16 - 30	17	3.32	1.94	1.86
28	Range 4	20 - 35	22	2.96	1.97	2.06
29	Range 4	15 - 30	19	3.23	2.29	2.17
25	Rang 3	27 - 34	27	3.16	2.07	1.90
26	Rang 3	7 - 20	30	3.17	2.24	2.18
27	Rang 3	7 - 27	26	2.95	1.92	1.98
22	Range 2	7 - 27	35	2.95	1.94	2.08
19	Range 1	7 - 17	42	2.86	1.90	2.05
21	Range 1	17 - 21	36	3.06	2.21	2.01
Agriculture soil						
		Average		3.06	2.07	2.06
		Std deviation		0.15	0.15	0.13
		CV%		4.90	7.41	6.36

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al ₂ O ₃			
Fe ₂ O ₃			
MnO			
MgO	CaO		
CaO	1.00	Na ₂ O	
Na ₂ O	-0.39	1.00	K ₂ O
K ₂ O	-0.71	0.82	1.00
TiO ₂	0.81	-0.78	-0.91
P ₂ O ₅	0.69	-0.88	-0.82
LO	0.58	-0.92	-0.80
Sc	0.78	-0.83	-0.90
V	0.80	-0.80	-0.92
Co	-0.56	0.85	0.72
Ga	0.58	-0.83	-0.73
Rb	-0.08	-0.44	0.04
Sr	-0.34	0.93	0.71
Y	0.71	-0.87	-0.82
Zr	0.84	-0.63	-0.73
Nb	0.62	-0.74	-0.60
Cs	0.50	-0.86	-0.64
Ba	-0.71	0.89	0.90
La	0.70	-0.78	-0.72
Ce	0.73	-0.75	-0.73
Pr	0.71	-0.80	-0.75
Nd	0.72	-0.81	-0.77
Sm	0.72	0.83	-0.78
Eu	0.76	-0.95	-0.87
Gd	0.72	-0.85	-0.81

Tb	0.72	-0.87	-0.83
Dy	0.73	-0.96	-0.83
Ho	0.72	-0.85	-0.82
Er	0.73	-0.86	-0.83
Tm	0.75	-0.84	-0.82
Yb	0.74	-0.85	-0.83
Lu	0.73	-0.85	-0.84
Hf	0.82	-0.69	-0.77
Ta	0.69	-0.71	-0.60
W	-0.56	0.88	0.75
Th	0.64	-0.74	-0.63
U	0.51	-0.79	-0.59

Core Sample No		Depth (cm)	Sample ID	TiO ₂ %	P ₂ O ₅ %	LO %
15	Range 28	7 - 15	93	0.34	0.07	1.05
1	Range 24	14 - 20	122	0.49	0.09	1.66
3	Range 24	7 - 17	119	0.66	0.11	1.91
4	Range 25	18-22	179	0.41	0.08	1.34
5	Range 25	24 - 30	113	0.44	0.09	1.03
Agriculture soil						
		Average		0.47	0.09	1.40
		Std deviation		0.12	0.01	0.38
		CV%		25.68	16.85	27.49
71-A	Range 17	18 - 22	129	0.70	0.12	1.39
71	Range 17	7 - 17	132	0.59	0.12	1.40
70	Range 17	9 - 18	136	0.54	0.11	1.37
66	Range 16	15 - 25	137	0.51	0.07	1.21
63	Range 15	15 - 25	141	0.47	0.10	1.23
60	Range 14	11 - 20	142	0.48	0.08	1.17
54	Range 12	7 - 17	144	0.51	0.10	1.36
52	Range 11	7 - 17	146	1.47	0.25	12.35
50	Range 11	25 - 35	148	0.54	0.10	0.87
49	Range 11	7 - 14	152	0.77	0.15	1.42
38-A	Range 7	10-15	7	0.97	0.24	12.13
34	Range 6	13 - 23	10	1.04	0.31	14.79

		Agriculture soil				
		Average	0.72	0.15	4.22	
		Std deviation	0.31	0.08	5.39	
		CV%	42.65	52.99	127.49	
31	Range 5	18 - 28	14	0.89	0.24	12.67
32	Range 5	16 - 30	17	1.01	0.33	17.53
28	Range 4	20 - 35	22	0.93	0.26	15.30
29	Range 4	15 - 30	19	1.01	0.25	12.65
25	Rang 3	27 - 34	27	1.08	0.22	10.31
26	Rang 3	7 - 20	30	0.97	0.26	10.86
27	Rang 3	7 - 27	26	0.96	0.29	16.38
22	Range 2	7 - 27	35	0.96	0.28	13.39
19	Range 1	7 - 17	42	0.94	0.30	13.91
21	Range 1	17 - 21	36	1.01	0.22	7.55

		Agriculture soil				
		Average	0.97	0.27	13.06	
		Std deviation	0.05	0.04	2.98	
		CV%	5.49	13.34	22.83	

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140			
SiO ₂			
Al ₂ O ₃			
Fe ₂ O ₃			
MnO			
MgO			
CaO			
Na ₂ O			
K ₂ O	TiO ₂		
TiO ₂	1.00	P ₂ O ₅	
P ₂ O ₅	0.88	1.00	LO
LO	0.84	0.97	1.00
Sc	0.99	0.92	0.89
V	0.99	0.89	0.85
Co	-0.81	-0.90	-0.90
Ga	0.81	0.92	0.91
Rb	0.16	0.45	0.50
Sr	-0.74	-0.82	-0.85
Y	0.92	0.97	0.96
Zr	0.85	0.82	0.77
Nb	0.76	0.88	0.86
Cs	0.76	0.93	0.94
Ba	-0.90	-0.94	-0.91
La	0.83	0.90	0.88
Ce	0.86	0.89	0.86
Pr	0.85	0.93	0.91
Nd	0.88	0.94	0.92
Sm	0.89	0.95	0.94

Eu	0.95	0.96	0.94
Gd	0.91	0.97	0.95
Tb	0.92	0.98	0.96
Dy	0.93	0.97	0.95
Ho	0.92	0.96	0.95
Er	0.93	0.97	0.95
Tm	0.94	0.96	0.94
Yb	0.94	0.96	0.94
Lu	0.94	0.96	0.94
Hf	0.89	0.85	0.80
Ta	0.81	0.88	0.85
W	-0.84	-0.92	-0.92
Th	0.79	0.87	0.85
U	0.67	0.89	0.93

Core Sample No		Depth (cm)	Sample ID	Sc	V	Co
				ppm	ppm	ppm
15	Range 28	7 - 15	93	6.00	52.00	201.00
1	Range 24	14 - 20	122	8.00	69.00	138.00
3	Range 24	7 - 17	119	10.00	87.00	216.00
4	Range 25	18-22	179	7.00	61.00	143.00
5	Range 25	24 - 30	113	7.00	64.00	192.00
Agriculture soil						
		Average		7.60	66.60	178.00
		Std deviation		1.52	12.97	35.33
		CV%		19.95	19.48	19.85
71-A	Range 17	18 - 22	129	11.00	87.00	190.00
71	Range 17	7 - 17	132	9.00	83.00	183.00
70	Range 17	9 - 18	136	9.00	73.00	131.00
66	Range 16	15 - 25	137	9.00	77.00	157.00
63	Range 15	15 - 25	141	8.00	73.00	142.00
60	Range 14	11 - 20	142	8.00	69.00	126.00
54	Range 12	7 - 17	144	9.00	78.00	151.00
52	Range 11	7 - 17	146	21.00	205.00	52.00
50	Range 11	25 - 35	148	9.00	79.00	120.00
49	Range 11	7 - 14	152	12.00	110.00	139.00
38-A	Range 7	10-15	7	15.00	138.00	56.00
34	Range 6	13 - 23	10	17.00	150.00	43.00
Agriculture soil						
		Average		11.42	101.83	124.17

		Std deviation		4.14	41.95	49.21
		CV%		36.30	41.20	39.64
31	Range 5	18 - 28	14	14.00	119.00	46.00
32	Range 5	16 - 30	17	17.00	149.00	29.00
28	Range 4	20 - 35	22	15.00	129.00	66.00
29	Range 4	15 - 30	19	15.00	135.00	45.00
25	Rang 3	27 - 34	27	17.00	148.00	38.00
26	Rang 3	7 - 20	30	15.00	134.00	40.00
27	Rang 3	7 - 27	26	16.00	135.00	37.00
22	Range 2	7 - 27	35	16.00	133.00	29.00
19	Range 1	7 - 17	42	16.00	135.00	37.00
21	Range 1	17 - 21	36	16.00	139.00	58.00

Agriculture soil				
Average			15.70	135.60
Std deviation			0.95	8.66
CV%			6.04	27.87

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al ₂ O ₃				
Fe ₂ O ₃				
MnO				
MgO				
CaO				
Na ₂ O				
K ₂ O				
TiO ₂				
P ₂ O ₅				
LO	Sc			
Sc	1.00	V		
V	0.99	1.00	Co	
Co	-0.86	-0.83	1.00	
Ga	0.85	0.80	-0.82	
Rb	0.24	0.16	-0.53	
Sr	-0.80	-0.78	0.87	
Y	0.95	0.92	-0.88	
Zr	0.84	0.81	-0.72	
Nb	0.81	0.75	-0.87	
Cs	0.82	0.76	-0.91	
Ba	-0.93	-0.91	0.86	
La	0.85	0.80	-0.81	
Ce	0.87	0.82	-0.79	
Pr	0.88	0.83	-0.81	
Nd	0.90	0.85	0.85	
Sm	0.92	0.88	0.88	
Eu	0.97	0.94	0.94	
Gd	0.94	0.90	0.90	

Tb	0.95	0.91	0.91
Dy	0.95	0.92	0.92
Ho	0.95	0.91	0.91
Er	0.96	0.93	0.93
Tm	0.94	0.92	-0.88
Yb	0.94	0.93	-0.89
Lu	0.94	0.94	-0.87
Hf	0.80	0.86	-0.79
Ta	0.85	0.80	-0.88
W	-0.92	-0.86	0.99
Th	0.85	0.76	-0.80
U	0.93	0.68	-0.83

Core Sample No		Depth (cm)	Sample ID	Ga	Rb	Sr
				ppm	ppm	ppm
15	Range 28	7 - 15	93	14.00	69.00	356.00
1	Range 24	14 - 20	122	14.00	58.00	364.00
3	Range 24	7 - 17	119	16.00	66.00	410.00
4	Range 25	18-22	179	15.00	66.00	370.00
5	Range 25	24 - 30	113	15.00	64.00	376.00
Agriculture soil						
		Average		14.80	64.60	375.20
		Std deviation		0.84	4.10	20.81
		CV%		5.65	6.34	5.55
71-A	Range 17	18 - 22	129	16.00	61.00	406.00
71	Range 17	7 - 17	132	15.00	59.00	408.00
70	Range 17	9 - 18	136	15.00	62.00	413.00
66	Range 16	15 - 25	137	14.00	70.00	335.00
63	Range 15	15 - 25	141	14.00	73.00	311.00
60	Range 14	11 - 20	142	15.00	77.00	380.00
54	Range 12	7 - 17	144	14.00	73.00	335.00
52	Range 11	7 - 17	146	18.00	52.00	262.00
50	Range 11	25 - 35	148	15.00	71.00	373.00
49	Range 11	7 - 14	152	16.00	66.00	369.00
38-A	Range 7	10-15	7	17.00	72.00	326.00
34	Range 6	13 - 23	10	17.00	65.00	301.00
Agriculture soil						
		Average		15.50	66.75	351.58

		Std deviation		1.31	7.24	47.60
		CV%		8.48	10.84	13.54
31	Range 5	18 - 28	14	18.00	85.00	291.00
32	Range 5	16 - 30	17	20.00	74.00	270.00
28	Range 4	20 - 35	22	19.00	77.00	263.00
29	Range 4	15 - 30	19	19.00	79.00	300.00
25	Rang 3	27 - 34	27	18.00	70.00	273.00
26	Rang 3	7 - 20	30	18.00	77.00	290.00
27	Rang 3	7 - 27	26	20.00	84.00	263.00
22	Range 2	7 - 27	35	21.00	85.00	259.00
19	Range 1	7 - 17	42	19.00	80.00	259.00
21	Range 1	17 - 21	36	17.00	71.00	282.00

Agriculture soil				
Average				18.90
Std deviation				1.20
CV%				6.33

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al ₂ O ₃				
Fe ₂ O ₃				
MnO				
MgO				
CaO				
Na ₂ O				
K ₂ O				
TiO ₂				
P ₂ O ₅				
LO				
Sc				
V				
Co	Ga			
Ga	1.00	Rb		
Rb	0.55	1.00	Sr	
Sr	-0.76	-0.55	1.00	
Y	0.93	0.43	-0.81	
Zr	0.76	0.25	-0.54	
Nb	0.90	0.67	-0.75	
Cs	0.91	0.70	-0.84	
Ba	-0.88	-0.34	0.84	
La	0.90	0.49	-0.69	
Ce	0.88	0.44	-0.67	
Pr	0.93	0.47	0.71	
Nd	0.92	0.44	-0.72	
Sm	0.92	0.45	-0.75	
Eu	0.91	0.35	-0.78	
Gd	0.93	0.45	-0.79	

Tb	0.93	0.42	-0.80
Dy	0.93	0.43	-0.80
Ho	0.92	0.44	-0.80
Er	0.92	0.43	-0.82
Tm	0.91	0.42	-0.79
Yb	0.92	0.41	-0.80
Lu	0.92	0.40	-0.81
Hf	0.83	0.30	-0.62
Ta	0.85	0.62	-0.75
W	-0.85	-0.52	0.90
Th	0.91	0.61	-0.70
U	0.85	0.65	-0.73

Core Sample No		Depth (cm)	Sample ID	Y	Zr	Nb
15	Range 28	7 - 15	93	10.00	100.00	4.00
1	Range 24	14 - 20	122	14.00	134.00	5.00
3	Range 24	7 - 17	119	20.00	155.00	7.00
4	Range 25	18-22	179	11.00	113.00	5.00
5	Range 25	24 - 30	113	11.00	120.00	5.00
Agriculture soil						
		Average		13.20	124.40	5.20
		Std deviation		4.09	21.05	1.10
		CV%		30.96	16.92	21.07
71-A	Range 17	18 - 22	129	21.00	185.00	8.00
71	Range 17	7 - 17	132	15.00	152.00	7.00
70	Range 17	9 - 18	136	15.00	127.00	5.00
66	Range 16	15 - 25	137	14.00	114.00	7.00
63	Range 15	15 - 25	141	13.00	99.00	6.00
60	Range 14	11 - 20	142	13.00	120.00	8.00
54	Range 12	7 - 17	144	14.00	113.00	7.00
52	Range 11	7 - 17	146	35.00	189.00	9.00
50	Range 11	25 - 35	148	14.00	122.00	10.00
49	Range 11	7 - 14	152	20.00	172.00	11.00
38-A	Range 7	10-15	7	30.00	200.00	15.00
34	Range 6	13 - 23	10	34.00	217.00	13.00
Agriculture soil						
		Average		19.83	150.83	8.83
		Std deviation		8.41	40.11	2.95

		CV%		42.39	26.59	33.39
31	Range 5	18 - 28	14	33.00	224.00	16.00
32	Range 5	16 - 30	17	36.00	196.00	17.00
28	Range 4	20 - 35	22	35.00	167.00	13.00
29	Range 4	15 - 30	19	33.00	207.00	18.00
25	Rang 3	27 - 34	27	30.00	198.00	16.00
26	Rang 3	7 - 20	30	31.00	210.00	15.00
27	Rang 3	7 - 27	26	36.00	196.00	17.00
22	Range 2	7 - 27	35	34.00	186.00	19.00
19	Range 1	7 - 17	42	35.00	147.00	14.00
21	Range 1	17 - 21	36	28.00	201.00	13.00
Agriculture soil						
Average				33.10	193.20	15.80
Std deviation				2.69	22.09	2.04
CV%				8.11	11.44	12.94

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe ₂ O ₃			
MnO			
MgO			
CaO			
Na ₂ O			
K ₂ O			
TiO ₂			
P ₂ O ₅			
LO			
Sc			
V			
Co			
Ga			
Rb			
Sr	Y		
Y	1.00	Zr	
Zr	0.86	1.00	Nb
Nb	0.88	0.82	1.00
Cs	0.92	0.77	0.94
Ba	-0.93	-0.81	-0.83
La	0.93	0.93	0.91
Ce	0.93	0.95	0.89
Pr	0.96	0.92	0.90
Nd	0.97	0.92	0.89
Sm	0.99	0.91	0.90
Eu	0.99	0.89	0.87
Gd	0.99	0.89	0.90
Tb	0.99	0.87	0.89

Dy	1.00	0.88	0.90
Ho	0.99	0.89	0.91
Er	1.00	0.88	0.89
Tm	0.99	0.91	0.90
Yb	0.99	0.89	0.90
Lu	0.99	0.87	0.87
Hf	0.88	0.97	0.88
Ta	0.91	0.84	0.96
W	-0.90	-0.72	-0.87
Th	0.91	0.89	0.95
U	0.88	0.76	0.88

Core Sample No		Depth (cm)	Sample ID	Cs	Ba	La
				ppm	ppm	ppm
15	Range 28	7 - 15	93	1.20	914.00	17.60
1	Range 24	14 - 20	122	1.30	872.00	17.80
3	Range 24	7 - 17	119	1.70	914.00	27.80
4	Range 25	18-22	179	1.20	856.00	24.50
5	Range 25	24 - 30	113	1.10	837.00	20.70
Agriculture soil						
		Average		1.30	878.60	21.68
		Std deviation		0.23	34.61	4.42
		CV%		18.04	3.94	20.38
71-A	Range 17	18 - 22	129	1.50	823.00	33.10
71	Range 17	7 - 17	132	1.50	832.00	22.70
70	Range 17	9 - 18	136	1.50	902.00	18.90
66	Range 16	15 - 25	137	1.60	831.00	17.90
63	Range 15	15 - 25	141	1.60	897.00	15.80
60	Range 14	11 - 20	142	1.80	930.00	17.70
54	Range 12	7 - 17	144	1.60	886.00	17.80
52	Range 11	7 - 17	146	2.50	664.00	34.00
50	Range 11	25 - 35	148	1.90	881.00	23.20
49	Range 11	7 - 14	152	1.70	769.00	29.60
38-A	Range 7	10-15	7	4.00	753.00	38.00
34	Range 6	13 - 23	10	4.00	680.00	40.40
Agriculture soil						
		Average		2.10	820.67	25.76
		Std deviation		0.93	87.45	8.81

		CV%		44.25	10.66	34.19
31	Range 5	18 - 28	14	5.10	721.00	49.30
32	Range 5	16 - 30	17	4.50	659.00	41.90
28	Range 4	20 - 35	22	4.70	685.00	38.10
29	Range 4	15 - 30	19	4.40	728.00	42.30
25	Rang 3	27 - 34	27	4.10	685.00	38.50
26	Rang 3	7 - 20	30	4.30	729.00	42.30
27	Rang 3	7 - 27	26	5.20	671.00	41.30
22	Range 2	7 - 27	35	5.10	684.00	42.90
19	Range 1	7 - 17	42	4.90	675.00	36.10
21	Range 1	17 - 21	36	4.10	713.00	36.70
Agriculture soil						
Average						
Std deviation						
CV%						

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe ₂ O ₃			
MnO			
MgO			
CaO			
Na ₂ O			
K ₂ O			
TiO ₂			
P ₂ O ₅			
LO			
Sc			
V			
Co			
Ga			
Rb			
Sr			
Y			
Zr			
Nb	Cs		
Cs	1.00	Ba	
Ba	-0.86	1.00	La
La	0.90	-0.88	1.00
Ce	0.89	-0.87	0.99
Pr	0.91	-0.90	0.99
Nd	0.91	-0.91	0.98
Sm	0.93	-0.92	0.97
Eu	0.89	-0.94	0.93
Gd	0.93	-0.93	0.95
Tb	0.92	-0.94	0.94

Dy	0.92	-0.94	0.95
Ho	0.92	-0.93	0.94
Er	0.92	-0.94	0.94
Tm	0.92	-0.93	0.95
Yb	0.92	-0.94	0.94
Lu	0.90	-0.93	0.92
Hf	0.80	-0.85	0.93
Ta	0.93	-0.83	0.90
W	-0.91	0.88	-0.81
Th	0.93	-0.83	0.97
U	0.93	-0.80	0.88

Core Sample No		Depth (cm)	Sample ID	Ce	Pr	Nd
15	Range 28	7 - 15	93	30.80	3.84	13.80
1	Range 24	14 - 20	122	35.60	4.28	16.80
3	Range 24	7 - 17	119	55.60	6.62	25.10
4	Range 25	18-22	179	42.30	4.80	16.90
5	Range 25	24 - 30	113	37.80	4.67	17.00
Agriculture soil						
		Average		40.42	4.84	17.92
		Std deviation		9.44	1.06	4.23
		CV%		23.36	21.94	23.62
71-A	Range 17	18 - 22	129	65.30	7.80	29.80
71	Range 17	7 - 17	132	45.00	5.52	21.30
70	Range 17	9 - 18	136	37.20	4.57	17.70
66	Range 16	15 - 25	137	34.00	4.13	15.60
63	Range 15	15 - 25	141	29.80	3.75	14.40
60	Range 14	11 - 20	142	33.40	4.05	15.20
54	Range 12	7 - 17	144	33.60	4.06	15.30
52	Range 11	7 - 17	146	68.80	8.31	33.50
50	Range 11	25 - 35	148	44.80	4.88	18.20
49	Range 11	7 - 14	152	57.00	6.68	25.20
38-A	Range 7	10-15	7	71.10	8.55	33.30
34	Range 6	13 - 23	10	77.00	9.34	35.80
Agriculture soil						
		Average		49.75	5.97	22.94
		Std deviation		17.15	2.05	8.17

		CV%		34.47	34.38	35.61
31	Range 5	18 - 28	14	93.80	10.90	41.30
32	Range 5	16 - 30	17	74.70	9.91	37.20
28	Range 4	20 - 35	22	72.90	9.49	37.50
29	Range 4	15 - 30	19	82.10	9.59	36.50
25	Rang 3	27 - 34	27	75.50	8.61	33.20
26	Rang 3	7 - 20	30	81.30	9.36	35.70
27	Rang 3	7 - 27	26	78.90	10.30	38.90
22	Range 2	7 - 27	35	76.80	9.92	36.30
19	Range 1	7 - 17	42	69.20	8.94	35.60
21	Range 1	17 - 21	36	72.50	8.24	31.60
Agriculture soil						
Average						
Std deviation						
CV%						
77.77						
9.53						
36.38						
6.91						
0.79						
2.72						
8.89						
8.32						
7.47						

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe ₂ O ₃				
MnO				
MgO				
CaO				
Na ₂ O				
K ₂ O				
TiO ₂				
P ₂ O ₅				
LO				
Sc				
V				
Co				
Ga				
Rb				
Sr				
Y				
Zr				
Nb				
Cs				
Ba				
La	Ce			
Ce	1.00	Pr		
Pr	0.99	1.00	Nd	
Nd	0.98	1.00	1.00	
Sm	0.97	0.99	1.00	
Eu	0.94	0.96	0.97	
Gd	0.96	0.98	0.99	
Tb	0.94	0.97	0.98	

Dy	0.95	0.97	0.98
Ho	0.94	0.97	0.97
Er	0.94	0.96	0.97
Tm	0.96	0.97	0.98
Yb	0.95	0.96	0.97
Lu	0.93	0.95	0.96
Hf	0.94	0.92	0.92
Ta	0.90	0.90	0.90
W	-0.80	-0.82	-0.83
Th	0.96	0.97	0.96
U	0.85	0.89	0.88

Core Sample No		Depth (cm)	Sample ID	Sm	Eu	Gd
				ppm	ppm	ppm
15	Range 28	7 - 15	93	2.60	0.71	1.90
1	Range 24	14 - 20	122	3.20	0.84	2.80
3	Range 24	7 - 17	119	4.80	1.02	3.90
4	Range 25	18-22	179	2.80	0.80	2.20
5	Range 25	24 - 30	113	3.10	0.82	2.50
Agriculture soil						
		Average		3.30	0.84	2.66
		Std deviation		0.87	0.11	0.77
		CV%		26.42	13.51	28.95
71-A	Range 17	18 - 22	129	5.70	1.14	4.70
71	Range 17	7 - 17	132	4.20	1.01	3.40
70	Range 17	9 - 18	136	3.50	0.91	2.90
66	Range 16	15 - 25	137	3.10	0.79	2.70
63	Range 15	15 - 25	141	2.90	0.77	2.50
60	Range 14	11 - 20	142	3.10	0.81	2.60
54	Range 12	7 - 17	144	3.10	0.83	2.70
52	Range 11	7 - 17	146	7.20	1.79	6.70
50	Range 11	25 - 35	148	3.70	0.92	3.00
49	Range 11	7 - 14	152	4.90	1.12	4.00
38-A	Range 7	10-15	7	7.00	1.55	6.20
34	Range 6	13 - 23	10	7.60	1.64	6.70
Agriculture soil						
		Average		4.67	1.11	4.01

		Std deviation		1.77	0.36	1.65
		CV%		38.00	32.35	41.25
31	Range 5	18 - 28	14	8.50	1.61	7.10
32	Range 5	16 - 30	17	7.80	1.60	7.30
28	Range 4	20 - 35	22	7.90	1.62	6.90
29	Range 4	15 - 30	19	7.50	1.59	6.70
25	Rang 3	27 - 34	27	7.00	1.60	6.30
26	Rang 3	7 - 20	30	7.40	1.52	6.60
27	Rang 3	7 - 27	26	8.30	1.68	7.20
22	Range 2	7 - 27	35	7.60	1.56	7.00
19	Range 1	7 - 17	42	7.50	1.57	6.90
21	Range 1	17 - 21	36	6.60	1.43	5.60

Agriculture soil			
Average		7.61	1.58
Std deviation		0.56	0.07
CV%		7.39	4.22

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al ₂ O ₃			
Fe ₂ O ₃			
MnO			
MgO			
CaO			
Na ₂ O			
K ₂ O			
TiO ₂			
P ₂ O ₅			
LO			
Sc			
V			
Co			
Ga			
Rb			
Sr			
Y			
Zr			
Nb			
Cs			
Ba			
La			
Ce			
Pr			
Nd	Sm		
Sm	1.00	Eu	
Eu	0.98	1.00	Gd
Gd	1.00	0.99	1.00

Tb	0.99	0.99	1.00
Dy	0.99	0.99	1.00
Ho	0.98	0.98	0.99
Er	0.99	0.99	1.00
Tm	0.99	0.99	0.99
Yb	0.98	0.99	0.99
Lu	0.98	0.99	0.99
Hf	0.91	0.92	0.91
Ta	0.92	0.89	0.92
W	-0.86	-0.89	-0.89
Th	0.96	0.90	0.94
U	0.89	0.84	0.89

Core Sample No		Depth (cm)	Sample ID	Tb	Dy	Ho
				ppm	ppm	ppm
15	Range 28	7 - 15	93	0.30	1.70	0.30
1	Range 24	14 - 20	122	0.40	2.50	0.50
3	Range 24	7 - 17	119	0.60	3.50	0.70
4	Range 25	18-22	179	0.40	2.00	0.40
5	Range 25	24 - 30	113	0.40	2.20	0.40
Agriculture soil						
		Average		0.42	2.38	0.46
		Std deviation		0.11	0.69	0.15
		CV%		26.08	29.02	32.97
71-A	Range 17	18 - 22	129	0.70	4.00	0.80
71	Range 17	7 - 17	132	0.50	3.00	0.50
70	Range 17	9 - 18	136	0.50	2.50	0.50
66	Range 16	15 - 25	137	0.40	2.50	0.50
63	Range 15	15 - 25	141	0.40	2.30	0.50
60	Range 14	11 - 20	142	0.40	2.40	0.50
54	Range 12	7 - 17	144	0.40	2.50	0.50
52	Range 11	7 - 17	146	1.10	6.30	1.20
50	Range 11	25 - 35	148	0.50	2.80	0.50
49	Range 11	7 - 14	152	0.60	3.80	0.70
38-A	Range 7	10-15	7	1.00	5.40	1.10
34	Range 6	13 - 23	10	1.10	6.00	1.20
Agriculture soil						
		Average		0.63	3.63	0.71

		Std deviation		0.28	1.48	0.29
		CV%		43.81	40.95	41.47
31	Range 5	18 - 28	14	1.10	6.20	1.20
32	Range 5	16 - 30	17	1.20	6.60	1.30
28	Range 4	20 - 35	22	1.10	6.10	1.20
29	Range 4	15 - 30	19	1.00	5.80	1.20
25	Rang 3	27 - 34	27	1.00	5.60	1.20
26	Rang 3	7 - 20	30	1.00	5.80	1.10
27	Rang 3	7 - 27	26	1.10	6.40	1.30
22	Range 2	7 - 27	35	1.10	6.30	1.20
19	Range 1	7 - 17	42	1.10	6.10	1.10
21	Range 1	17 - 21	36	0.90	5.20	1.00
Agriculture soil						
		Average		1.06	6.01	1.18
		Std deviation		0.08	0.41	0.09
		CV%		7.96	6.90	7.79

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃
Fe₂O₃
MnO
MgO
CaO
Na₂O
K₂O
TiO₂
P₂O₅
LO
Sc
V
Co
Ga
Rb
Sr
Y
Zr
Nb
Cs
Ba
La
Ce
Pr
Nd
Sm
Eu
Gd Tb

Tb	1.00	Dy	
Dy	1.00	1.00	Ho
Ho	0.99	0.99	1.00
Er	0.99	1.00	0.99
Tm	0.99	1.00	0.99
Yb	0.99	1.00	0.99
Lu	0.99	1.00	0.99
Hf	0.90	0.91	0.92
Ta	0.90	0.92	0.92
W	-0.90	-0.90	-0.90
Th	0.92	0.93	0.93
U	0.88	0.87	0.88

Core Sample No		Depth (cm)	Sample ID	Er	Tm	Yb
				ppm	ppm	ppm
15	Range 28	7 - 15	93	1.00	0.14	0.90
1	Range 24	14 - 20	122	1.40	0.21	1.40
3	Range 24	7 - 17	119	2.00	0.30	2.00
4	Range 25	18-22	179	1.10	0.16	1.10
5	Range 25	24 - 30	113	1.20	0.18	1.20
Agriculture soil						
				1.34	0.20	1.32
				0.40	0.06	0.42
				29.66	31.62	31.87
71-A	Range 17	18 - 22	129	2.20	0.34	2.20
71	Range 17	7 - 17	132	1.60	0.23	1.60
70	Range 17	9 - 18	136	1.40	0.22	1.50
66	Range 16	15 - 25	137	1.50	0.22	1.50
63	Range 15	15 - 25	141	1.40	0.20	1.30
60	Range 14	11 - 20	142	1.30	0.20	1.40
54	Range 12	7 - 17	144	1.50	0.22	1.40
52	Range 11	7 - 17	146	3.60	0.53	3.60
50	Range 11	25 - 35	148	1.50	0.23	1.60
49	Range 11	7 - 14	152	2.10	0.32	2.00
38-A	Range 7	10-15	7	3.00	0.46	3.00
34	Range 6	13 - 23	10	3.40	0.52	3.40
Agriculture soil						
				2.04	0.31	2.04
				0.83	0.13	0.83

		CV%		40.90	41.28	40.63
31	Range 5	18 - 28	14	3.40	0.53	3.40
32	Range 5	16 - 30	17	3.60	0.52	3.60
28	Range 4	20 - 35	22	3.30	0.49	3.30
29	Range 4	15 - 30	19	3.20	0.51	3.30
25	Rang 3	27 - 34	27	3.20	0.48	3.30
26	Rang 3	7 - 20	30	3.30	0.50	3.30
27	Rang 3	7 - 27	26	3.60	0.54	3.40
22	Range 2	7 - 27	35	3.50	0.51	3.50
19	Range 1	7 - 17	42	3.40	0.47	3.30
21	Range 1	17 - 21	36	2.90	0.45	3.00

Agriculture soil

Average

3.34

3.34

Std deviation

0.21

0.03

CV%

6.34

0.16

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃
MnO
MgO
CaO
Na₂O
K₂O
TiO₂
P₂O₅
LO
Sc
V
Co
Ga
Rb
Sr
Y
Zr
Nb
Cs
Ba
La
Ce
Pr
Nd
Sm
Eu
Gd
Tb

Dy			
Ho	Er		
Er	1.00	Tm	
Tm	1.00	1.00	Yb
Yb	1.00	1.00	1.00
Lu	1.00	0.99	0.99
Hf	0.91	0.93	0.92
Ta	0.92	0.92	0.92
W	-0.90	-0.89	-0.90
Th	0.93	0.94	0.93
U	0.86	0.87	0.85

Core Sample No		Depth (cm)	Sample ID	Lu	Hf	Ta
15	Range 28	7 - 15	93	0.15	2.30	0.20
1	Range 24	14 - 20	122	0.26	3.00	0.50
3	Range 24	7 - 17	119	0.33	3.40	0.60
4	Range 25	18-22	179	0.17	2.70	0.30
5	Range 25	24 - 30	113	0.19	2.80	0.30
Agriculture soil						
		Average		0.22	2.84	0.38
		Std deviation		0.07	0.40	0.16
		CV%		33.71	14.22	43.24
71-A	Range 17	18 - 22	129	0.37	4.20	0.70
71	Range 17	7 - 17	132	0.26	3.40	0.60
70	Range 17	9 - 18	136	0.23	2.80	0.50
66	Range 16	15 - 25	137	0.24	2.70	0.60
63	Range 15	15 - 25	141	0.23	2.40	0.60
60	Range 14	11 - 20	142	0.23	2.80	0.70
54	Range 12	7 - 17	144	0.25	2.60	0.70
52	Range 11	7 - 17	146	0.62	4.80	0.90
50	Range 11	25 - 35	148	0.25	3.10	0.80
49	Range 11	7 - 14	152	0.34	4.00	1.00
38-A	Range 7	10-15	7	0.51	5.00	1.20
34	Range 6	13 - 23	10	0.53	4.70	1.10
Agriculture soil						
		Average		0.34	3.54	0.78
		Std deviation		0.14	0.95	0.22

		CV%		41.15	26.80	28.20
31	Range 5	18 - 28	14	0.54	4.90	1.40
32	Range 5	16 - 30	17	0.59	5.00	1.20
28	Range 4	20 - 35	22	0.57	3.90	1.20
29	Range 4	15 - 30	19	0.52	5.40	1.30
25	Rang 3	27 - 34	27	0.51	5.10	1.20
26	Rang 3	7 - 20	30	0.54	5.10	1.40
27	Rang 3	7 - 27	26	0.56	4.70	1.30
22	Range 2	7 - 27	35	0.57	4.90	1.30
19	Range 1	7 - 17	42	0.56	3.60	1.20
21	Range 1	17 - 21	36	0.47	4.80	1.10
Agriculture soil						
	Average			0.54	4.74	1.26
	Std deviation			0.04	0.56	0.10
	CV%			6.50	11.82	7.67

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃
MnO
MgO
CaO
Na₂O
K₂O
TiO₂
P₂O₅
LO
Sc
V
Co
Ga
Rb
Sr
Y
Zr
Nb
Cs
Ba
La
Ce
Pr
Nd
Sm
Eu
Gd
Tb

Dy			
Ho			
Er			
Tm			
Yb	Lu		
Lu	1.00	Hf	
Hf	0.90	1.00	Ta
Ta	0.91	0.87	1.00
W	-0.90	-0.79	-0.88
Th	0.91	0.91	0.94
U	0.84	0.77	0.85

Core Sample No		Depth (cm)	Sample ID	W ppm	Th ppm	U ppm
15	Range 28	7 - 15	93	1400.00	3.80	0.80
1	Range 24	14 - 20	122	941.00	4.60	1.20
3	Range 24	7 - 17	119	1430.00	7.50	1.60
4	Range 25	18-22	179	958.00	4.00	1.00
5	Range 25	24 - 30	113	1330.00	4.80	1.00
Agriculture soil						
		Average		1211.80	4.94	1.12
		Std deviation		242.25	1.49	0.30
		CV%		19.99	30.15	27.08
71-A	Range 17	18 - 22	129	1350.00	8.60	1.90
71	Range 17	7 - 17	132	1270.00	5.80	1.40
70	Range 17	9 - 18	136	999.00	4.50	1.30
66	Range 16	15 - 25	137	1070.00	5.10	1.40
63	Range 15	15 - 25	141	937.00	4.90	1.40
60	Range 14	11 - 20	142	836.00	5.20	1.50
54	Range 12	7 - 17	144	1000.00	5.10	1.40
52	Range 11	7 - 17	146	172.00	7.90	2.80
50	Range 11	25 - 35	148	985.00	6.50	1.80
49	Range 11	7 - 14	152	942.00	7.30	1.80
38-A	Range 7	10-15	7	371.00	9.40	9.20
34	Range 6	13 - 23	10	233.00	8.80	9.10
Agriculture soil						
		Average		847.08	6.59	2.92

		Std deviation		384.20	1.74	2.94
		CV%		45.36	26.38	100.80
31	Range 5	18 - 28	14	227.00	12.90	12.40
32	Range 5	16 - 30	17	77.00	10.80	12.60
28	Range 4	20 - 35	22	341.00	9.80	9.70
29	Range 4	15 - 30	19	240.00	11.20	9.20
25	Rang 3	27 - 34	27	185.00	10.00	5.70
26	Rang 3	7 - 20	30	224.00	11.40	6.40
27	Rang 3	7 - 27	26	153.00	11.80	12.20
22	Range 2	7 - 27	35	85.00	12.00	8.00
19	Range 1	7 - 17	42	125.00	9.60	7.30
21	Range 1	17 - 21	36	347.00	9.60	4.70
Agriculture soil						
		Average		200.40	10.91	8.82
		Std deviation		94.75	1.14	2.89
		CV%		47.28	10.48	32.73

R^2 (n=27)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃
Fe₂O₃
MnO
MgO
CaO
Na₂O
K₂O
TiO₂
P₂O₅
LO
Sc
V
Co
Ga
Rb
Sr
Y
Zr
Nb
Cs
Ba
La
Ce
Pr
Nd
Sm
Eu
Gd

Tb			
Dy			
Ho			
Er			
Tm			
Yb			
Lu			
Hf			
Ta	W		
W	1.00	Th	
Th	-0.80	1.00	U
U	-0.83	0.87	1.00

5e Processed Cores 30-120cm Core Sample Data

Core Sample No		Depth (cm)	Sample ID	$\delta^{13}\text{C}_{\text{VPDB}}$	C%	$\delta^{15}\text{N}_{\text{air}}$	N%	C/N	Sc46 mg/g
				1000		1000		(molar ratio)	
2	Range 24	67 - 71	121	-24.6	0.1805	4.14	0.0152	13.9	0.020
3	Range 24	33 - 43	118	-24.35	0.1233	3.94	0.012	12.0	0.016
5	Range 25	46 - 50	112	-25.32	0.1365	3.12	0.0108	14.7	ND
15	Range 28	27 - 37	92	-25	0.1329	3.28	0.01	15.5	ND
Agriculture soil									
Average				-24.82	0.15	3.73	0.01	13.53	0.02
Std deviation				0.43	0.03	0.54	0.00	1.41	0.00
CV%				-1.73	20.41	14.48	17.96	10.40	15.71
38-A	Range 7	45 - 50	5	-26.155	6.1622	3.195	0.47195	15.2	0.026
40	Range 8	55-64	178	-20.95	0.1066	3.71	0.0188	6.6	0.015
46	Range 10	40 - 47	156	-22.19	0.0917	4.54	0.0092	11.6	0.006
54	Range 12	108 - 114	143	-26.18	0.6482	5.18	0.0452	16.7	0.014
60	Range 14	55 - 70	167	-24.18	0.7518	3.73	0.0336	26.1	0.009
62	Range 15	76-81	176	-20.77	0.0613	6.42	0.0071	10.1	0.012
65	Range 16	50 - 57	140	-21.7	0.0627	4.01	0.0065	11.3	0.012
70	Range 17	30 - 35	135	-24.48	0.0943	2.54	0.0115	9.6	0.027
71	Range 17	48 - 52	131	-26.1	1.9602	5.12	0.1645	13.9	0.019
71-A	Range 17	36 - 38	128	-24.46	0.2127	2.64	0.0248	10.0	0.033

			Agriculture soil							
			Average		-23.72	1.02	4.11	0.08	13.11	0.02
			Std deviation		2.15	1.90	1.22	0.15	5.44	0.01
			CV%		-9.08	187.41	29.77	183.83	41.49	50.54
19	Range 1	72 - 82	41	-26.47	2.9559	3.615	0.2417	14.3	0.024	
20	Range 1	15 - 55	39	-26.34	4.3656	2.44	0.3356	15.2	0.022	
28	Range 4	60 - 75	21	-26.33	5.9985	4.15	0.4344	16.1	0.018	
			Agriculture soil							
			Average		-26.38	4.44	3.40	0.34	15.18	0.02
			Std deviation		0.08	1.52	0.87	0.10	0.92	0.00
			CV%		-0.30	34.29	25.71	28.57	6.07	14.32
R^2 (n=17)			$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$							
			$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	1.00	C%					
			C%	-0.60	1.00					
			$\delta^{15}\text{N}_{\text{air}} \times 1000$	0.35	-0.19	1.00	N%			
			N%	-0.60	1.00	-0.19	1.00	C/N		
			C/N	-0.50	0.29	-0.03	0.25	1.00	Sc46	
			Sc46	-0.52	0.33	-0.63	0.36	-0.23	1.00	
			La140	0.17	-0.13	-0.16	-0.11	-0.53	0.46	
			SiO ₂	0.55	-0.96	0.18	-0.97	-0.11	-0.41	
			Al ₂ O ₃	0.20	0.24	-0.06	0.27	-0.44	0.35	
			Fe ₂ O ₃	-0.55	0.86	-0.21	0.87	0.12	0.47	
			MnO	-0.47	0.79	-0.18	0.81	0.17	0.38	
			MgO	-0.22	0.69	-0.20	0.71	-0.03	0.31	

CaO	0.16	0.13	-0.21	0.14	-0.18	0.20
Na ₂ O	0.76	-0.89	0.11	-0.90	-0.32	-0.31
K ₂ O	0.75	-0.80	0.23	-0.82	-0.21	-0.54
TiO ₂	-0.49	0.76	-0.11	0.78	0.10	0.42
P ₂ O ₅	-0.58	0.94	-0.23	0.95	0.17	0.43
LO	-0.63	0.99	-0.16	0.99	0.22	0.37
Sc	-0.49	0.86	-0.16	0.87	0.12	0.42
V	-0.44	0.78	-0.14	0.79	0.13	0.36
Co	0.36	-0.67	-0.03	-0.68	-0.09	-0.17
Ga	-0.49	0.84	-0.21	0.85	0.08	0.43
Rb	0.27	0.09	0.30	0.09	-0.01	-0.46
Sr	0.68	-0.88	-0.01	-0.88	-0.37	-0.23
Y	-0.57	0.87	-0.20	0.88	0.14	0.41
Zr	-0.27	0.31	-0.06	0.34	-0.13	0.27
Nb	-0.14	0.63	-0.12	0.65	0.00	0.01
Cs	-0.44	0.83	-0.15	0.84	0.10	0.20
Ba	0.70	-0.88	0.16	-0.89	-0.25	-0.38
La	-0.45	0.60	-0.10	0.61	0.10	0.25
Ce	-0.46	0.60	-0.12	0.61	0.09	0.27
Pr	-0.49	0.65	-0.14	0.66	0.10	0.31
Nd	-0.51	0.68	-0.15	0.68	0.10	0.33
Sm	-0.53	0.73	-0.15	0.74	0.11	0.35
Eu	-0.51	0.70	-0.09	0.70	0.13	0.30
Gd	-0.54	0.75	-0.13	0.75	0.13	0.34
Tb	-0.51	0.73	-0.11	0.74	0.13	0.30
Dy	-0.52	0.73	-0.10	0.74	0.13	0.32
Ho	-0.53	0.75	-0.11	0.76	0.13	0.33
Er	-0.54	0.76	-0.11	0.76	0.14	0.33

Tm	-0.55	0.77	-0.11	0.78	0.15	0.34
Yb	-0.56	0.80	-0.12	0.81	0.16	0.34
Lu	-0.57	0.80	-0.12	0.81	0.18	0.35
Hf	-0.33	0.49	-0.14	0.52	-0.09	0.33
Ta	-0.05	0.54	0.15	0.55	0.07	-0.26
W	0.46	-0.76	0.00	-0.78	-0.15	-0.02
Th	-0.41	0.58	-0.96	0.58	0.08	0.23
U	-0.52	0.95	-0.28	0.95	0.18	0.32

Core Sample No		Depth (cm)	Sample ID	La140 mg/g	SiO ₂ %	Al ₂ O ₃ %	Fe ₂ O ₃ (T) %	MnO %	MgO %	CaO %
2	Range 24	67 - 71	121	0.002	69.26	13.32	4.74	0.07	1.39	3.26
3	Range 24	33 - 43	118	ND	69.93	12.98	5.08	0.08	1.48	3.42
5	Range 25	46 - 50	112	0.028	71.26	12.51	3.46	0.05	1.01	2.71
15	Range 28	27 - 37	92	0.020	74.73	11.55	2.56	0.04	0.76	2.23
Agriculture soil										
		Average		0.02	70.15	12.94	4.43	0.07	1.29	3.13
		Std deviation		0.02	1.02	0.41	0.85	0.02	0.25	0.37
		CV%		122.57	1.45	3.14	19.30	26.93	19.29	11.90
38-A	Range 7	45 - 50	5	0.042	51.84	13.48	8.30	0.17	1.92	3.65
40	Range 8	55-64	178	0.041	66.90	13.37	4.97	0.07	1.86	3.76
46	Range 10	40 - 47	156	0.050	70.50	13.50	3.95	0.06	1.43	3.02
54	Range 12	108 - 114	143	0.022	70.04	11.74	4.49	0.07	1.24	2.86
60	Range 14	55 - 70	167	0.013	71.86	12.51	4.16	0.07	1.41	3.20
62	Range 15	76-81	176	0.058	71.16	13.21	3.37	0.05	1.21	2.74
65	Range 16	50 - 57	140	ND	71.43	12.79	3.46	0.06	1.17	2.72
70	Range 17	30 - 35	135	0.136	71.17	13.00	3.90	0.06	1.24	3.05
71	Range 17	48 - 52	131	0.048	62.68	13.47	5.46	0.09	1.29	2.46
71-A	Range 17	36 - 38	128	0.100	69.05	13.57	4.49	0.06	1.42	3.23
Agriculture soil										
		Average		0.06	67.66	13.06	4.66	0.08	1.42	3.07
		Std deviation		0.04	6.22	0.58	1.43	0.03	0.27	0.41
		CV%		67.95	9.19	4.45	30.78	43.63	18.68	13.33

19	Range 1	72 - 82	41	0.045	57.12	12.96	7.12	0.10	1.99	3.18
20	Range 1	15 - 55	39	0.002	55.83	13.47	6.68	0.10	1.92	2.72
28	Range 4	60 - 75	21	0.057	53.15	12.87	6.32	0.08	1.84	2.94

Agriculture soil

Average	0.03	55.37	13.10	6.71	0.09	1.92	2.95
Std deviation	0.03	2.03	0.32	0.40	0.01	0.08	0.23
CV%	83.42	3.66	2.47	5.97	10.19	3.92	7.81

R² (n=17)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46 La140

La140 1.00 SiO₂

SiO₂ 0.77 1.00 Al₂O₃

Al₂O₃ 0.28 -0.41 1.00 Fe₂O₃(T)

Fe₂O₃ -0.11 -0.94 0.46 1.00 MnO

MnO -0.13 -0.82 0.40 0.92 1.00 MgO

MgO -0.05 -0.83 0.57 0.88 0.71 1.00 CaO

CaO 0.14 -0.25 0.46 0.47 0.46 0.64 1.00

Na₂O 0.26 0.89 -0.07 -0.81 -0.71 -0.59 0.08

K₂O 0.09 0.86 -0.27 -0.92 -0.85 -0.69 -0.36

TiO₂ -0.06 -0.87 0.51 0.96 0.89 0.85 0.51

P₂O₅ -0.11 -0.96 0.41 0.95 0.92 0.78 0.32

LO	-0.13	-0.98	0.28	0.88	0.78	0.71	0.09
Sc	-0.09	-0.94	0.48	0.99	0.92	0.89	0.48
V	-0.15	-0.86	0.47	0.97	0.92	0.88	0.61
Co	0.00	0.76	-0.50	-0.78	-0.69	-0.72	-0.26
Ga	-0.01	-0.89	0.33	0.85	0.76	0.72	0.30
Rb	-0.24	-0.05	-0.09	0.85	-0.23	-0.10	-0.61
Sr	0.29	0.88	-0.11	-0.20	-0.71	-0.60	0.09
Y	0.00	-0.92	0.45	-0.80	0.84	0.82	0.35
Zr	0.26	-0.46	0.58	0.94	0.53	0.54	0.40
Nb	-0.21	-0.72	0.53	0.60	0.71	0.82	0.35
Cs	-0.19	-0.88	0.37	0.76	0.56	0.75	-0.01
Ba	0.14	0.94	-0.30	-0.92	-0.76	-0.78	-0.21
La	0.09	-0.67	0.09	0.61	0.34	0.64	0.15
Ce	0.10	-0.69	0.12	0.63	0.36	0.66	0.17
Pr	0.11	-0.73	0.15	0.68	0.42	0.68	0.18
Nd	0.11	-0.75	0.18	0.71	0.45	0.70	0.20
Sm	0.09	-0.80	0.21	0.76	0.51	0.74	0.21
Eu	0.05	-0.76	0.13	0.70	0.46	0.68	0.16
Gd	0.06	-0.82	0.20	0.77	0.54	0.74	0.22
Tb	0.07	-0.80	0.18	0.76	0.52	0.74	0.22
Dy	0.06	-0.80	0.18	0.76	0.53	0.73	0.21
Ho	0.05	-0.82	0.19	0.77	0.54	0.73	0.20
Er	0.05	-0.83	0.19	0.79	0.56	0.74	0.22
Tm	0.05	-0.84	0.21	0.81	0.60	0.76	0.24
Yb	0.03	-0.87	0.23	0.83	0.63	0.77	0.25
Lu	0.04	-0.87	0.24	0.85	0.65	0.77	0.26
Hf	0.09	-0.63	0.58	0.76	0.75	0.66	0.46
Ta	-0.17	-0.64	0.51	0.64	0.52	0.78	0.25
W	0.09	0.84	-0.46	-0.84	-0.75	-0.74	-0.22

				Th	0.11	-0.66	0.10	0.59	0.31	0.64	0.15
Core Sample No		Depth (cm)	Sample ID	U	-0.15	-0.94	0.33	0.85	0.74	0.77	0.14
2	Range 24	67 - 71	121	2.88	2.09	0.76	0.15	2.38	12.00	114.00	
3	Range 24	33 - 43	118	2.97	2.12	0.91	0.13	1.64	12.00	122.00	
5	Range 25	46 - 50	112	2.93	2.31	0.51	0.09	1.63	8.00	75.00	
15	Range 28	27 - 37	92	2.71	2.61	0.37	0.07	1.13	7.00	56.00	
Agriculture soil											
				Average	2.93	2.17	0.73	0.12	1.88	10.67	103.67
				Std deviation	0.05	0.12	0.20	0.03	0.43	2.31	25.15
				CV%	1.54	5.49	27.48	24.77	22.84	21.65	24.26
38-A	Range 7	45 - 50	5	1.86	1.43	1.27	0.36	16.01	21.00	189.00	
40	Range 8	55-64	178	3.04	2.28	0.87	0.13	1.53	13.00	128.00	
46	Range 10	40 - 47	156	2.97	2.63	0.66	0.12	1.32	11.00	94.00	
54	Range 12	108 - 114	143	2.42	2.13	0.72	0.13	3.10	11.00	104.00	
60	Range 14	55 - 70	167	2.98	2.37	0.73	0.11	1.01	11.00	107.00	
62	Range 15	76-81	176	3.17	2.72	0.53	0.08	1.30	9.00	76.00	
65	Range 16	50 - 57	140	3.02	2.67	0.54	0.10	1.32	9.00	78.00	
70	Range 17	30 - 35	135	3.03	2.30	0.65	0.12	1.17	10.00	85.00	
71	Range 17	48 - 52	131	2.08	1.85	1.04	0.19	7.90	14.00	122.00	
71-A	Range 17	36 - 38	128	3.09	2.29	0.72	0.12	1.90	11.00	97.00	
Agriculture soil											
				Average	2.77	2.27	0.77	0.15	3.66	12.00	108.00
				Std deviation	0.47	0.40	0.23	0.08	4.81	3.53	33.24

		CV%		16.94	17.43	29.68	55.00	131.55	29.40	30.78
19	Range 1	72 - 82	41	1.85	1.73	1.09	0.22	10.75	18.00	150.00
20	Range 1	15 - 55	39	1.82	1.97	0.97	0.26	13.38	16.00	133.00
28	Range 4	60 - 75	21	1.83	1.78	0.99	0.26	16.09	16.00	136.00
Agriculture soil										
	Average			1.83	1.83	1.02	0.25	13.41	16.67	139.67
	Std deviation			0.02	0.13	0.06	0.02	2.67	1.15	9.07
	CV%			0.83	6.93	6.28	9.36	19.92	6.93	6.50

R² (n=17)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO Na₂O

Na₂O 1.00 K₂O

K₂O 0.82 1.00 TiO₂

TiO ₂	-0.74	-0.91	1.00	P ₂ O ₅			
P ₂ O ₅	-0.86	-0.89	0.89	1.00	LOI		
LO	-0.94	-0.83	0.79	0.95	1.00	Sc	
Sc	-0.81	-0.90	0.96	0.95	0.88	1.00	V
V	-0.71	-0.90	0.97	0.91	0.79	0.97	1.00
Co	0.68	0.67	-0.76	-0.77	-0.71	-0.78	-0.73
Ga	-0.77	-0.80	0.78	0.84	0.86	0.86	0.79
Rb	-0.15	0.39	-0.39	-0.09	0.11	-0.15	-0.30
Sr	0.97	0.77	-0.74	-0.84	-0.91	-0.80	-0.70
Y	-0.81	-0.87	0.94	0.91	0.89	0.92	0.89
Zr	-0.26	-0.58	0.76	0.48	0.36	0.59	0.63
Nb	-0.60	-0.50	0.72	0.72	0.65	0.78	0.74
Cs	-0.84	-0.60	0.67	0.78	0.87	0.75	0.63
Ba	0.91	0.92	-0.89	-0.89	-0.92	-0.90	-0.85
La	-0.65	-0.57	0.56	0.52	0.65	0.62	0.53
Ce	-0.65	-0.59	0.59	0.54	0.65	0.64	0.55
Pr	-0.69	-0.64	0.64	0.59	0.70	0.68	0.59
Nd	-0.71	-0.67	0.67	0.62	0.72	0.71	0.62
Sm	-0.75	-0.72	0.72	0.68	0.77	0.76	0.67
Eu	-0.74	-0.67	0.65	0.63	0.74	0.71	0.62
Gd	-0.77	-0.73	0.72	0.70	0.79	0.77	0.69
Tb	-0.76	-0.71	0.71	0.69	0.77	0.76	0.68
Dy	-0.76	-0.72	0.71	0.69	0.78	0.76	0.68
Ho	-0.77	-0.73	0.72	0.70	0.80	0.77	0.69
Er	-0.78	-0.74	0.74	0.72	0.80	0.79	0.71
Tm	-0.79	-0.77	0.77	0.74	0.81	0.81	0.74
Yb	-0.81	-0.79	0.79	0.77	0.84	0.83	0.76
Lu	-0.81	0.80	0.81	0.78	0.84	0.85	0.78
Hf	-0.51	-0.72	0.88	0.68	0.53	0.76	0.80

Ta	-0.53	-0.40	0.68	0.58	0.57	0.67	0.64
W	0.77	0.75	-0.81	-0.84	-0.81	-0.84	-0.78
Th	-0.62	-0.54	0.54	0.50	0.63	0.59	0.50
U	-0.85	-0.72	0.74	0.91	0.95	0.83	0.75

Core Sample No		Depth (cm)	Sample ID	Co ppm	Ga ppm	Rb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm
2	Range 24	67 - 71	121	122.00	16.00	56.00	370.00	16.00	142.00	7.00
3	Range 24	33 - 43	118	162.00	16.00	54.00	401.00	29.00	217.00	8.00
5	Range 25	46 - 50	112	173.00	16.00	65.00	392.00	14.00	128.00	6.00
15	Range 28	27 - 37	92	283.00	15.00	71.00	374.00	10.00	105.00	5.00
Agriculture soil										
		Average		152.33	16.00	58.33	387.67	19.67	162.33	7.00
		Std deviation		26.84	0.00	5.86	15.95	8.14	47.86	1.00
		CV%		17.62	0.00	10.04	4.11	41.41	29.48	14.29
38-A	Range 7	45 - 50	5	49.00	21.00	59.00	255.00	38.00	188.00	15.00
40	Range 8	55-64	178	152.00	16.00	63.00	392.00	20.00	181.00	13.00
46	Range 10	40 - 47	156	97.00	15.00	74.00	382.00	18.00	181.00	13.00
54	Range 12	108 - 114	143	107.00	14.00	63.00	309.00	18.00	148.00	9.00
60	Range 14	55 - 70	167	146.00	15.00	63.00	358.00	19.00	155.00	10.00
62	Range 15	76-81	176	168.00	15.00	75.00	381.00	14.00	119.00	8.00
65	Range 16	50 - 57	140	110.00	16.00	78.00	366.00	14.00	130.00	9.00
70	Range 17	30 - 35	135	119.00	15.00	58.00	401.00	19.00	170.00	7.00
71	Range 17	48 - 52	131	75.00	17.00	67.00	268.00	29.00	236.00	11.00
71-A	Range 17	36 - 38	128	175.00	16.00	59.00	394.00	20.00	176.00	8.00
Agriculture soil										
		Average		119.80	16.00	65.90	350.60	20.90	168.40	10.30
		Std deviation		40.68	1.94	7.29	53.78	7.29	33.07	2.63
		CV%		33.96	12.15	11.07	15.34	34.90	19.64	25.50

19	Range 1	72 - 82	41	52.00	21.00	68.00	248.00	31.00	182.00	13.00
20	Range 1	15 - 55	39	51.00	17.00	74.00	245.00	34.00	172.00	17.00
28	Range 4	60 - 75	21	68.00	20.00	70.00	253.00	35.00	168.00	10.00

Agriculture soil

Average	57.00	19.33	70.67	248.67	33.33	174.00	13.33
Std deviation	9.54	2.08	3.06	4.04	2.08	7.21	3.51
CV%	16.74	10.77	4.32	1.63	6.24	4.14	26.34

R² (n=17)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

K₂O

TiO₂

P₂O₅

LO	Sc	V	Co	Ga	Rb	Sr	Y	Zr	Nb
		Co	1.00						
		Ga	-0.61	1.00					
		Rb	-0.08	-0.01	1.00				
		Sr	0.74	-0.74	-0.23	1.00			
		Y	-0.74	0.80	-0.15	-0.78	1.00		
		Zr	-0.53	0.37	-0.37	-0.33	0.70	1.00	
		Nb	-0.74	0.51	0.23	-0.65	0.70	0.50	1.00
		Cs	-0.73	0.68	0.38	-0.85	0.78	0.35	0.79
		Ba	0.78	-0.83	0.08	0.89	-0.92	-0.57	-0.65
		La	-0.49	0.77	0.10	-0.62	0.63	0.30	0.34
		Ce	-0.51	0.77	0.06	-0.62	0.66	0.35	0.36
		Pr	-0.54	0.81	0.04	-0.65	0.71	0.38	0.38
		Nd	-0.56	0.82	0.01	-0.67	0.74	0.42	0.40
		Sm	-0.61	0.85	0.01	-0.71	0.79	0.44	0.46
		Eu	-0.57	0.85	0.08	-0.71	0.69	0.32	0.40
		Gd	-0.63	0.87	0.03	-0.74	0.79	0.42	0.47
		Tb	-0.64	0.85	0.05	-0.73	0.77	0.41	0.47
		Dy	-0.62	0.87	0.04	-0.73	0.76	0.39	0.45
		Ho	-0.62	0.88	0.01	-0.74	0.78	0.40	0.46
		Er	-0.64	0.88	0.03	-0.76	0.79	0.42	0.48
		Tm	-0.66	0.88	0.00	-0.77	0.82	0.45	0.50
		Yb	-0.67	0.90	0.00	-0.78	0.84	0.46	0.52
		Lu	-0.69	0.90	-0.02	-0.79	0.86	0.49	0.53
		Hf	-0.62	0.51	-0.34	-0.49	0.80	0.94	0.67
		Ta	-0.77	0.39	0.29	-0.62	0.68	0.56	0.89
		W	0.98	-0.72	-0.08	0.82	-0.80	-0.49	-0.73

				Th	-0.50	0.74	0.11	-0.59	0.62	0.31	0.34
				U	-0.69	0.76	0.17	-0.83	0.87	0.33	0.74
Core Sample No		Depth (cm)	Sample ID	Cs	Ba	La	Ce	Pr	Nd	Sm	
				ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
2	Range 24	67 - 71	121	1.50	813.00	19.70	40.60	4.91	19.60	3.90	
3	Range 24	33 - 43	118	1.40	797.00	42.20	85.20	10.00	37.70	7.20	
5	Range 25	46 - 50	112	1.40	819.00	19.50	37.40	4.68	17.40	3.40	
15	Range 28	27 - 37	92	1.20	912.00	21.10	37.10	4.45	15.90	2.80	
Agriculture soil											
				Average	1.43	809.67	27.13	54.40	6.53	24.90	4.83
				Std deviation	0.06	11.37	13.05	26.72	3.01	11.14	2.06
				CV%	4.03	1.40	48.09	49.12	46.05	44.74	42.72
38-A	Range 7	45 - 50	5	3.10	655.00	37.80	69.10	9.32	36.10	7.90	
40	Range 8	55-64	178	2.20	808.00	31.00	60.10	6.61	24.40	4.80	
46	Range 10	40 - 47	156	2.30	851.00	28.00	53.30	5.82	21.60	4.30	
54	Range 12	108 - 114	143	1.70	785.00	21.90	43.10	4.89	19.00	4.00	
60	Range 14	55 - 70	167	1.50	819.00	25.70	49.00	5.78	21.70	4.20	
62	Range 15	76-81	176	1.80	899.00	18.10	34.80	4.24	16.10	3.30	
65	Range 16	50 - 57	140	1.90	886.00	20.00	37.40	4.55	17.00	3.30	
70	Range 17	30 - 35	135	1.40	840.00	31.50	62.90	7.49	28.30	5.30	
71	Range 17	48 - 52	131	2.90	689.00	32.70	63.90	7.99	31.60	6.40	
71-A	Range 17	36 - 38	128	1.60	833.00	28.00	55.70	6.77	25.80	5.10	
Agriculture soil											
				Average	2.04	806.50	27.47	52.93	6.35	24.16	4.86
				Std deviation	0.58	78.92	6.16	11.65	1.62	6.44	1.42

		CV%		28.51	9.79	22.41	22.02	25.45	26.66	29.28
19	Range 1	72 - 82	41	3.90	630.00	138.00	228.00	23.80	83.50	15.70
20	Range 1	15 - 55	39	5.40	661.00	43.90	84.50	9.88	38.00	8.00
28	Range 4	60 - 75	21	4.30	619.00	113.00	189.00	20.70	73.50	14.10
Agriculture soil										
	Average			4.53	636.67	98.30	167.17	18.13	65.00	12.60
	Std deviation			0.78	21.78	48.74	74.20	7.31	23.91	4.06
	CV%			17.13	3.42	49.58	44.39	40.32	36.79	32.25

R² (n=17)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

K₂O

TiO₂

P₂O₅

LO

Sc

V

Co

Ga

Rb

Sr

Y

Zr

Nb

Cs

Cs

1.00

Ba

Ba

-0.83

1.00

La

La

0.65

-0.73

1.00

Ce

Ce

0.66

-0.75

1.00

Pr

Pr

0.68

-0.78

0.99

1.00

1.00

Nd

Nd

0.70

-0.81

0.99

0.99

1.00

Sm

Sm

0.74

-0.85

0.97

0.98

0.99

1.00

Eu

0.70

-0.81

0.99

0.98

0.99

0.98

Gd

0.74

-0.86

0.97

0.98

0.99

0.99

Tb

0.74

-0.85

0.98

0.98

0.99

0.99

Dy

0.72

-0.84

0.98

0.98

0.99

0.99

Ho

0.74

-0.85

0.97

0.97

0.99

0.99

Er

0.74

-0.87

0.97

0.97

0.98

0.99

Tm

0.74

-0.88

0.95

0.96

0.97

0.98

Yb

0.76

-0.90

0.94

0.95

0.97

0.99

Lu

0.75

-0.90

0.92

0.93

0.95

0.97

Hf

0.47

-0.68

0.29

0.33

0.37

0.41

0.46

Ta	-0.78	-0.63	0.41	0.43	0.44	0.46	0.50
W	-0.79	0.86	-0.57	-0.58	-0.61	-0.64	-0.68
Th	0.65	-0.71	1.00	1.00	0.99	0.98	0.97
U	0.92	-0.85	0.57	0.59	0.63	0.65	0.71

Core Sample No		Depth (cm)	Sample ID	Eu	Gd	Tb	Dy	Ho	Er	Tm
				ppm						
2	Range 24	67 - 71	121	1.03	3.50	0.50	3.10	0.60	1.70	0.26
3	Range 24	33 - 43	118	1.30	6.00	0.90	5.20	1.00	2.90	0.44
5	Range 25	46 - 50	112	0.87	2.90	0.40	2.50	0.50	1.40	0.21
15	Range 28	27 - 37	92	0.81	2.10	0.30	1.90	0.40	1.10	0.15
Agriculture soil										
		Average		1.07	4.13	0.60	3.60	0.70	2.00	0.30
		Std deviation		0.22	1.64	0.26	1.42	0.26	0.79	0.12
		CV%		20.37	39.78	44.10	39.38	37.80	39.69	39.88
38-A	Range 7	45 - 50	5	1.91	7.70	1.20	7.10	1.40	4.10	0.62
40	Range 8	55-64	178	1.13	4.10	0.70	3.70	0.70	2.10	0.31
46	Range 10	40 - 47	156	1.01	3.60	0.60	3.20	0.60	1.80	0.27
54	Range 12	108 - 114	143	1.03	3.60	0.60	3.40	0.60	2.00	0.30
60	Range 14	55 - 70	167	0.98	3.60	0.60	3.30	0.60	1.90	0.29
62	Range 15	76-81	176	0.83	2.70	0.40	2.60	0.50	1.40	0.21
65	Range 16	50 - 57	140	0.88	3.00	0.50	2.60	0.50	1.50	0.22
70	Range 17	30 - 35	135	1.08	4.40	0.70	3.70	0.70	2.10	0.31
71	Range 17	48 - 52	131	1.47	5.70	0.90	5.10	1.00	3.00	0.44
71-A	Range 17	36 - 38	128	1.10	4.10	0.60	3.70	0.70	2.00	0.30
Agriculture soil										
		Average		1.14	4.25	0.68	3.84	0.73	2.19	0.33
		Std deviation		0.32	1.46	0.23	1.34	0.28	0.80	0.12
		CV%		28.08	34.46	33.10	34.99	37.68	36.43	36.81

19	Range 1	72 - 82	41	4.32	15.10	2.50	14.50	2.70	7.60	1.06
20	Range 1	15 - 55	39	1.64	7.10	1.10	6.10	1.20	3.40	0.51
28	Range 4	60 - 75	21	3.63	13.30	2.20	12.40	2.40	6.60	0.93
Agriculture soil										
	Average			3.20	11.83	1.93	11.00	2.10	5.87	0.83
	Std deviation			1.39	4.20	0.74	4.37	0.79	2.19	0.29
	CV%			43.53	35.47	38.13	39.74	37.80	37.40	34.50

R² (n=17)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

K₂O

TiO₂

P₂O₅

LO								
Sc								
V								
Co								
Ga								
Rb								
Sr								
Y								
Zr								
Nb								
Cs								
Ba								
La								
Ce								
Pr								
Nd								
Sm	Eu							
Eu	1.00	Gd						
Gd	0.99	1.00	Tb					
Tb	0.99	1.00	1.00	Dy				
Dy	0.99	1.00	1.00	1.00	Ho			
Ho	0.99	1.00	1.00	1.00	1.00	Er		
Er	0.99	1.00	1.00	1.00	1.00	1.00	Tm	
Tm	0.98	1.00	0.99	1.00	1.00	1.00	1.00	1.00
Yb	0.97	0.99	0.99	0.99	0.99	0.99	1.00	1.00
Lu	0.96	0.99	0.98	0.98	0.99	0.99	0.99	1.00
Hf	0.35	0.45	0.43	0.42	0.43	0.46	0.46	0.49
Ta	0.44	0.50	0.52	0.49	0.49	0.51	0.53	
W	-0.65	-0.71	-0.71	-0.70	-0.70	-0.72	-0.74	

Core Sample No		Depth (cm)	Sample ID	Th	0.98	0.96	0.97	0.97	0.96	0.96	0.94
				U	0.65	0.71	0.70	0.69	0.71	0.71	0.73
				Yb	Lu	Hf	Ta	W	Th	U	
2	Range 24	67 - 71	121	1.80	0.28	3.40	0.60	762.00	4.70	1.20	
3	Range 24	33 - 43	118	2.90	0.49	4.80	0.80	1080.00	11.70	2.10	
5	Range 25	46 - 50	112	1.40	0.22	3.10	0.40	1100.00	4.90	1.20	
15	Range 28	27 - 37	92	1.10	0.17	2.60	0.30	1840.00	4.60	1.00	
Agriculture soil											
	Average				2.03	0.33	3.77	0.60	980.67	7.10	1.50
	Std deviation				0.78	0.14	0.91	0.20	189.63	3.98	0.52
	CV%				38.20	42.96	24.09	33.33	19.34	56.13	34.64
38-A	Range 7	45 - 50	5	4.10	0.69	5.30	0.90	200.00	8.30	7.70	
40	Range 8	55-64	178	2.00	0.31	4.60	1.00	1120.00	8.30	2.10	
46	Range 10	40 - 47	156	1.80	0.29	4.00	1.00	791.00	7.80	2.10	
54	Range 12	108 - 114	143	1.90	0.32	3.50	0.80	787.00	5.50	1.70	
60	Range 14	55 - 70	167	1.90	0.34	3.60	0.90	1030.00	6.90	1.60	
62	Range 15	76-81	176	1.40	0.23	2.80	0.80	1140.00	5.30	1.40	
65	Range 16	50 - 57	140	1.50	0.26	3.10	0.80	798.00	5.80	1.50	
70	Range 17	30 - 35	135	2.00	0.33	3.90	0.60	931.00	8.70	1.60	
71	Range 17	48 - 52	131	2.90	0.50	5.50	1.00	484.00	8.10	2.80	
71-A	Range 17	36 - 38	128	1.90	0.33	3.80	0.60	1240.00	7.50	1.70	
Agriculture soil											
	Average				2.14	0.36	4.01	0.84	852.10	7.22	2.42
	Std deviation				0.80	0.14	0.88	0.15	318.79	1.27	1.90
	CV%				37.20	37.79	22.01	17.92	37.41	17.57	78.52

19	Range 1	72 - 82	41	6.40	1.02	4.40	1.00	216.00	34.50	4.80
20	Range 1	15 - 55	39	3.40	0.54	4.50	1.30	262.00	11.90	9.00
28	Range 4	60 - 75	21	5.80	0.91	3.80	1.00	362.00	29.20	7.80
Agriculture soil										
	Average			5.20	0.82	4.23	1.10	280.00	25.20	7.20
	Std deviation			1.59	0.25	0.38	0.17	74.65	11.82	2.16
	CV%			30.53	30.54	8.94	15.75	26.66	46.90	30.05

R2 (n=17)

d13CVPDB x

1000

C%

d15Nair x 1000

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

K₂O

TiO₂

P₂O₅

LO

Sc

V									
Co									
Ga									
Rb									
Sr									
Y									
Zr									
Nb									
Cs									
Ba									
La									
Ce									
Pr									
Nd									
Sm									
Eu									
Gd									
Tb									
Dy									
Ho									
Er									
Tm	Yb								
Yb	1.00	Lu							
Lu	1.00	1.00	Hf						
Hf	0.51	0.55	1.00	Ta					
Ta	0.54	0.55	0.62	1.00	W				
W	-0.75	-0.76	-0.61	-0.73	1.00	Th			
Th	0.93	0.91	0.28	0.43	-0.56	1.00	U		
U	0.76	0.76	0.51	0.66	-0.76	0.57	1.00		

5f Processed Source A Data

AG samples

Location name	Sample ID	Sample type	$\delta^{13}\text{C}$	C%	$\delta^{15}\text{N}$	N%	C/N (molar ratio)
Potlatch 7	82	Ag	-26.62	2.09	7.02	0.17	14.52
Clearwater7	67	Ag	-26.63	2.57	6.2	0.22	13.74
	Average		-26.63	2.33	6.61	0.19	14.13
	Stdev		0.01	0.34	0.58	0.04	0.55
	CV		-0.03	14.79	8.77	18.65	3.91
Asotin1	81	Ag	-25.42	1.26	7.23	0.12	12.66
GR8	58	Ag	-26.23	2.60	6.41	0.19	15.76
HC8	49	Ag	-28.24	7.66	5.28	0.64	13.91
	Average		-26.63	3.84	6.31	0.32	14.11
	Stdev		1.45	3.38	0.98	0.28	1.56
	CV		-5.45	87.99	15.52	89.78	11.04
Bank Samples							
Potlatch 6	83	BK	-25.39	1.54	4.46	0.08	22.79
Clearwater6	68	BK	-27.81	1.18	1.46	0.09	14.65
Clearwater8	66	BK	-26.19	0.26	1.39	0.02	15.66
	Average		-27.00	0.72	1.42	0.06	15.15
	Stdev		1.15	0.66	0.05	0.05	0.71
	CV%		-4.24	91.22	3.23	93.91	4.70

Asotin 2 (Submerged)	80	BK	-27.22	0.75	5	0.06	13.60
Asotin8	74	BK	-26.63	0.40	4.89	0.04	11.80
	Average		-26.93	0.57	4.95	0.05	12.70
	Stdev		0.42	0.25	0.08	0.02	1.28
	CV%		-1.55	43.19	1.57	33.88	10.05
GR6	60	BK	-24.71	0.17	4.2	0.02	11.60
GR7	59	BK	-26.05	2.26	5.03	0.20	13.03
GR9	57	BK	-26.18	0.77	4.48	0.07	13.74
	Average		-25.65	1.07	4.57	0.09	12.79
	Stdev		0.81	1.07	0.42	0.10	1.09
	CV%		-3.17	100.86	9.24	101.20	8.53
Salmon 5	48	BK	-24.50	0.42	2.185	0.03	18.56
Salmon 6 (BK)	190	BK	-25.34	1.73	4.51	0.07	28.86
	Average		-24.92	1.08	3.35	0.05	23.71
	Stdev		0.59	0.93	1.64	0.03	7.28
	CV		-2.38	86.13	49.11	63.86	30.72
HC5	51	BK	-23.67	0.35	5.36	0.03	12.56
HC7	50	BK	-21.61	0.30	7.97	0.05	7.53
	Average		-22.64	0.32	6.67	0.04	10.05
	Stdev		1.46	0.04	1.85	0.01	3.56
	CV%		-6.43	11.17	27.69	24.72	35.40

Bed Samples

Potlatch 1	88	BD	-26.18	1.16	3.93	0.08	16.31
Potlatch 2	87	BD	-24.95	0.08	5.96	0.01	9.41
Potlatch 3	86	BD	-24.86	0.39	4.9	0.02	22.03
Potlatch 4	85	BD	-26.46	2.13	3.95	0.17	14.75
Potlatch 5	84	BD	-25.49	1.85	4.82	0.17	12.39
Average			-25.59	1.12	4.71	0.09	14.98
Stdev			0.72	0.89	0.84	0.08	4.72
CV%			-2.80	79.02	17.75	85.46	31.53
Clearwater1	73	BD	-25.58	0.23	2.99	0.02	16.30
Clearwater2	72	BD	-25.25	0.21	3.19	0.02	15.24
Clearwater3	71	BD	-25.35	0.10	3.57	0.01	11.32
Clearwater4	70	BD	-23.06	0.02	0.81	0.00	9.13
Clearwater5	69	BD	-24.52	0.12	1.30	0.01	13.92
Average			-24.75	0.13	2.37	0.01	13.18
Stdev			1.03	0.08	1.23	0.01	2.93
CV%			-4.15	62.06	52.02	49.61	22.26
Asotin3	79	BD	-27.87	1.28	3.38	0.10	15.13
Asotin4	78	BD	-28.40	2.64	3.63	0.19	16.32
Asotin5	77	BD	-27.30	0.70	4.32	0.06	13.56
Asotin6	76	BD	-28.51	2.58	3.62	0.18	16.61
Asotin7	75	BD	-28.15	3.41	3.88	0.25	15.98
Average			-28.05	2.12	3.77	0.16	15.52
Stdev			0.48	1.10	0.36	0.08	1.23
CV%			-1.73	52.01	9.47	48.56	7.91
GR1	65	BD	-24.43	0.21	4.32	0.02	12.71

GR2	64	BD	-25.58	0.73	3.93	0.05	16.53
GR3	63	BD	-23.15	0.12	4.35	0.01	11.13
GR4	62	BD	-22.23	0.11	4.36	0.01	13.65
GR5	61	BD	-25.92	1.86	3.34	0.13	16.30
	Average		-24.26	0.61	4.06	0.05	14.06
	Stdev		1.57	0.75	0.44	0.05	2.33
	CV%		-6.48	122.63	10.86	114.37	16.54
Salmon 1	43	BD	-18.49	0.05	1.93	0.00	15.75
Salmon 2	44	BD	-19.07	0.04	1.81	0.00	13.60
Salmon 3	45	BD	-20.24	0.04	1.95	0.00	14.56
Salmon 4	46	BD	-20.76	0.04	1.84	0.00	13.84
Sample 6	47	BD	-20.54	0.04	0.825	0.00	11.21
	Average		-19.82	0.04	1.67	0.00	13.79
	Stdev		0.99	0.00	0.48	0.00	1.67
	CV%		-4.98	10.86	28.52	11.62	12.11
HC1	56	BD	-21.22	0.09	5.31	0.01	11.44
HC2	54	BD	-13.08	0.29	4.12	0.02	15.54
HC3	53	BD	-21.44	0.07	1.12	0.01	14.50
HC4	52	BD	-24.63	0.47	6.24	0.03	20.49
HC6	55	BD	-14.72	0.26	6.96	0.01	23.66
	Average		-19.02	0.24	4.75	0.02	17.13
	Stdev		4.90	0.17	2.29	0.01	4.89
	CV%		-25.75	69.60	48.23	58.10	28.55

AG samples

Location name	Sample ID	Sample type	Sc46 mg/g	La140 mg/g	SiO ₂ %	Al ₂ O ₃ %	Fe ₂ O ₃ %	MnO %
Potlatch 7	82	Ag	ND	0.06	66.04	13.16	4.58	0.12
Clearwater7	67	Ag	0.02	0.05	59.89	13.86	6.45	0.12
	Average		0.02	0.05	62.97	13.51	5.52	0.12
	Stdev		-	0.01	4.35	0.49	1.32	0.00
	CV		-	15.71	6.91	3.66	23.98	0.59
Asotin1	81	Ag	0.06	0.17	64.74	13.09	5.58	0.11
GR8	58	Ag	0.02	0.04	59.52	15.04	6.71	0.19
HC8	49	Ag	0.06	ND	46.81	13.74	8.19	0.13
	Average		0.05	0.11	57.02	13.96	6.83	0.14
	Stdev		0.02	0.09	9.22	0.99	1.31	0.04
	CV		43.52	88.31	16.17	7.11	19.17	31.33
Bank Samples								
Potlatch 6	83	BK	0.04	0.04	53.94	13.03	12.78	0.20
Clearwater6	68	BK	0.01	0.12	67.82	12.75	4.43	0.07
Clearwater8	66	BK	0.01	0.01	71.76	12.89	3.36	0.05
	Average		0.01	0.07	69.79	12.82	3.90	0.06
	Stdev		0.00	0.08	2.79	0.10	0.76	0.01
	CV%		5.24	112.31	3.99	0.77	19.43	23.18
Asotin 2 (Submerged)	80	BK	0.02	0.03	60.58	13.73	7.85	0.10
Asotin8	74	BK	0.04	0.04	53.97	13.39	11.88	0.17

	Average		0.03	0.03	57.28	13.56	9.87	0.13
	Stdev		0.02	0.00	4.67	0.24	2.85	0.05
	CV%		62.85	13.26	8.16	1.77	28.89	40.10
GR6	60	BK	0.05	0.03	55.64	13.63	11.88	0.17
GR7	59	BK	0.03	0.02	62.61	14.02	6.17	0.11
GR9	57	BK	0.03	0.05	56.36	14.80	9.51	0.14
	Average		0.03	0.03	58.20	14.15	9.19	0.14
	Stdev		0.01	0.01	3.83	0.60	2.87	0.03
	CV%		33.05	32.78	6.59	4.21	31.23	19.02
Salmon 5	48	BK	0.01	0.04	67.14	13.60	4.55	0.08
Salmon 6 (BK)	190	BK	0.04	0.04	54.03	13.16	11.85	0.18
	Average		0.03	0.04	60.59	13.38	8.20	0.13
	Stdev		0.02	0.00	9.27	0.31	5.16	0.07
	CV		62.23	12.53	15.30	2.33	62.95	58.56
HC5	51	BK	0.03	0.03	47.90	13.44	16.18	0.23
HC7	50	BK	0.04	0.02	56.45	16.77	9.20	0.15
	Average		0.03	0.03	52.18	15.11	12.69	0.19
	Stdev		0.01	0.00	6.05	2.35	4.94	0.05
	CV%		37.44	5.66	11.59	15.59	38.89	26.94
Bed Samples								
Potlatch 1	88	BD	0.02	0.03	60.81	14.22	7.68	0.13
Potlatch 2	87	BD	0.04	0.04	68.96	11.47	7.30	0.11
Potlatch 3	86	BD	0.02	0.05	68.70	11.46	7.15	0.11
Potlatch 4	85	BD	0.05	0.08	59.09	12.79	7.01	0.09

Potlatch 5	84	BD	0.02	0.03	61.02	13.23	7.39	0.12
	Average		0.03	0.05	63.72	12.63	7.31	0.11
	Stdev		0.01	0.02	4.73	1.19	0.25	0.02
	CV%		43.82	42.81	7.42	9.39	3.48	14.01
Clearwater1	73	BD	0.02	0.05	70.12	12.33	4.45	0.08
Clearwater2	72	BD	0.01	0.03	73.18	12.71	3.40	0.05
Clearwater3	71	BD	0.01	0.02	72.96	12.14	3.71	0.06
Clearwater4	70	BD	0.01	0.03	73.28	11.17	4.48	0.09
Clearwater5	69	BD	0.01	0.03	72.48	12.62	3.63	0.06
	Average		0.01	0.03	72.40	12.19	3.93	0.07
	Stdev		0.00	0.01	1.31	0.62	0.50	0.01
	CV%		23.29	31.82	1.81	5.05	12.66	21.58
Asotin3	79	BD	0.04	0.04	54.65	13.92	10.45	0.14
Asotin4	78	BD	0.02	0.04	54.18	13.05	8.81	0.11
Asotin5	77	BD	0.03	0.03	55.53	14.10	10.11	0.14
Asotin6	76	BD	0.03	0.05	55.12	12.86	8.90	0.11
Asotin7	75	BD	ND	0.04	54.63	12.68	7.82	0.11
	Average		0.03	0.04	54.82	13.32	9.22	0.12
	Stdev		0.01	0.01	0.52	0.64	1.06	0.02
	CV%		19.02	23.99	0.94	4.84	11.55	13.09
GR1	65	BD	0.03	0.03	56.61	14.50	10.43	0.15
GR2	64	BD	0.03	0.05	55.47	14.89	10.20	0.15
GR3	63	BD	0.20	0.09	57.69	14.27	10.07	0.14
GR4	62	BD	ND	0.03	57.49	14.32	10.41	0.16
GR5	61	BD	0.03	0.03	55.43	13.96	9.45	0.15

	Average		0.07	0.04	56.54	14.39	10.11	0.15
	Stdev		0.08	0.02	1.07	0.34	0.40	0.00
	CV%		118.24	56.58	1.90	2.37	3.95	2.97
Salmon 1	43	BD	0.02	0.04	71.75	12.79	3.26	0.07
Salmon 2	44	BD	ND	0.08	73.68	12.32	2.36	0.04
Salmon 3	45	BD	ND	0.02	73.89	12.32	2.20	0.04
Salmon 4	46	BD	ND	ND	75.46	12.74	1.97	0.03
Sample 6	47	BD	0.02	0.04	73.16	12.63	3.14	0.07
	Average		0.02	0.04	73.59	12.56	2.59	0.05
	Stdev		0.00	0.02	1.34	0.23	0.58	0.02
	CV%		11.47	58.91	1.82	1.80	22.39	34.06
HC1	56	BD	0.05	0.03	47.53	15.23	15.68	0.23
HC2	54	BD	0.03	0.01	56.08	13.67	10.70	0.19
HC3	53	BD	0.04	ND	52.40	13.64	12.39	0.18
HC4	52	BD	0.05	ND	50.23	15.17	12.39	0.18
HC6	55	BD	0.03	0.02	52.04	15.17	12.17	0.19
	Average		0.04	0.02	51.66	14.58	12.67	0.19
	Stdev		0.01	0.01	3.14	0.84	1.83	0.02
	CV%		23.79	48.24	6.07	5.77	14.42	11.42

AG samples

Location name	Sample ID	Sample type	MgO %	CaO %	Na ₂ O %	K ₂ O %	TiO ₂ %	P ₂ O ₅ %	LO %

Potlatch 7	82	Ag	1.06	1.82	2.03	2.11	0.92	0.19	7.66
Clearwater7	67	Ag	0.99	2.05	1.64	1.65	1.16	0.24	10.49
	Average		1.03	1.94	1.84	1.88	1.04	0.22	9.08
	Stdev		0.05	0.16	0.28	0.33	0.17	0.04	2.00
	CV		4.83	8.40	15.03	17.30	16.21	16.44	22.05
Asotin1	81	Ag	1.56	2.48	2.13	2.08	1.06	0.15	6.61
GR8	58	Ag	1.21	2.29	1.93	1.68	1.21	0.22	9.60
HC8	49	Ag	2.25	4.55	2.56	1.05	1.40	0.39	17.03
	Average		1.67	3.11	2.21	1.60	1.22	0.25	11.08
	Stdev		0.53	1.25	0.32	0.52	0.17	0.12	5.37
	CV		31.62	40.35	14.59	32.39	13.92	48.72	48.42
Bank Samples									
Potlatch 6	83	BK	2.25	4.15	1.90	1.54	1.45	0.27	8.25
Clearwater6	68	BK	1.41	2.74	2.57	2.18	0.79	0.14	4.08
Clearwater8	66	BK	1.14	2.69	2.96	2.44	0.53	0.08	1.55
	Average		1.28	2.72	2.77	2.31	0.66	0.11	2.82
	Stdev		0.19	0.04	0.28	0.18	0.19	0.04	1.79
	CV%		14.97	1.30	9.97	7.96	28.07	38.57	63.55
Asotin 2 (Submerged)	80	BK	2.22	4.21	2.51	1.63	1.60	0.21	5.19
Asotin8	74	BK	3.29	6.79	2.76	1.50	2.21	0.46	2.27
	Average		2.76	5.50	2.64	1.57	1.91	0.34	3.73
	Stdev		0.76	1.82	0.18	0.09	0.43	0.18	2.06

	CV%		27.46	33.17	6.71	5.87	22.35	52.77	55.36
GR6	60	BK	3.04	6.42	3.03	1.41	2.34	0.29	1.72
GR7	59	BK	3.11	4.63	2.98	1.60	0.92	0.24	4.08
GR9	57	BK	2.62	5.87	3.12	1.49	1.85	0.28	3.64
	Average		2.92	5.64	3.04	1.50	1.71	0.27	3.15
	Stdev		0.27	0.92	0.07	0.10	0.72	0.03	1.25
	CV%		9.07	16.26	2.33	6.36	42.29	9.80	39.88
Salmon 5	48	BK	1.82	3.04	2.83	2.50	0.72	0.17	2.39
Salmon 6 (BK)	190	BK	2.47	4.57	2.02	1.76	1.52	0.32	6.68
	Average		2.15	3.81	2.43	2.13	1.12	0.25	4.54
	Stdev		0.46	1.08	0.57	0.52	0.57	0.11	3.03
	CV		21.43	28.43	23.62	24.57	50.54	43.29	66.89
HC5	51	BK	2.12	5.12	2.28	0.71	2.62	0.34	8.88
HC7	50	BK	1.74	2.66	2.21	1.65	1.36	0.11	8.20
	Average		1.93	3.89	2.25	1.18	1.99	0.23	8.54
	Stdev		0.27	1.74	0.05	0.66	0.89	0.16	0.48
	CV%		13.92	44.72	2.20	56.33	44.79	72.28	5.63
Bed Samples									
Potlatch 1	88	BD	2.00	3.82	2.47	1.73	1.36	0.23	6.19
Potlatch 2	87	BD	1.74	4.17	2.32	1.47	1.26	0.25	1.80
Potlatch 3	86	BD	1.69	3.91	2.20	1.57	1.27	0.23	2.57
Potlatch 4	85	BD	1.49	3.06	1.90	1.61	1.32	0.21	9.93
Potlatch 5	84	BD	1.74	3.42	2.09	1.62	1.41	0.23	7.78

	Average		1.73	3.68	2.20	1.60	1.32	0.23	5.65
	Stdev		0.18	0.44	0.22	0.09	0.06	0.01	3.44
	CV%		10.50	11.89	9.91	5.86	4.62	6.15	60.92
Clearwater1	73	BD	1.41	3.03	3.00	2.30	0.88	0.14	1.42
Clearwater2	72	BD	1.13	2.66	2.93	2.48	0.56	0.11	1.56
Clearwater3	71	BD	1.11	2.86	2.86	2.16	0.75	0.11	1.04
Clearwater4	70	BD	1.42	3.41	2.42	1.79	0.81	0.09	0.77
Clearwater5	69	BD	1.17	2.81	2.89	2.37	0.65	0.11	1.26
	Average		1.25	2.95	2.82	2.22	0.73	0.11	1.21
	Stdev		0.15	0.29	0.23	0.27	0.13	0.02	0.31
	CV%		12.34	9.72	8.14	12.02	17.67	15.97	25.86
Asotin3	79	BD	2.93	6.06	2.87	1.37	2.18	0.30	4.58
Asotin4	78	BD	2.48	5.18	2.54	1.34	1.81	0.24	9.66
Asotin5	77	BD	2.93	6.07	2.84	1.40	2.09	0.30	4.11
Asotin6	76	BD	2.54	5.00	2.40	1.40	1.79	0.24	8.40
Asotin7	75	BD	2.16	4.45	2.41	1.39	1.55	0.24	10.87
	Average		2.61	5.35	2.61	1.38	1.88	0.26	7.52
	Stdev		0.33	0.70	0.23	0.03	0.26	0.03	3.04
	CV%		12.56	13.16	8.76	1.85	13.54	12.45	40.34
GR1	65	BD	2.95	6.45	3.12	1.44	1.96	0.40	2.03
GR2	64	BD	2.89	6.26	3.04	1.34	1.99	0.27	3.66
GR3	63	BD	2.88	6.42	3.10	1.42	1.95	0.29	1.66
GR4	62	BD	2.93	6.60	3.13	1.46	2.02	0.30	1.53
GR5	61	BD	2.86	5.56	2.77	1.38	1.66	0.28	6.67
	Average		2.90	6.26	3.03	1.41	1.92	0.31	3.11

	Stdev		0.04	0.41	0.15	0.05	0.15	0.05	2.16
	CV%		1.28	6.53	4.97	3.42	7.66	17.09	69.60
Salmon 1	43	BD	1.29	2.92	2.99	2.65	0.53	0.14	0.99
Salmon 2	44	BD	0.89	2.24	3.08	2.88	0.36	0.06	0.92
Salmon 3	45	BD	0.74	1.97	2.99	2.90	0.33	0.06	0.89
Salmon 4	46	BD	0.68	1.84	3.05	3.16	0.28	0.07	0.97
Sample 6	47	BD	0.95	2.33	3.02	2.86	0.62	0.12	0.97
	Average		0.91	2.26	3.03	2.89	0.42	0.09	0.95
	Stdev		0.24	0.42	0.04	0.18	0.14	0.04	0.04
	CV%		26.25	18.53	1.29	6.28	33.84	41.57	4.37
HC1	56	BD	2.28	7.19	3.08	0.98	3.46	0.46	3.49
HC2	54	BD	2.41	4.74	2.48	1.45	2.07	0.18	4.93
HC3	53	BD	4.24	8.19	2.97	0.97	2.16	0.20	2.20
HC4	52	BD	3.72	8.16	3.15	0.97	2.19	0.26	3.65
HC6	55	BD	2.89	7.63	2.70	0.75	1.51	0.22	4.11
	Average		3.11	7.18	2.88	1.02	2.28	0.26	3.68
	Stdev		0.85	1.43	0.28	0.26	0.72	0.11	1.00
	CV%		27.28	19.86	9.73	25.10	31.44	42.99	27.12

AG samples

Location name	Sample ID	Sample type	Sc	V	Co	Ga	Rb	Sr	Y	Zr
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				ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Potlatch 7	82	Ag		12.00	94.00	46.00	17.00	81.00	269.00	33.00	336.00
Clearwater7	67	Ag		16.00	137.00	28.00	19.00	69.00	233.00	34.00	251.00
	Average			14.00	115.50	37.00	18.00	75.00	251.00	33.50	293.50
	Stdev			2.83	30.41	12.73	1.41	8.49	25.46	0.71	60.10
	CV			20.20	26.33	34.40	7.86	11.31	10.14	2.11	20.48
Asotin1	81	Ag		13.00	119.00	41.00	17.00	69.00	279.00	29.00	283.00
GR8	58	Ag		15.00	145.00	35.00	19.00	70.00	264.00	30.00	261.00
HC8	49	Ag		23.00	214.00	33.00	17.00	29.00	279.00	21.00	101.00
	Average			17.00	159.33	36.33	17.67	56.00	274.00	26.67	215.00
	Stdev			5.29	49.10	4.16	1.15	23.39	8.66	4.93	99.34
	CV			31.13	30.81	11.46	6.54	41.76	3.16	18.50	46.20
Bank Samples											
Potlatch 6	83	BK		23.00	238.00	56.00	19.00	62.00	285.00	31.00	211.00
Clearwater6	68	BK		11.00	84.00	180.00	17.00	71.00	329.00	39.00	401.00
Clearwater8	66	BK		8.00	65.00	175.00	16.00	68.00	398.00	17.00	180.00
	Average			9.50	74.50	177.50	16.50	69.50	363.50	28.00	290.50
	Stdev			2.12	13.44	3.54	0.71	2.12	48.79	15.56	156.27
	CV%			22.33	18.03	1.99	4.29	3.05	13.42	55.56	53.79
Asotin 2 (Submerged)	80	BK		19.00	218.00	62.00	19.00	54.00	311.00	28.00	274.00
Asotin8	74	BK		30.00	315.00	83.00	21.00	40.00	301.00	34.00	227.00
	Average			24.50	266.50	72.50	20.00	47.00	306.00	31.00	250.50

		Stdev	7.78	68.59	14.85	1.41	9.90	7.07	4.24	33.23
		CV%	31.75	25.74	20.48	7.07	21.06	2.31	13.69	13.27
GR6	60	BK	29.00	397.00	96.00	20.00	34.00	367.00	27.00	373.00
GR7	59	BK	17.00	148.00	114.00	17.00	46.00	439.00	30.00	172.00
GR9	57	BK	24.00	284.00	86.00	21.00	37.00	417.00	25.00	194.00
		Average	23.33	276.33	98.67	19.33	39.00	407.67	27.33	246.33
		Stdev	6.03	124.68	14.19	2.08	6.24	36.90	2.52	110.25
		CV%	25.83	45.12	14.38	10.77	16.01	9.05	9.21	44.76
Salmon 5	48	BK	11.00	92.00	91.00	16.00	78.00	383.00	24.00	268.00
Salmon 6 (BK)	190	BK	23.00	247.00	52.00	18.00	64.00	270.00	32.00	212.00
		Average	17.00	169.50	71.50	17.00	71.00	326.50	28.00	240.00
		Stdev	8.49	109.60	27.58	1.41	9.90	79.90	5.66	39.60
		CV	49.91	64.66	38.57	8.32	13.94	24.47	20.20	16.50
HC5	51	BK	36.00	372.00	52.00	24.00	26.00	289.00	41.00	251.00
HC7	50	BK	23.00	213.00	39.00	22.00	67.00	262.00	30.00	201.00
		Average	29.50	292.50	45.50	23.00	46.50	275.50	35.50	226.00
		Stdev	9.19	112.43	9.19	1.41	28.99	19.09	7.78	35.36
		CV%	31.16	38.44	20.20	6.15	62.35	6.93	21.91	15.64
Bed Samples										
Potlatch 1	88	BD	19.00	188.00	65.00	19.00	59.00	354.00	34.00	281.00
Potlatch 2	87	BD	18.00	193.00	124.00	16.00	36.00	289.00	22.00	162.00
Potlatch 3	86	BD	18.00	188.00	103.00	16.00	43.00	296.00	27.00	174.00
Potlatch 4	85	BD	17.00	172.00	66.00	18.00	61.00	256.00	34.00	305.00
Potlatch 5	84	BD	18.00	181.00	62.00	18.00	60.00	279.00	34.00	290.00

	Average		18.00	184.40	84.00	17.40	51.80	294.80	30.20	242.40
	Stdev		0.71	8.14	27.97	1.34	11.52	36.38	5.50	68.59
	CV%		3.93	4.42	33.30	7.71	22.24	12.34	18.20	28.30
Clearwater1	73	BD	11.00	93.00	194.00	16.00	61.00	379.00	37.00	458.00
Clearwater2	72	BD	9.00	67.00	180.00	16.00	70.00	394.00	21.00	220.00
Clearwater3	71	BD	9.00	76.00	247.00	15.00	58.00	378.00	33.00	354.00
Clearwater4	70	BD	13.00	88.00	206.00	14.00	47.00	344.00	38.00	224.00
Clearwater5	69	BD	9.00	71.00	196.00	16.00	66.00	394.00	28.00	270.00
	Average		10.20	79.00	204.60	15.40	60.40	377.80	31.40	305.20
	Stdev		1.79	11.11	25.45	0.89	8.79	20.43	7.02	101.02
	CV%		17.54	14.07	12.44	5.81	14.56	5.41	22.36	33.10
Asotin3	79	BD	27.00	335.00	53.00	20.00	42.00	327.00	28.00	211.00
Asotin4	78	BD	22.00	277.00	63.00	19.00	45.00	307.00	25.00	218.00
Asotin5	77	BD	26.00	304.00	55.00	20.00	42.00	331.00	27.00	225.00
Asotin6	76	BD	23.00	263.00	62.00	19.00	47.00	288.00	26.00	221.00
Asotin7	75	BD	20.00	224.00	54.00	18.00	48.00	289.00	27.00	215.00
	Average		23.60	280.60	57.40	19.20	44.80	308.40	26.60	218.00
	Stdev		2.88	41.93	4.72	0.84	2.77	20.32	1.14	5.39
	CV%		12.21	14.94	8.23	4.36	6.19	6.59	4.29	2.47
GR1	65	BD	28.00	312.00	77.00	20.00	36.00	383.00	30.00	176.00
GR2	64	BD	28.00	296.00	50.00	21.00	37.00	393.00	27.00	185.00
GR3	63	BD	27.00	309.00	73.00	20.00	35.00	393.00	26.00	180.00
GR4	62	BD	27.00	323.00	80.00	20.00	34.00	407.00	37.00	204.00
GR5	61	BD	25.00	259.00	45.00	19.00	40.00	382.00	29.00	187.00

	Average		27.00	299.80	65.00	20.00	36.40	391.60	29.80	186.40
	Stdev		1.22	24.75	16.26	0.71	2.30	10.09	4.32	10.74
	CV%		4.54	8.26	25.02	3.54	6.32	2.58	14.51	5.76
Salmon 1	43	BD	10.00	67.00	148.00	17.00	83.00	372.00	24.00	122.00
Salmon 2	44	BD	7.00	46.00	172.00	13.00	71.00	370.00	15.00	133.00
Salmon 3	45	BD	5.00	41.00	186.00	14.00	80.00	364.00	13.00	115.00
Salmon 4	46	BD	5.00	35.00	173.00	14.00	86.00	372.00	11.00	121.00
Sample 6	47	BD	7.00	60.00	205.00	15.00	79.00	384.00	27.00	324.00
	Average		6.80	49.80	176.80	14.60	79.80	372.40	18.00	163.00
	Stdev		2.05	13.33	20.90	1.52	5.63	7.27	7.07	90.24
	CV%		30.14	26.77	11.82	10.39	7.06	1.95	39.28	55.36
HC1	56	BD	34.00	444.00	62.00	25.00	25.00	370.00	44.00	245.00
HC2	54	BD	24.00	367.00	53.00	19.00	42.00	268.00	28.00	191.00
HC3	53	BD	39.00	448.00	94.00	20.00	22.00	344.00	27.00	129.00
HC4	52	BD	39.00	436.00	62.00	22.00	22.00	401.00	26.00	133.00
HC6	55	BD	29.00	290.00	48.00	19.00	21.00	311.00	26.00	125.00
	Average		33.00	397.00	63.80	21.00	26.40	338.80	30.20	164.60
	Stdev		6.52	68.34	17.92	2.55	8.85	51.61	7.76	52.43
	CV%		19.76	17.21	28.09	12.14	33.52	15.23	25.69	31.85

AG samples

Location name	Sample ID	Sample type	Nb ppm	Cs ppm	Ba ppm	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm
Potlatch 7	82	Ag	15.00	3.20	721.00	49.60	95.50	10.50	39.00	7.50
Clearwater7	67	Ag	12.00	3.50	670.00	38.90	78.80	8.74	34.30	7.10
	Average		13.50	3.35	695.50	44.25	87.15	9.62	36.65	7.30
	Stdev		2.12	0.21	36.06	7.57	11.81	1.24	3.32	0.28
	CV		15.71	6.33	5.19	17.10	13.55	12.94	9.07	3.87
Asotin1	81	Ag	12.00	3.40	645.00	42.70	85.40	9.18	34.90	6.80
GR8	58	Ag	13.00	3.40	748.00	39.30	91.90	8.82	33.70	7.00
HC8	49	Ag	6.00	1.10	393.00	13.40	29.20	3.70	16.00	3.90
	Average		10.33	2.63	595.33	31.80	68.83	7.23	28.20	5.90
	Stdev		3.79	1.33	182.64	16.03	34.48	3.07	10.58	1.73
	CV		36.64	50.43	30.68	50.39	50.09	42.38	37.53	29.41
Bank Samples										
Potlatch 6	83	BK	12.00	3.50	618.00	31.30	68.40	7.45	29.80	6.60
Clearwater6	68	BK	12.00	2.20	730.00	81.30	161.00	17.10	63.30	11.70
Clearwater8	66	BK	9.00	1.60	845.00	35.50	68.20	7.24	27.50	5.10
	Average		10.50	1.90	787.50	58.40	114.60	12.17	45.40	8.40
	Stdev		2.12	0.42	81.32	32.39	65.62	6.97	25.31	4.67
	CV%		20.20	22.33	10.33	55.45	57.26	57.29	55.76	55.56
Asotin 2 (Submerged)	80	BK	13.00	2.20	636.00	35.00	70.00	7.70	30.20	6.20
Asotin8	74	BK	13.00	1.10	944.00	30.90	62.30	7.58	31.60	7.20

	Average		13.00	1.65	790.00	32.95	66.15	7.64	30.90	6.70
	Stdev		0.00	0.78	217.79	2.90	5.44	0.08	0.99	0.71
	CV%		0.00	47.14	27.57	8.80	8.23	1.11	3.20	10.55
GR6	60	BK	11.00	1.00	672.00	24.10	48.90	5.87	24.50	5.60
GR7	59	BK	9.00	1.80	681.00	45.10	79.40	8.15	29.80	5.90
GR9	57	BK	10.00	1.20	712.00	22.10	45.20	5.41	22.50	5.10
	Average		10.00	1.33	688.33	30.43	57.83	6.48	25.60	5.53
	Stdev		1.00	0.42	20.98	12.74	18.77	1.47	3.77	0.40
	CV%		10.00	31.22	3.05	41.87	32.45	22.65	14.74	7.30
Salmon 5	48	BK	14.00	2.70	823.00	34.60	66.60	7.74	28.70	5.30
Salmon 6 (BK)	190	BK	10.00	3.60	615.00	27.00	60.10	7.32	30.00	6.70
	Average		12.00	3.15	719.00	30.80	63.35	7.53	29.35	6.00
	Stdev		2.83	0.64	147.08	5.37	4.60	0.30	0.92	0.99
	CV		23.57	20.20	20.46	17.45	7.26	3.94	3.13	16.50
HC5	51	BK	15.00	2.00	470.00	27.90	61.70	7.65	33.30	8.10
HC7	50	BK	12.00	4.10	664.00	27.60	55.90	6.66	27.10	6.20
	Average		13.50	3.05	567.00	27.75	58.80	7.16	30.20	7.15
	Stdev		2.12	1.48	137.18	0.21	4.10	0.70	4.38	1.34
	CV%		15.71	48.69	24.19	0.76	6.97	9.78	14.52	18.79
Bed Samples										
Potlatch 1	88	BD	14.00	2.10	720.00	47.60	94.70	10.60	40.20	8.20
Potlatch 2	87	BD	7.00	0.80	679.00	22.70	47.10	5.38	22.30	4.80
Potlatch 3	86	BD	9.00	1.10	730.00	29.00	57.20	6.85	27.20	5.80
Potlatch 4	85	BD	14.00	2.40	662.00	59.10	109.00	11.80	44.60	8.70

Potlatch 5	84	BD	15.00	2.10	666.00	44.20	86.60	9.86	38.30	7.60
	Average		11.80	1.70	691.40	40.52	78.92	8.90	34.52	7.02
	Stdev		3.56	0.70	31.51	14.66	25.97	2.68	9.37	1.66
	CV%		30.20	41.39	4.56	36.17	32.90	30.16	27.14	23.59
Clearwater1	73	BD	14.00	1.50	791.00	87.20	171.00	18.00	66.40	11.70
Clearwater2	72	BD	9.00	1.70	858.00	41.80	79.80	8.57	31.70	5.60
Clearwater3	71	BD	12.00	1.20	751.00	84.00	163.00	17.20	62.50	11.20
Clearwater4	70	BD	12.00	0.90	648.00	69.10	135.00	14.10	51.00	8.90
Clearwater5	69	BD	11.00	1.50	835.00	55.50	106.00	11.30	41.70	7.40
	Average		11.60	1.36	776.60	67.52	130.96	13.83	50.66	8.96
	Stdev		1.82	0.31	82.82	19.15	38.36	3.97	14.39	2.56
	CV%		15.66	23.02	10.66	28.37	29.29	28.66	28.40	28.59
Asotin3	79	BD	12.00	1.40	632.00	25.50	51.70	6.04	25.20	5.50
Asotin4	78	BD	12.00	1.70	577.00	27.40	55.20	6.33	25.60	5.70
Asotin5	77	BD	14.00	1.40	718.00	27.40	54.90	6.53	26.40	5.90
Asotin6	76	BD	12.00	1.80	630.00	29.00	58.20	6.75	27.20	5.80
Asotin7	75	BD	11.00	1.90	576.00	28.60	57.90	6.63	26.80	5.70
	Average		12.20	1.64	626.60	27.58	55.58	6.46	26.24	5.72
	Stdev		1.10	0.23	57.91	1.36	2.64	0.28	0.83	0.15
	CV%		8.98	14.04	9.24	4.95	4.75	4.32	3.16	2.59
GR1	65	BD	10.00	1.10	695.00	27.20	53.10	6.18	25.40	5.70
GR2	64	BD	11.00	1.20	706.00	22.30	45.80	5.56	23.00	5.20
GR3	63	BD	10.00	1.00	696.00	22.20	45.40	5.53	23.00	5.30
GR4	62	BD	10.00	1.00	701.00	53.00	92.80	9.72	36.30	7.50
GR5	61	BD	11.00	1.50	657.00	25.60	51.40	6.12	25.40	5.90

	Average		10.40	1.16	691.00	30.06	57.70	6.62	26.62	5.92
	Stdev		0.55	0.21	19.51	13.00	19.91	1.76	5.54	0.93
	CV%		5.27	17.88	2.82	43.26	34.51	26.55	20.82	15.68
Salmon 1	43	BD	15.00	2.00	822.00	44.50	83.60	8.74	31.50	5.80
Salmon 2	44	BD	3.00	1.80	896.00	23.00	43.00	4.93	18.10	3.30
Salmon 3	45	BD	7.00	1.80	954.00	20.60	38.60	4.50	16.20	3.10
Salmon 4	46	BD	7.00	2.00	989.00	19.40	36.20	4.26	15.20	2.90
Sample 6	47	BD	14.00	1.90	899.00	48.40	90.90	10.10	36.00	6.20
	Average		9.20	1.90	912.00	31.18	58.46	6.51	23.40	4.26
	Stdev		5.12	0.10	63.67	14.07	26.52	2.71	9.64	1.60
	CV%		55.64	5.26	6.98	45.12	45.36	41.71	41.19	37.58
HC1	56	BD	17.00	0.90	600.00	27.50	65.90	8.04	35.50	9.00
HC2	54	BD	14.00	2.60	654.00	29.80	62.40	6.49	26.00	5.60
HC3	53	BD	7.00	0.80	410.00	13.50	29.80	3.94	18.30	4.80
HC4	52	BD	7.00	0.80	468.00	13.60	31.20	4.05	18.70	4.80
HC6	55	BD	8.00	1.10	422.00	15.80	34.30	4.21	18.70	4.90
	Average		10.60	1.24	510.80	20.04	44.72	5.35	23.44	5.82
	Stdev		4.62	0.77	109.93	7.96	17.85	1.84	7.47	1.81
	CV%		43.54	62.10	21.52	39.70	39.93	34.38	31.88	31.08

AG samples

Location name	Sample ID	Sample type	Eu	Gd	Tb	Dy	Ho	Er	Tm
			ppm						
Potlatch 7	82	Ag	1.63	6.70	1.00	5.90	1.10	3.30	0.50
Clearwater7	67	Ag	1.66	6.50	1.00	5.90	1.20	3.40	0.51
	Average		1.65	6.60	1.00	5.90	1.15	3.35	0.51
	Stdev		0.02	0.14	0.00	0.00	0.07	0.07	0.01
	CV		1.29	2.14	0.00	0.00	6.15	2.11	1.40
Asotin1	81	Ag	1.49	6.00	1.00	5.60	1.10	3.20	0.46
GR8	58	Ag	1.58	6.20	1.00	5.50	1.10	3.10	0.46
HC8	49	Ag	1.25	4.20	0.70	4.10	0.80	2.20	0.33
	Average		1.44	5.47	0.90	5.07	1.00	2.83	0.42
	Stdev		0.17	1.10	0.17	0.84	0.17	0.55	0.08
	CV		11.85	20.15	19.25	16.55	17.32	19.44	18.01

Bank Samples

Potlatch 6	83	BK	1.66	6.40	1.10	6.00	1.20	3.40	0.50
Clearwater6	68	BK	1.60	9.20	1.40	7.50	1.40	4.10	0.59
Clearwater8	66	BK	1.07	4.00	0.60	3.40	0.60	1.90	0.26
	Average		1.34	6.60	1.00	5.45	1.00	3.00	0.43
	Stdev		0.37	3.68	0.57	2.90	0.57	1.56	0.23
	CV%		28.07	55.71	56.57	53.20	56.57	51.85	54.90
Asotin 2 (Submerged)	80	BK	1.60	5.60	0.90	5.30	1.00	2.90	0.43
Asotin8	74	BK	2.31	7.30	1.20	6.70	1.30	3.70	0.54

	Average		1.96	6.45	1.05	6.00	1.15	3.30	0.49
	Stdev		0.50	1.20	0.21	0.99	0.21	0.57	0.08
	CV%		25.68	18.64	20.20	16.50	18.45	17.14	16.04
GR6	60	BK	1.66	5.60	0.90	5.30	1.10	3.00	0.43
GR7	59	BK	1.62	5.80	0.90	5.60	1.10	3.00	0.43
GR9	57	BK	1.61	5.00	0.80	4.70	0.90	2.70	0.40
	Average		1.63	5.47	0.87	5.20	1.03	2.90	0.42
	Stdev		0.03	0.42	0.06	0.46	0.12	0.17	0.02
	CV%		1.62	7.62	6.66	8.81	11.17	5.97	4.12
Salmon 5	48	BK	1.08	4.50	0.70	4.10	0.80	2.30	0.35
Salmon 6 (BK)	190	BK	1.68	6.10	1.00	5.90	1.20	3.50	0.51
	Average		1.38	5.30	0.85	5.00	1.00	2.90	0.43
	Stdev		0.42	1.13	0.21	1.27	0.28	0.85	0.11
	CV		30.74	21.35	24.96	25.46	28.28	29.26	26.31
HC5	51	BK	2.32	8.60	1.50	8.20	1.60	4.60	0.66
HC7	50	BK	1.62	6.10	1.00	5.90	1.20	3.30	0.51
	Average		1.97	7.35	1.25	7.05	1.40	3.95	0.59
	Stdev		0.49	1.77	0.35	1.63	0.28	0.92	0.11
	CV%		25.13	24.05	28.28	23.07	20.20	23.27	18.13
Bed Samples									
Potlatch 1	88	BD	1.79	7.40	1.10	6.30	1.20	3.50	0.50
Potlatch 2	87	BD	1.56	4.60	0.70	4.10	0.80	2.20	0.31
Potlatch 3	86	BD	1.61	5.90	0.90	5.30	1.00	3.00	0.42

Potlatch 4	85	BD	2.13	8.10	1.30	7.60	1.40	4.20	0.62
Potlatch 5	84	BD	1.75	6.90	1.10	6.10	1.20	3.50	0.50
	Average		1.77	6.58	1.02	5.88	1.12	3.28	0.47
	Stdev		0.22	1.37	0.23	1.29	0.23	0.74	0.11
	CV%		12.65	20.77	22.36	21.99	20.36	22.55	24.35
Clearwater1	73	BD	1.67	9.00	1.30	7.10	1.30	4.00	0.59
Clearwater2	72	BD	1.16	4.70	0.70	4.00	0.80	2.20	0.32
Clearwater3	71	BD	1.57	8.50	1.20	6.60	1.20	3.50	0.50
Clearwater4	70	BD	1.48	7.30	1.10	6.60	1.30	4.00	0.59
Clearwater5	69	BD	1.31	6.00	0.90	5.00	1.00	2.80	0.43
	Average		1.44	7.10	1.04	5.86	1.12	3.30	0.49
	Stdev		0.20	1.77	0.24	1.31	0.22	0.79	0.11
	CV%		14.20	24.98	23.16	22.30	19.36	23.86	23.58
Asotin3	79	BD	1.74	5.50	0.90	5.30	1.00	2.80	0.41
Asotin4	78	BD	1.58	5.40	0.90	5.10	1.00	2.90	0.42
Asotin5	77	BD	1.80	5.70	0.90	5.30	1.00	3.00	0.44
Asotin6	76	BD	1.68	5.80	0.90	5.30	1.00	3.00	0.45
Asotin7	75	BD	1.60	5.50	0.90	5.00	1.00	3.00	0.43
	Average		1.68	5.58	0.90	5.20	1.00	2.94	0.43
	Stdev		0.09	0.16	0.00	0.14	0.00	0.09	0.02
	CV%		5.52	2.94	0.00	2.72	0.00	3.04	3.68
GR1	65	BD	1.76	5.80	0.90	5.50	1.10	3.00	0.44
GR2	64	BD	1.74	5.10	0.90	5.00	1.00	2.90	0.42
GR3	63	BD	1.72	5.50	0.90	5.10	1.00	2.80	0.41
GR4	62	BD	2.34	7.60	1.30	7.40	1.40	4.00	0.56

GR5	61	BD	1.57	5.60	0.90	5.50	1.10	3.20	0.46
	Average		1.83	5.92	0.98	5.70	1.12	3.18	0.46
	Stdev		0.30	0.97	0.18	0.98	0.16	0.48	0.06
	CV%		16.26	16.44	18.25	17.14	14.67	15.15	13.14
Salmon 1	43	BD	1.25	4.90	0.70	4.20	0.80	2.40	0.35
Salmon 2	44	BD	0.80	2.70	0.40	2.30	0.40	1.30	0.20
Salmon 3	45	BD	0.75	2.40	0.40	2.10	0.40	1.20	0.19
Salmon 4	46	BD	0.74	2.40	0.40	2.10	0.40	1.20	0.19
Sample 6	47	BD	1.00	4.70	0.80	4.40	0.90	2.70	0.40
	Average		0.91	3.42	0.54	3.02	0.58	1.76	0.27
	Stdev		0.22	1.27	0.19	1.17	0.25	0.73	0.10
	CV%		24.02	37.07	36.10	38.86	42.93	41.48	38.02
HC1	56	BD	2.53	9.40	1.60	9.00	1.70	4.90	0.70
HC2	54	BD	1.44	5.60	0.90	5.40	1.10	3.00	0.46
HC3	53	BD	1.54	5.40	0.90	5.40	1.10	2.90	0.44
HC4	52	BD	1.71	5.50	0.90	5.50	1.10	3.00	0.44
HC6	55	BD	1.49	5.20	0.90	5.30	1.10	3.00	0.42
	Average		1.74	6.22	1.04	6.12	1.22	3.36	0.49
	Stdev		0.45	1.78	0.31	1.61	0.27	0.86	0.12
	CV%		25.95	28.68	30.10	26.33	21.99	25.65	23.81

AG samples

Location name	Sample ID	Sample type	Yb ppm	Lu ppm	Hf ppm	Ta ppm	W ppm	Th ppm	U ppm
Potlatch 7	82	Ag	3.20	0.56	8.60	1.30	298.00	12.80	3.30
Clearwater7	67	Ag	3.40	0.58	6.60	1.00	89.00	10.10	2.70
	Average		3.30	0.57	7.60	1.15	193.50	11.45	3.00
	Stdev		0.14	0.01	1.41	0.21	147.79	1.91	0.42
	CV		4.29	2.48	18.61	18.45	76.37	16.67	14.14
Asotin1	81	Ag	3.10	0.50	7.40	1.10	239.00	11.70	2.70
GR8	58	Ag	3.10	0.52	7.00	1.10	81.00	10.40	2.90
HC8	49	Ag	2.20	0.35	2.50	0.50	108.00	2.20	1.00
	Average		2.80	0.46	5.63	0.90	142.67	8.10	2.20
	Stdev		0.52	0.09	2.72	0.35	84.51	5.15	1.04
	CV		18.56	20.35	48.30	38.49	59.24	63.59	47.46

Bank Samples

Potlatch 6	83	BK	3.30	0.55	5.20	0.90	240.00	7.80	2.40
Clearwater6	68	BK	3.90	0.66	10.40	0.90	1280.00	24.00	3.70
Clearwater8	66	BK	1.90	0.30	4.40	0.70	1230.00	9.10	1.80
	Average		2.90	0.48	7.40	0.80	1255.00	16.55	2.75
	Stdev		1.41	0.25	4.24	0.14	35.36	10.54	1.34
	CV%		48.77	53.03	57.33	17.68	2.82	63.66	48.85
Asotin 2	80	BK	2.90	0.48	7.10	1.10	356.00	8.90	2.40

(Submerged)									
Asotin8	74	BK	3.50	0.57	5.80	1.00	379.00	6.00	1.50
	Average		3.20	0.53	6.45	1.05	367.50	7.45	1.95
	Stdev		0.42	0.06	0.92	0.07	16.26	2.05	0.64
	CV%		13.26	12.12	14.25	6.73	4.43	27.52	32.64
GR6	60	BK	2.90	0.50	9.60	0.80	469.00	5.00	1.70
GR7	59	BK	2.80	0.44	4.30	0.70	803.00	10.80	1.50
GR9	57	BK	2.60	0.42	5.10	0.80	466.00	4.70	1.70
	Average		2.77	0.45	6.33	0.77	579.33	6.83	1.63
	Stdev		0.15	0.04	2.86	0.06	193.71	3.44	0.12
	CV%		5.52	9.18	45.11	7.53	33.44	50.32	7.07
Salmon 5	48	BK	2.40	0.40	6.30	1.20	682.00	10.00	2.50
Salmon 6 (BK)	190	BK	3.40	0.58	4.80	0.90	222.00	6.80	2.10
	Average		2.90	0.49	5.55	1.05	452.00	8.40	2.30
	Stdev		0.71	0.13	1.06	0.21	325.27	2.26	0.28
	CV		24.38	25.98	19.11	20.20	71.96	26.94	12.30
HC5	51	BK	4.20	0.70	6.70	1.10	66.00	5.00	1.30
HC7	50	BK	3.20	0.55	5.30	0.90	104.00	7.00	1.90
	Average		3.70	0.63	6.00	1.00	85.00	6.00	1.60
	Stdev		0.71	0.11	0.99	0.14	26.87	1.41	0.42
	CV%		19.11	16.97	16.50	14.14	31.61	23.57	26.52
Bed Samples									
Potlatch 1	88	BD	3.20	0.55	7.20	1.00	388.00	11.80	3.10

Potlatch 2	87	BD	2.10	0.32	4.00	0.60	873.00	5.10	1.30
Potlatch 3	86	BD	2.80	0.46	4.50	0.70	803.00	6.70	1.60
Potlatch 4	85	BD	4.00	0.63	6.90	1.00	466.00	14.40	2.80
Potlatch 5	84	BD	3.40	0.55	7.40	1.10	403.00	10.70	2.70
	Average		3.10	0.50	6.00	0.88	586.60	9.74	2.30
	Stdev		0.71	0.12	1.62	0.22	232.67	3.80	0.80
	CV%		22.81	23.54	26.95	24.64	39.66	38.98	34.65
Clearwater1	73	BD	3.90	0.64	12.00	1.10	1400.00	25.10	3.70
Clearwater2	72	BD	2.20	0.37	5.80	0.70	1360.00	11.10	2.10
Clearwater3	71	BD	3.20	0.55	9.10	0.90	1760.00	23.10	3.00
Clearwater4	70	BD	3.80	0.62	5.60	1.00	1490.00	16.60	2.30
Clearwater5	69	BD	2.80	0.45	6.90	0.80	1420.00	15.50	2.40
	Average		3.18	0.53	7.88	0.90	1486.00	18.28	2.70
	Stdev		0.71	0.11	2.69	0.16	160.25	5.74	0.65
	CV%		22.28	21.78	34.14	17.57	10.78	31.41	24.15
Asotin3	79	BD	2.70	0.43	5.30	0.90	219.00	5.90	2.00
Asotin4	78	BD	2.70	0.46	5.60	0.90	303.00	6.50	2.40
Asotin5	77	BD	3.00	0.50	5.80	1.00	226.00	6.10	1.90
Asotin6	76	BD	2.80	0.49	5.70	0.90	304.00	6.90	2.30
Asotin7	75	BD	2.80	0.49	5.80	0.90	305.00	7.00	2.70
	Average		2.80	0.47	5.64	0.92	271.40	6.48	2.26
	Stdev		0.12	0.03	0.21	0.04	44.71	0.48	0.32
	CV%		4.37	6.08	3.68	4.86	16.48	7.43	14.20
GR1	65	BD	2.90	0.47	4.50	0.70	362.00	5.90	1.60
GR2	64	BD	2.70	0.47	4.70	0.80	177.00	4.90	2.00

GR3	63	BD	2.70	0.46	4.60	0.80	362.00	4.70	1.60
GR4	62	BD	3.50	0.55	5.20	0.70	413.00	12.00	1.60
GR5	61	BD	3.10	0.51	4.90	0.90	191.00	5.60	3.50
	Average		2.98	0.49	4.78	0.78	301.00	6.62	2.06
	Stdev		0.33	0.04	0.28	0.08	108.93	3.05	0.82
	CV%		11.23	7.66	5.81	10.73	36.19	46.03	39.97
Salmon 1	43	BD	2.20	0.38	3.20	1.30	1120.00	10.80	2.10
Salmon 2	44	BD	1.40	0.21	0.90	0.50	1060.00	6.00	1.40
Salmon 3	45	BD	1.20	0.21	2.70	0.70	1310.00	6.20	1.50
Salmon 4	46	BD	1.20	0.20	2.80	0.70	1230.00	6.10	1.50
Sample 6	47	BD	2.70	0.47	7.20	1.40	1410.00	13.80	2.70
	Average		1.74	0.29	3.36	0.92	1226.00	8.58	1.84
	Stdev		0.68	0.12	2.32	0.40	141.17	3.56	0.55
	CV%		38.89	42.11	69.12	43.75	11.51	41.47	30.16
HC1	56	BD	4.50	0.73	6.30	1.40	145.00	4.00	1.30
HC2	54	BD	3.10	0.51	4.90	1.10	177.00	7.40	1.70
HC3	53	BD	2.80	0.47	3.30	0.50	352.00	2.10	0.70
HC4	52	BD	2.70	0.46	3.50	0.40	136.00	2.00	0.80
HC6	55	BD	2.90	0.48	3.10	0.50	126.00	2.50	0.90
	Average		3.20	0.53	4.22	0.78	187.20	3.60	1.08
	Stdev		0.74	0.11	1.36	0.44	94.09	2.27	0.41
	CV%		23.18	21.39	32.25	56.90	50.26	63.07	38.40

5g Processed Agricultural Samples

Agriculture soils

Location name	ID	$\delta^{13}\text{C}$	C%	$\delta^{15}\text{N}$	N%	C/N (molar ratio)	Sc46 mg/g	La140 mg/g
Potlatch 7	82	-26.62	2.085	7.02	0.1675	14.5	ND	0.06
Clearwater7	67	-26.63	2.5722	6.2	0.2184	13.7	0.02	0.05
Asotin1	81	-25.42	1.2576	7.23	0.1159	12.7	0.06	0.17
GR8	58	-26.23	2.5957	6.41	0.1922	15.8	0.02	0.04
HC8	49	-28.24	7.6587	5.28	0.6422	13.9	0.06	ND
Average		-26.63	3.23	6.43	0.27	14.12	0.04	0.08
Std deviation		1.03	2.53	0.77	0.21	1.14	0.02	0.06
CV%		-3.9	78.3	12.0	79.7	8.0	54.63	77.73
R^2 (n=5)		$d^{13}\text{C}_{\text{VPDB}} \times 1000$						
	$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$	1.00	C%					
	C%	-0.94	1.00	$d^{15}\text{N}_{\text{air}} \times 1000$				
	$\delta^{15}\text{N}_{\text{air}} \times 1000$	0.89	-0.92	1.00	N%			
	N%	-0.93	1.00	-0.91	1.00	C/N		
	C/N	-0.14	0.05	-0.17	-0.01	1.00	Sc46	
	Sc46	-0.32	0.51	-0.17	0.55	-0.52	1.00	La140
	La140	0.90	-0.96	0.77	-0.91	-0.79	0.98	1.00
	SiO ₂	0.86	-0.96	0.96	-0.96	-0.07	-0.44	0.55

Al ₂ O ₃	-0.09	0.13	-0.38	0.08	0.79	-0.62	-0.62
Fe ₂ O ₃	-0.68	0.84	-0.92	0.83	0.09	0.31	-0.30
MnO	0.00	0.04	-0.21	-0.02	0.90	-0.48	-0.57
MgO	-0.59	0.81	-0.60	0.82	-0.29	0.92	0.90
CaO	-0.76	0.93	-0.79	0.94	-0.17	0.78	0.65
Na ₂ O	-0.56	0.73	-0.42	0.74	-0.17	0.92	0.65
K ₂ O	0.85	-0.93	0.99	-0.92	-0.13	-0.28	0.63
TiO ₂	-0.67	0.83	-0.91	0.83	0.10	0.35	-0.26
P ₂ O ₅	-0.96	0.98	-0.97	0.98	0.10	0.36	-0.89
LOI	-0.93	0.98	-0.98	0.98	0.08	0.37	-0.80
Sc	-0.86	0.96	-0.96	0.96	-0.02	0.46	-0.46
V	-0.77	0.93	-0.93	0.92	0.03	0.49	-0.26
Co	0.37	-0.40	0.70	-0.40	-0.03	0.54	0.38
Ga	0.18	-0.23	-0.15	-0.27	0.50	-0.98	-0.67
Rb	0.79	-0.95	0.86	-0.96	0.16	-0.70	-0.26
Sr	-0.08	0.26	0.08	0.27	-0.11	0.85	0.62
Y	0.63	-0.85	0.66	-0.85	0.12	-0.85	-0.63
Zr	0.79	-0.94	0.92	-0.94	0.09	-0.57	0.12
Nb	0.88	-0.90	0.84	-0.92	0.27	-0.72	-0.38
Cs	0.77	-0.97	0.79	-0.97	0.08	-0.71	0.04
Ba	0.77	-0.90	0.75	-0.92	0.38	-0.78	-0.74
La	0.81	-0.95	0.91	-0.96	0.08	-0.59	0.13
Ce	0.84	-0.95	0.87	-0.97	0.24	-0.66	-0.18
Pr	0.81	0.96	0.90	-0.96	0.11	-0.63	0.01
Nd	0.81	-0.96	0.88	-0.97	0.10	-0.66	-0.03
Sm	0.80	-0.95	0.82	-0.96	0.17	-0.74	-0.58
Eu	0.62	0.83	0.63	-0.85	0.25	-0.90	-0.86
Gd	0.73	-0.91	0.77	-0.92	0.17	-0.80	-0.66

Tb	0.88	-0.98	0.83	-0.98	0.11	-0.69	.
Dy	0.77	-0.94	0.80	-0.94	0.04	-0.74	-0.30
Ho	0.78	-0.91	0.69	-0.91	0.03	-0.78	-0.34
Er	0.79	-0.94	0.78	-0.94	0.00	-0.72	-0.18
Tm	0.71	-0.90	0.73	-0.90	0.07	-0.79	-0.49
Yb	0.76	-0.91	0.72	-0.92	0.05	-0.78	-0.44
Lu	0.67	-0.87	0.68	-0.88	0.13	-0.84	-0.67
Hf	0.82	-0.95	0.92	-0.96	0.11	-0.59	0.11
Ta	0.79	-0.93	0.90	-0.94	0.18	-0.61	-0.04
W	0.37	-0.45	0.73	-0.42	-0.33	0.57	0.49
Th	0.86	-0.98	0.93	-0.98	0.05	-0.56	0.35
U	0.78	-0.93	0.85	-0.95	0.23	-0.72	-0.38

Agriculture

soils

Location name	ID	SiO ₂ %	Al ₂ O ₃ %	Fe ₂ O ₃ %	MnO %	MgO %	CaO %	Na ₂ O %	K ₂ O %
Potlatch 7	82	66.04	13.16	4.58	0.119	1.06	1.82	2.03	2.11
Clearwater7	67	59.89	13.86	6.45	0.12	0.99	2.05	1.64	1.65
Asotin1	81	64.74	13.09	5.58	0.106	1.56	2.48	2.13	2.08
GR8	58	59.52	15.04	6.71	0.191	1.21	2.29	1.93	1.68
HC8	49	46.81	13.74	8.19	0.127	2.25	4.55	2.56	1.05
Average		59.40	13.78	6.30	0.13	1.41	2.64	2.06	1.71
Std deviation		7.61	0.78	1.35	0.03	0.52	1.10	0.34	0.43
CV%		12.8	5.7	21.3	25.3	36.5	41.6	16.3	25.0

R² (n=5)

δ¹³C_{VPDB} x
1000

C%

δ¹⁵N_{air} x 1000

N%

C/N

Sc46

La140 SiO₂

SiO₂ 1.00 Al₂O₃

Al₂O₃ -0.30 1.00 Fe₂O₃(T)

Fe₂O₃ -0.95 0.48 1.00 MnO

MnO -0.16 0.95 0.30 1.00 MgO

MgO -0.78 -0.13 0.70 -0.15 CaO

CaO -0.92 0.02 0.83 -0.06 Na₂O

Na ₂ O	-0.62	-0.24	0.46	-0.15	0.93	0.86	1.00	K ₂ O
K ₂ O	0.99	-0.39	-0.96	-0.22	-0.69	-0.85	-0.50	1.00
TiO ₂	-0.95	0.48	1.00	0.31	0.71	0.84	0.48	-0.95
P ₂ O ₅	-0.97	0.22	0.87	0.09	0.71	0.87	0.59	-0.97
LOI	-0.98	0.24	0.90	0.10	0.72	0.88	0.59	-0.98
Sc	-0.99	0.22	0.94	0.06	0.79	0.92	0.61	-0.98
V	-0.99	0.33	0.98	0.18	0.81	0.93	0.62	-0.97
Co	0.59	-0.52	-0.74	-0.22	-0.12	-0.31	0.22	0.69
Ga	0.04	0.78	0.19	0.62	-0.56	-0.39	-0.74	-0.10
Rb	0.96	-0.07	-0.89	0.04	-0.92	-0.99	-0.77	0.91
Sr	-0.16	-0.28	0.04	-0.06	0.67	0.49	0.84	-0.02
Y	0.83	-0.03	-0.76	-0.02	-0.98	-0.97	-0.92	0.74
Zr	0.98	-0.20	-0.95	-0.05	-0.84	-0.95	-0.65	0.96
Nb	0.93	-0.03	-0.89	0.11	-0.90	-0.97	-0.72	0.89
Cs	0.89	0.07	-0.72	0.10	-0.90	-0.96	-0.87	0.82
Ba	0.86	0.21	-0.74	0.32	-0.92	-0.96	-0.80	0.79
La	0.99	-0.18	-0.93	-0.04	-0.87	-0.96	-0.70	0.95
Ce	0.94	0.04	-0.84	0.18	-0.88	-0.96	-0.73	0.90
Pr	0.98	-0.13	-0.91	-0.01	-0.89	-0.98	-0.73	0.94
Nd	0.97	-0.12	-0.90	-0.01	-0.91	-0.99	-0.77	0.93
Sm	0.93	-0.01	-0.84	0.08	-0.95	-1.00	-0.83	0.87
Eu	0.81	0.10	-0.71	0.12	-1.00	-0.97	-0.94	0.71
Gd	0.91	-0.02	-0.83	0.04	-0.97	-1.00	-0.87	0.84
Tb	0.93	0.03	-0.78	0.09	-0.90	-0.97	-0.84	0.86
Dy	0.92	-0.10	-0.83	-0.05	-0.95	-0.99	-0.87	0.86
Ho	0.83	0.04	-0.68	0.02	-0.94	-0.95	-0.95	0.74
Er	0.91	-0.09	-0.80	-0.06	-0.94	-0.98	-0.89	0.84
Tm	0.88	-0.07	-0.79	-0.05	-0.97	-0.98	-0.91	0.80

Yb	0.86	0.00	-0.73	0.00	-0.96	-0.97	-0.93	0.78
Lu	0.84	0.00	-0.75	0.02	-0.99	-0.98	-0.93	0.76
Hf	0.98	-0.16	-0.93	-0.01	-0.86	-0.96	-0.68	0.95
Ta	0.97	-0.12	-0.92	0.05	-0.86	-0.95	-0.66	0.94
W	0.65	-0.78	-0.82	-0.56	-0.17	-0.36	0.12	0.74
Th	0.99	-0.16	-0.91	-0.03	-0.85	-0.96	-0.71	0.96
U	0.94	-0.02	-0.87	0.11	-0.92	-0.98	-0.76	0.90

Agriculture
soils

Location name	ID	TiO ₂ %	P ₂ O ₅ %	LOI %	Sc ppm	V ppm	Co ppm	Ga ppm	Rb ppm	Sr ppm	Y ppm
Potlatch 7	82	0.919	0.19	7.66	12	94	46	17	81	269	33
Clearwater7	67	1.157	0.24	10.49	16	137	28	19	69	233	34
Asotin1	81	1.061	0.15	6.61	13	119	41	17	69	279	29
GR8	58	1.21	0.22	9.6	15	145	35	19	70	264	30
HC8	49	1.401	0.39	17.03	23	214	33	17	29	279	21
Average		1.15	0.24	10.28	15.80	141.80	36.60	17.80	63.60	264.80	29.40
Std deviation		0.18	0.09	4.07	4.32	44.86	7.02	1.10	19.99	18.93	5.13
CV%		15.6	38.4	39.6	27.4	31.6	19.2	6.2	31.4	7.1	17.4

R² (n=5)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na ₂ O											
K ₂ O	TiO ₂										
TiO ₂	1.00	P ₂ O ₅									
P ₂ O ₅	0.86	1.00	LOI								
LOI	0.89	1.00	1.00	Sc							
Sc	0.93	0.97	0.98	1.00	V						
V	0.98	0.93	0.95	0.98	1.00			Co			
Co	-0.72	-0.53	-0.57	-0.61	-0.61	1.00	Ga				
Ga	0.17	-0.08	0.05	-0.06	-0.02	-0.66	1.00	Rb			
Rb	-0.89	-0.91	-0.93	-0.97	-0.96	0.45	0.27	1.00	Sr		
Sr	0.08	0.10	0.09	0.12	0.19	0.61	-0.79	-0.34	1.00	Y	Y
Y	-0.77	-0.75	-0.77	-0.82	-0.86	0.15	0.21	0.93	-0.66	1.00	1.00
Zr	-0.95	-0.93	-0.95	-0.99	-0.99	0.59	0.10	0.98	-0.20	0.87	
Nb	-0.89	-0.87	-0.90	-0.95	-0.95	0.51	0.24	0.99	-0.29	0.90	
Cs	-0.73	-0.91	-0.90	-0.89	-0.85	0.19	0.47	0.94	-0.47	0.91	
Ba	-0.74	-0.85	-0.85	-0.89	-0.85	0.31	0.47	0.96	-0.39	0.88	
La	-0.93	-0.94	-0.96	-0.99	-0.99	0.54	0.15	0.99	-0.25	0.89	
Ce	-0.83	-0.93	-0.94	-0.96	-0.93	0.45	0.31	0.98	-0.27	0.87	
Pr	-0.92	-0.93	-0.95	-0.98	-0.98	0.50	0.46	1.00	-0.29	0.91	
Nd	-0.90	-0.93	-0.94	-0.97	-0.97	0.45	0.25	1.00	-0.34	0.93	
Sm	-0.84	-0.90	-0.91	-0.94	-0.93	0.35	0.37	0.99	-0.44	0.95	
Eu	-0.73	-0.74	-0.75	-0.80	-0.83	0.12	0.54	0.93	-0.66	0.99	
Gd	-0.84	-0.85	-0.86	-0.91	-0.92	0.30	0.39	0.98	-0.51	0.98	
Tb	-0.79	-0.93	-0.93	-0.93	-0.90	0.29	0.41	0.97	-0.42	0.92	
Dy	-0.84	-0.88	-0.88	-0.91	-0.93	0.28	0.37	0.97	-0.52	0.98	
Ho	-0.69	-0.82	-0.81	-0.82	-0.81	0.05	0.54	0.90	-0.65	0.96	
Er	-0.81	-0.88	-0.88	-0.89	-0.90	0.22	0.40	0.95	-0.55	0.97	
Tm	-0.81	-0.82	-0.83	-0.87	-0.89	0.21	0.42	0.95	0.99	0.99	

Yb	-0.74	-0.83	-0.83	-0.85	-0.86	0.12	0.49	0.93	0.98	0.98
Lu	-0.77	-0.78	-0.79	-0.83	-0.86	0.15	0.48	0.94	1.00	1.00
Hf	-0.93	-0.94	-0.96	-0.99	-0.98	0.56	0.15	0.99	0.87	0.87
Ta	-0.92	-0.92	-0.94	-0.98	-0.97	0.58	0.15	0.99	0.86	0.86
W	-0.81	-0.56	-0.60	-0.63	-0.68	0.92	-0.72	0.47	0.26	0.26
Th	-0.91	-0.96	-0.97	-0.99	-0.98	0.51	0.18	0.99	0.88	0.88
U	-0.88	-0.90	-0.91	-0.96	-0.95	0.46	0.29	1.00	0.91	0.91

Agriculture
 soils

Location name	ID	Zr ppm	Nb ppm	Cs ppm	Ba ppm	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm
Potlatch 7	82	336	15	3.2	721	49.6	95.5	10.5	39	7.5	1.63
Clearwater7	67	251	12	3.5	670	38.9	78.8	8.74	34.3	7.1	1.66
Asotin1	81	283	12	3.4	645	42.7	85.4	9.18	34.9	6.8	1.49
GR8	58	261	13	3.4	748	39.3	91.9	8.82	33.7	7	1.58
HC8	49	101	6	1.1	393	13.4	29.2	3.7	16	3.9	1.25
Average		246.40	11.60	2.92	635.40	36.78	76.16	8.19	31.58	6.46	1.52
Std deviation		87.67	3.36	1.02	141.47	13.76	27.02	2.61	8.95	1.45	0.17
CV%		35.6	29.0	35.0	22.3	37.4	35.5	31.8	28.4	22.5	10.8

R² (n=5)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na ₂ O											
K ₂ O											
TiO ₂											
P ₂ O ₅											
LOI											
Sc											
V											
Co											
Ga											
Rb											
Sr											
Y	Zr										
Zr	1.00	Nb									
Nb	0.98	1.00	Cs								
Cs	0.88	0.89	1.00	Ba							
Ba	0.91	0.96	0.94	1.00	La						
La	1.00	0.98	0.91	0.92	1.00	Ce					
Ce	0.96	0.98	0.94	0.98	0.97	1.00	Pr				
Pr	0.99	0.98	0.93	0.94	1.00	0.98	1.00	Nd			
Nd	0.99	0.98	0.94	0.94	0.99	0.98	1.00	1.00	Sm		
Sm	0.96	0.97	0.97	0.97	0.97	0.98	0.98	0.99	1.00	Eu	
Eu	0.86	0.91	0.91	0.92	0.88	0.89	0.90	0.92	0.96	1.00	
Gd	0.94	0.96	0.94	0.95	0.96	0.95	0.97	0.98	0.99	0.98	
Tb	0.93	0.93	0.99	0.96	0.95	0.97	0.96	0.97	0.98	0.92	
Dy	0.93	0.93	0.96	0.92	0.95	0.93	0.96	0.98	0.99	0.96	
Ho	0.83	0.84	0.97	0.89	0.87	0.88	0.89	0.91	0.94	0.95	
Er	0.91	0.91	0.97	0.90	0.94	0.92	0.95	0.96	0.98	0.96	
Tm	0.90	0.91	0.94	0.90	0.92	0.90	0.94	0.95	0.97	0.98	

Yb	0.87	0.88	0.97	0.90	0.90	0.90	0.92	0.94	0.96	0.97
Lu	0.88	0.91	0.93	0.91	0.90	0.89	0.92	0.94	0.96	0.99
Hf	1.00	0.98	0.91	0.93	1.00	0.98	1.00	0.99	0.97	0.87
Ta	1.00	0.99	0.89	0.94	0.99	0.98	0.99	0.98	0.96	0.86
W	0.61	0.49	0.23	0.25	0.57	0.41	0.52	0.49	0.37	0.19
Th	0.99	0.97	0.94	0.93	1.00	0.98	1.00	0.99	0.97	0.87
U	0.98	1.00	0.93	0.97	0.99	0.99	0.99	0.99	0.99	0.92

Agriculture
soils

Location name	ID	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm	Hf ppm
Potlatch 7	82	6.7	1	5.9	1.1	3.3	0.5	3.2	0.56	8.6
Clearwater7	67	6.5	1	5.9	1.2	3.4	0.51	3.4	0.58	6.6
Asotin1	81	6	1	5.6	1.1	3.2	0.46	3.1	0.5	7.4
GR8	58	6.2	1	5.5	1.1	3.1	0.46	3.1	0.52	7
HC8	49	4.2	0.7	4.1	0.8	2.2	0.33	2.2	0.35	2.5
Average		5.92	0.94	5.40	1.06	3.04	0.45	3.00	0.50	6.42
Std deviation		1.00	0.13	0.75	0.15	0.48	0.07	0.46	0.09	2.32
CV%		16.9	14.3	13.9	14.3	15.9	15.9	15.5	18.1	36.1

R² (n=5)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na ₂ O								
K ₂ O								
TiO ₂								
P ₂ O ₅								
LOI								
Sc								
V								
Co								
Ga								
Rb								
Sr								
Y								
Zr								
Nb								
Cs								
Ba								
La								
Ce								
Pr								
Nd								
Sm								
Eu	Gd							
Gd	1.00	Tb						
Tb	0.96	1.00	Dy					
Dy	0.99	0.97	1.00	Ho				
Ho	0.95	0.96	0.97	1.00	Er			
Er	0.98	0.97	1.00	0.98	1.00	Tm		
Tm	0.99	0.95	0.99	0.97	0.99	1.00	Yb	

Yb	0.97	0.96	0.99	1.00	0.99	0.99	1.00	Lu	
Lu	0.99	0.94	0.98	0.97	0.98	1.00	0.99	1.00	Hf
Hf	0.95	0.95	0.94	0.85	0.92	0.91	0.88	0.89	1.00
Ta	0.94	0.93	0.92	0.82	0.90	0.89	0.86	0.87	1.00
W	0.35	0.31	0.37	0.15	0.32	0.31	0.22	0.24	0.57
Th	0.95	0.97	0.95	0.88	0.94	0.92	0.91	0.90	0.99
U	0.98	0.96	0.96	0.88	0.93	0.93	0.91	0.93	0.99

Agriculture
 soils

Location name	ID	Ta ppm	W ppm	Th ppm	U ppm
Potlatch 7	82	1.3	298	12.8	3.3
Clearwater7	67	1	89	10.1	2.7
Asotin1	81	1.1	239	11.7	2.7
GR8	58	1.1	81	10.4	2.9
HC8	49	0.5	108	2.2	1
Average		1.00	163.00	9.44	2.52
Std deviation		0.30	99.03	4.19	0.88
CV%		30.0	60.8	44.4	35.1

R² (n=5)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

K₂O

TiO₂

P₂O₅

LOI

Sc

V

Co

Ga

Rb

Sr

Y

Zr

Nb

Cs

Ba

La

Ce

Pr

Nd

Sm

Eu

Gd

Tb

Dy

Ho

Er

Tm

Yb				
Lu				
Hf	Ta			
Ta	1.00	W		
W	0.57	1.00	Th	
Th	0.98	0.54	1.00	U
U	0.99	0.45	0.98	1.00

5h Processed Bank Samples

Bank samples

Location name	ID	$\delta^{13}\text{C}$	C%	$\delta^{15}\text{N}$	N%	C/N (molar ratio)	Sc46	La140	SiO ₂
Potlatch 6	83	-25.39	1.5431	4.46	0.079	22.8	0.04	0.04	53.94
Submerged	80	-27.22	0.745	5	0.0639	13.6	0.02	0.03	60.58
Clearwater6	68	-27.81	1.18	1.46	0.09	14.65	0.01	0.12	67.82
Clearwater8	66	-26.19	0.255	1.39	0.019	15.7	0.01	0.01	71.76
Asotin8	74	-26.63	0.3964	4.89	0.0392	11.8	0.04	0.04	53.97
GR6	60	-24.71	0.171	4.2	0.0172	11.6	0.05	0.03	55.64
GR7	59	-26.05	2.2576	5.03	0.2022	13.0	0.03	0.02	62.61
GR9	57	-26.18	0.768	4.48	0.0652	13.7	0.03	0.05	56.36
Salmon 5	48	-24.5	0.42075	2.185	0.02645	18.6	0.01	0.04	67.14
Salmon 6 (BK)	190	-25.34	1.7316	4.51	0.07	28.9	0.04	0.04	54.03
HC5	51	-23.67	0.3457	5.36	0.0321	12.6	0.03	0.03	47.9
HC7	50	-21.61	0.2951	7.97	0.0457	7.5	0.04	0.02	56.45
Average		-25.44	0.84	4.24	0.06	15.36	0.03	0.04	59.02
Std deviation		1.68	0.68	1.84	0.05	5.68	0.01	0.03	7.05
CV%		-6.6	81.1	43.3	80.1	37.0	43.26	70.97	11.9

$$\begin{aligned}
 R^2 &= 0.999 \\
 \delta^{13}\text{C}_{\text{VPDB}} \times 1000 &= 1.00 \\
 \text{C\%} &= -0.37 \\
 \delta^{15}\text{N}_{\text{air}} \times 1000 &= 0.60
 \end{aligned}$$

N%	-0.30	0.94	0.13	1.00	C/N			
C/N	-0.33	0.35	-0.56	0.05	1.00	Sc46		
Sc46	0.50	-0.13	0.67	-0.11	-0.35	1.00	La140	
La140	-0.46	0.23	-0.46	0.15	0.17	-0.33	1.00	SiO ₂
SiO ₂	-0.41	0.12	-0.72	0.12	0.24	-0.69	0.28	1.00
Al ₂ O ₃	0.67	-0.16	0.76	0.03	-0.62	0.45	-0.30	-0.27
Fe ₂ O ₃	0.37	-0.17	0.59	-0.22	-0.13	0.65	-0.28	-0.98
MnO	0.45	-0.07	0.65	-0.11	-0.12	0.72	-0.28	-0.97
MgO	-0.09	0.24	0.42	0.31	-0.22	0.58	-0.27	-0.55
CaO	-0.14	-0.08	0.29	-0.04	-0.21	0.54	-0.24	-0.66
Na ₂ O	-0.35	-0.10	-0.39	0.06	-0.22	-0.18	-0.06	0.41
K ₂ O	-0.28	-0.01	-0.68	-0.06	0.34	-0.54	0.29	0.93
TiO ₂	0.22	-0.35	0.53	-0.31	-0.35	0.59	-0.25	-0.90
P ₂ O ₅	-0.12	0.00	0.30	-0.02	-0.07	0.47	-0.15	-0.73
LOI	0.49	0.18	0.61	0.12	0.00	0.21	-0.07	-0.58
Sc	0.37	-0.24	0.66	-0.20	-0.36	0.69	-0.31	-0.97
V	0.29	-0.30	0.56	-0.28	-0.34	0.70	-0.31	-0.90
Co	-0.60	0.14	-0.83	0.14	0.15	-0.54	0.48	0.79
Ga	0.49	-0.36	0.74	-0.28	-0.51	0.59	-0.25	-0.91
Rb	-0.03	0.08	-0.41	-0.02	0.38	-0.44	0.31	0.74
Sr	-0.35	0.29	-0.46	0.36	0.12	-0.34	-0.07	0.52
Y	0.02	0.20	0.28	0.21	-0.18	0.14	0.46	-0.53
Zr	-0.23	-0.20	-0.36	-0.24	-0.04	-0.09	0.67	0.09
Nb	0.26	-0.37	0.17	-0.43	0.05	-0.04	0.13	-0.43
Cs	0.54	0.13	0.35	0.05	0.17	0.07	0.02	-0.02
Ba	-0.36	-0.19	-0.43	-0.16	0.04	-0.11	0.09	0.52
La	-0.53	0.43	-0.52	0.41	0.13	-0.53	0.83	0.55
Ce	-0.51	0.38	-0.51	0.34	0.16	-0.51	0.87	0.48

Pr	-0.47	0.31	-0.48	0.27	0.12	-0.48	0.89	0.42
Nd	-0.44	0.25	-0.43	0.21	0.08	-0.42	0.89	0.31
Sm	-0.30	0.18	-0.21	0.14	-0.03	-0.22	0.82	0.00
Eu	0.06	-0.03	0.52	0.02	-0.36	0.46	-0.02	-0.82
Gd	-0.10	0.14	0.11	0.13	-0.16	0.06	0.58	-0.39
Tb	0.01	0.10	0.22	0.07	-0.15	0.15	0.46	-0.53
Dy	0.05	0.14	0.31	0.15	-0.23	0.20	0.40	-0.58
Ho	0.15	0.13	0.40	0.14	-0.26	0.32	0.33	-0.65
Er	0.08	0.10	0.33	0.10	-0.22	0.23	0.39	-0.62
Tm	0.14	0.08	0.39	0.09	-0.24	0.27	0.38	-0.64
Yb	0.08	0.08	0.32	0.07	-0.19	0.22	0.43	-0.60
Lu	0.13	0.03	0.32	0.01	-0.20	0.25	0.44	-0.59
Hf	-0.22	-0.20	-0.29	-0.23	-0.12	-0.05	0.66	0.03
Ta	0.15	-0.34	0.07	-0.39	0.14	-0.23	0.09	-0.23
W	-0.60	0.21	-0.83	0.21	0.21	-0.62	0.47	0.89
Th	-0.49	0.39	-0.55	0.35	0.18	-0.56	0.84	0.62
U	-0.40	0.20	-0.51	0.06	0.38	-0.47	0.83	0.52

Bank samples

Location name	ID	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O	TiO ₂	P ₂ O ₅
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		%	%	%	%	%	%	%	%	%
Potlatch 6	83	13.03	12.78	0.198	2.25	4.15	1.9	1.54	1.451	0.27
Submerged	80	13.73	7.85	0.096	2.22	4.21	2.51	1.63	1.604	0.21
Clearwater6	68	12.75	4.43	0.071	1.41	2.74	2.57	2.18	0.791	0.14
Clearwater8	66	12.89	3.36	0.051	1.14	2.69	2.96	2.44	0.529	0.08
Asotin8	74	13.39	11.88	0.172	3.29	6.79	2.76	1.5	2.206	0.46
GR6	60	13.63	11.88	0.166	3.04	6.42	3.03	1.41	2.344	0.29
GR7	59	14.02	6.17	0.113	3.11	4.63	2.98	1.6	0.923	0.24
GR9	57	14.8	9.51	0.139	2.62	5.87	3.12	1.49	1.851	0.28
Salmon 5	48	13.6	4.55	0.075	1.82	3.04	2.83	2.5	0.721	0.17
Salmon 6 (BK)	190	13.16	11.85	0.181	2.47	4.57	2.02	1.76	1.523	0.32
HC5	51	13.44	16.18	0.225	2.12	5.12	2.28	0.71	2.615	0.34
HC7	50	16.77	9.2	0.153	1.74	2.66	2.21	1.65	1.357	0.11
Average		13.77	9.14	0.14	2.27	4.41	2.60	1.70	1.49	0.24
Std deviation		1.09	3.96	0.06	0.68	1.45	0.42	0.49	0.67	0.11
CV%		7.9	43.3	40.4	29.8	33.0	16.0	28.7	45.1	44.5

R² (n=12)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂ Al₂O₃

Al₂O₃ 1.00 Fe₂O₃(T)

Fe ₂ O ₃	0.09	1.00	MnO						
MnO	0.17	0.98	1.00	MgO					
MgO	0.06	0.49	0.50	1.00	CaO				
CaO	-0.08	0.65	0.60	0.88	1.00	Na ₂ O			
Na ₂ O	-0.09	-0.43	-0.47	0.29	0.31	1.00	K ₂ O		
K ₂ O	-0.19	-0.91	-0.88	-0.56	-0.66	0.29	1.00	TiO ₂	
TiO ₂	0.10	0.91	0.83	0.59	0.81	-0.12	-0.88	1.00	P ₂ O ₅
P ₂ O ₅	-0.19	0.74	0.70	0.81	0.90	0.02	-0.68	0.79	1.00
LOI	0.34	0.54	0.60	-0.16	-0.19	-0.87	-0.56	0.26	0.02
Sc	0.21	0.96	0.93	0.60	0.75	-0.25	-0.93	0.97	0.79
V	0.15	0.91	0.85	0.65	0.83	-0.09	-0.87	0.98	0.76
Co	-0.53	-0.71	-0.72	-0.37	-0.32	0.51	0.64	-0.60	-0.41
Ga	0.44	0.86	0.84	0.33	0.51	-0.35	-0.87	0.86	0.55
Rb	-0.01	-0.73	-0.67	-0.71	-0.87	-0.20	0.86	-0.86	-0.77
Sr	-0.16	-0.53	-0.52	0.16	0.08	0.85	0.36	-0.38	-0.17
Y	-0.09	0.52	0.53	0.17	0.19	-0.50	-0.57	0.45	0.44
Zr	-0.35	-0.02	-0.11	-0.09	0.03	0.03	0.08	0.14	-0.02
Nb	-0.08	0.45	0.39	-0.07	0.04	-0.53	-0.29	0.41	0.32
Cs	0.43	-0.03	0.08	-0.47	-0.67	-0.78	0.13	-0.33	-0.47
Ba	-0.16	-0.52	-0.51	0.03	0.00	0.50	0.66	-0.39	0.00
La	-0.40	-0.54	-0.52	-0.38	-0.47	-0.04	0.43	-0.54	-0.36
Ce	-0.42	-0.46	-0.44	-0.41	-0.46	-0.13	0.38	-0.47	-0.33
Pr	-0.40	-0.39	-0.39	-0.40	-0.43	-0.15	0.34	-0.40	-0.27
Nd	-0.40	-0.28	-0.28	-0.38	-0.36	-0.21	0.23	-0.28	-0.19
Sm	-0.33	0.03	0.02	-0.25	-0.18	-0.36	-0.06	0.00	0.03
Eu	0.01	0.81	0.79	0.54	0.65	-0.30	-0.84	0.81	0.82
Gd	-0.20	0.41	0.41	0.03	0.11	-0.47	-0.44	0.35	0.34
Tb	-0.17	0.56	0.55	0.07	0.17	-0.55	-0.57	0.47	0.43

Dy	-0.08	0.58	0.58	0.16	0.22	-0.52	-0.62	0.50	0.45
Ho	-0.01	0.65	0.66	0.23	0.26	-0.54	-0.68	0.56	0.49
Er	-0.07	0.62	0.63	0.16	0.24	-0.54	-0.65	0.54	0.47
Tm	0.02	0.63	0.64	0.15	0.21	-0.58	-0.65	0.54	0.45
Yb	-0.07	0.60	0.61	0.13	0.20	-0.58	-0.61	0.52	0.45
Lu	-0.04	0.60	0.60	0.09	0.17	-0.60	-0.59	0.52	0.40
Hf	-0.31	0.03	-0.05	-0.07	0.06	0.01	-0.01	0.20	0.01
Ta	-0.07	0.23	0.15	-0.10	-0.05	-0.38	-0.08	0.23	0.21
W	-0.49	-0.83	-0.83	-0.41	-0.42	0.50	0.75	-0.73	-0.51
Th	-0.35	-0.61	-0.59	-0.47	-0.57	-0.05	0.53	-0.62	-0.47
U	-0.29	-0.50	-0.51	-0.54	-0.58	-0.24	0.57	-0.53	-0.49

Bank samples

Location name	ID	LOI	Sc	V	Co	Ga	Rb	Sr	Y	Zr
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		%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Potlatch 6	83	8.25	23	238	56	19	62	285	31	211	
Submerged	80	5.19	19	218	62	19	54	311	28	274	
Clearwater6	68	4.08	11	84	180	17	71	329	39	401	
Clearwater8	66	1.55	8	65	175	16	68	398	17	180	
Asotin8	74	2.27	30	315	83	21	40	301	34	227	
GR6	60	1.72	29	397	96	20	34	367	27	373	
GR7	59	4.08	17	148	114	17	46	439	30	172	
GR9	57	3.64	24	284	86	21	37	417	25	194	
Salmon 5	48	2.39	11	92	91	16	78	383	24	268	
Salmon 6 (BK)	190	6.68	23	247	52	18	64	270	32	212	
HC5	51	8.88	36	372	52	24	26	289	41	251	
HC7	50	8.2	23	213	39	22	67	262	30	201	
Average		4.74	21.17	222.75	90.50	19.17	53.92	337.58	29.83	247.00	
Std deviation		2.67	8.42	109.82	46.15	2.52	16.86	60.82	6.51	73.07	
CV%		56.3	39.8	49.3	51.0	13.1	31.3	18.0	21.8	29.6	

R^2 (n=12)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe_2O_3									
MnO									
MgO									
CaO									
Na_2O									
K_2O									
TiO_2									
P_2O_5	LOI								
LOI	1.00	Sc							
Sc	0.42	1.00	V						
V	0.24	0.96	1.00	Co					
Co	-0.63	-0.69	-0.62	1.00	Ga				
Ga	0.57	0.91	0.83	-0.70	1.00	Rb			
Rb	-0.08	-0.83	-0.86	0.34	-0.69	1.00	Sr		
Sr	-0.67	-0.45	-0.32	0.53	-0.56	-0.04	1.00	Y	
Y	0.55	0.51	0.36	-0.22	0.51	-0.33	-0.56	1.00	Zr
Zr	-0.20	-0.01	0.11	0.28	-0.08	0.04	-0.17	0.37	1.00
Nb	0.42	0.40	0.30	-0.51	0.43	-0.05	-0.67	0.56	0.32
Cs	0.69	-0.17	-0.30	-0.40	0.02	0.60	-0.55	0.12	-0.17
Ba	-0.77	-0.44	-0.40	0.46	-0.49	0.36	0.30	-0.44	-0.09
La	-0.11	-0.56	-0.60	0.68	-0.51	0.45	0.05	0.38	0.50
Ce	-0.03	-0.49	-0.55	0.64	-0.44	0.44	-0.05	0.44	0.54
Pr	-0.01	-0.42	-0.48	0.59	-0.36	0.40	-0.12	0.51	0.59
Nd	0.05	-0.31	-0.38	0.53	-0.24	0.32	-0.21	0.60	0.61
Sm	0.25	0.00	-0.10	0.32	0.06	0.09	-0.41	0.80	0.60
Eu	0.40	0.86	0.74	-0.45	0.79	-0.73	-0.51	0.78	0.05
Gd	0.45	0.39	0.25	-0.01	0.41	-0.24	-0.55	0.97	0.46
Tb	0.55	0.52	0.37	-0.16	0.53	-0.33	-0.63	0.98	0.37

Dy	0.57	0.57	0.41	-0.22	0.57	-0.38	-0.60	0.99	0.34
Ho	0.60	0.64	0.49	-0.32	0.62	-0.42	-0.62	0.98	0.33
Er	0.59	0.61	0.46	-0.26	0.61	-0.40	-0.62	0.98	0.34
Tm	0.63	0.61	0.46	-0.33	0.64	-0.36	-0.67	0.98	0.32
Yb	0.59	0.58	0.43	-0.28	0.59	-0.34	-0.67	0.98	0.39
Lu	0.60	0.57	0.44	-0.29	0.60	-0.30	-0.70	0.97	0.44
Hf	-0.14	0.06	0.17	0.25	0.00	-0.03	-0.21	0.43	0.99
Ta	0.26	0.19	0.12	-0.47	0.22	0.10	-0.50	0.34	0.25
W	-0.63	-0.81	-0.74	0.98	-0.82	0.47	0.58	-0.30	0.23
Th	-0.12	-0.64	-0.67	0.68	-0.57	0.57	0.05	0.28	0.51
U	-0.02	-0.60	-0.57	0.42	-0.51	0.69	-0.15	0.16	0.60

Bank samples

Location name	ID	Nb	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu
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		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Potlatch 6	83	12	3.5	618	31.3	68.4	7.45	29.8	6.6	1.66	
Submerged	80	13	2.2	636	35	70	7.7	30.2	6.2	1.6	
Clearwater6	68	12	2.2	730	81.3	161	17.1	63.3	11.7	1.6	
Clearwater8	66	9	1.6	845	35.5	68.2	7.24	27.5	5.1	1.07	
Asotin8	74	13	1.1	944	30.9	62.3	7.58	31.6	7.2	2.31	
GR6	60	11	1	672	24.1	48.9	5.87	24.5	5.6	1.66	
GR7	59	9	1.8	681	45.1	79.4	8.15	29.8	5.9	1.62	
GR9	57	10	1.2	712	22.1	45.2	5.41	22.5	5.1	1.61	
Salmon 5	48	14	2.7	823	34.6	66.6	7.74	28.7	5.3	1.08	
Salmon 6 (BK)	190	10	3.6	615	27	60.1	7.32	30	6.7	1.68	
HC5	51	15	2	470	27.9	61.7	7.65	33.3	8.1	2.32	
HC7	50	12	4.1	664	27.6	55.9	6.66	27.1	6.2	1.62	
Average	11.67	2.25	700.83	35.20	70.64	7.99	31.53	6.64	1.65		
Std deviation	1.92	1.03	124.36	15.76	29.95	2.98	10.43	1.82	0.38		
CV%	16.5	45.8	17.7	44.8	42.4	37.3	33.1	27.5	22.8		

R² (n=12)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

<chem>Fe2O3</chem>									
<chem>MnO</chem>									
<chem>MgO</chem>									
<chem>CaO</chem>									
<chem>Na2O</chem>									
<chem>K2O</chem>									
<chem>TiO2</chem>									
<chem>P2O5</chem>									
LOI									
Sc									
V									
Co									
Ga									
Rb									
Sr									
Y									
Zr	Nb								
Nb	1.00	Cs							
Cs	0.28	1.00	Ba						
Ba	-0.25	-0.31	1.00	La					
La	-0.06	0.06	0.12	1.00	Ce				
Ce	0.02	0.09	0.07	0.99	1.00	Pr			
Pr	0.11	0.09	0.06	0.97	0.99	1.00	Nd		
Nd	0.19	0.08	0.01	0.94	0.97	0.99	1.00	Sm	
Sm	0.34	0.08	-0.15	0.80	0.86	0.90	0.95	1.00	Eu
Eu	0.44	-0.21	-0.29	-0.15	-0.09	-0.02	0.10	0.38	1.00
Gd	0.48	0.06	-0.33	0.51	0.58	0.65	0.74	0.91	0.71
Tb	0.55	0.09	-0.42	0.36	0.44	0.51	0.61	0.83	0.79

Dy	0.53	0.09	-0.45	0.33	0.40	0.46	0.56	0.78	0.82
Ho	0.54	0.13	-0.49	0.24	0.31	0.37	0.48	0.71	0.83
Er	0.55	0.10	-0.47	0.28	0.35	0.43	0.53	0.76	0.83
Tm	0.59	0.18	-0.48	0.24	0.32	0.40	0.50	0.74	0.82
Yb	0.60	0.15	-0.46	0.30	0.38	0.45	0.56	0.78	0.80
Lu	0.62	0.19	-0.48	0.29	0.37	0.45	0.56	0.78	0.76
Hf	0.32	-0.18	-0.14	0.49	0.53	0.58	0.62	0.63	0.12
Ta	0.94	0.27	-0.11	-0.07	-0.01	0.06	0.11	0.18	0.22
W	-0.51	-0.30	0.49	0.70	0.65	0.59	0.51	0.25	-0.57
Th	-0.06	0.14	0.14	0.99	0.98	0.96	0.91	0.75	-0.28
U	0.14	0.34	0.09	0.78	0.81	0.80	0.76	0.61	-0.39

Bank samples

Location name	ID	Gd	Tb	Dy	Ho	Er	Tm	Yb
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		ppm						
Potlatch 6	83	6.4	1.1	6	1.2	3.4	0.5	3.3
Submerged	80	5.6	0.9	5.3	1	2.9	0.43	2.9
Clearwater6	68	9.2	1.4	7.5	1.4	4.1	0.59	3.9
Clearwater8	66	4	0.6	3.4	0.6	1.9	0.26	1.9
Asotin8	74	7.3	1.2	6.7	1.3	3.7	0.54	3.5
GR6	60	5.6	0.9	5.3	1.1	3	0.43	2.9
GR7	59	5.8	0.9	5.6	1.1	3	0.43	2.8
GR9	57	5	0.8	4.7	0.9	2.7	0.4	2.6
Salmon 5	48	4.5	0.7	4.1	0.8	2.3	0.35	2.4
Salmon 6 (BK)	190	6.1	1	5.9	1.2	3.5	0.51	3.4
HC5	51	8.6	1.5	8.2	1.6	4.6	0.66	4.2
HC7	50	6.1	1	5.9	1.2	3.3	0.51	3.2
Average		6.18	1.00	5.72	1.12	3.20	0.47	3.08
Std deviation		1.54	0.27	1.34	0.27	0.74	0.11	0.64
CV%		24.9	26.6	23.5	24.1	23.2	23.0	20.7

R^2 (n=12)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO_2

Al_2O_3

Fe₂O₃
MnO
MgO
CaO
Na₂O
K₂O
TiO₂
P₂O₅
LOI
Sc
V
Co
Ga
Rb
Sr
Y
Zr
Nb
Cs
Ba
La
Ce
Pr
Nd
Sm
Eu Gd
Gd 1.00 Tb
Tb 0.98 Dy

Dy	0.97	0.99	1.00	Ho			
Ho	0.94	0.97	0.99	1.00	Er		
Er	0.96	0.99	1.00	0.99	1.00	Tm	
Tm	0.98	0.98	0.99	0.99	0.99	1.00	Yb
Yb	0.99	0.99	0.99	0.99	0.99	1.00	1.00
Lu	0.98	0.98	0.98	0.98	0.98	0.99	0.99
Hf	0.43	0.43	0.41	0.40	0.41	0.39	0.45
Ta	0.30	0.30	0.28	0.27	0.29	0.34	0.35
W	-0.27	-0.27	-0.32	-0.41	-0.36	-0.42	-0.37
Th	0.27	0.27	0.22	0.14	0.18	0.16	0.21
U	0.16	0.16	0.09	0.03	0.07	0.09	0.14

Bank samples

Location name	ID	Lu	Hf	Ta	W	Th	U
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A-409

		ppm	ppm	ppm	ppm	ppm	ppm
Potlatch 6	83	0.55	5.2	0.9	240	7.8	2.4
Submerged	80	0.48	7.1	1.1	356	8.9	2.4
Clearwater6	68	0.66	10.4	0.9	1280	24	3.7
Clearwater8	66	0.3	4.4	0.7	1230	9.1	1.8
Asotin8	74	0.57	5.8	1	379	6	1.5
GR6	60	0.5	9.6	0.8	469	5	1.7
GR7	59	0.44	4.3	0.7	803	10.8	1.5
GR9	57	0.42	5.1	0.8	466	4.7	1.7
Salmon 5	48	0.4	6.3	1.2	682	10	2.5
Salmon 6 (BK)	190	0.58	4.8	0.9	222	6.8	2.1
HC5	51	0.7	6.7	1.1	66	5	1.3
HC7	50	0.55	5.3	0.9	104	7	1.9
Average		0.51	6.25	0.92	524.75	8.76	2.04
Std deviation		0.11	1.96	0.16	402.99	5.21	0.65
CV%		22.0	31.3	17.3	76.8	59.5	31.9

R² (n=12)

$\delta^{13}\text{C}_{\text{VPDB}} \times 1000$

C%

$\delta^{15}\text{N}_{\text{air}} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

K₂O

TiO₂

P₂O₅

LOI

Sc

V

Co

Ga

Rb

Sr

Y

Zr

Nb

Cs

Ba

La

Ce

Pr

Nd

Sm

Eu

Gd

Tb

Dy						
Ho						
Er						
Tm						
Yb	Lu					
Lu	1.00	Hf				
Hf	0.50	1.00	Ta			
Ta	0.37	0.22	1.00	W		
W	-0.38	0.19	-0.42	1.00	Th	
Th	0.21	0.49	-0.04	0.72	1.00	U
U	0.18	0.56	0.20	0.48	0.85	1.00

5i Processed Bed Samples

Bed samples									
Location name	ID	$d^{13}\text{C}$	C%	$d^{15}\text{N}$	N%	C/N (molar ratio)	Sc46	La140	SiO_2
Potlatch 1	88	-26.18	1.1561	3.93	0.0827	16.3	0.021	0.034	60.81
Potlatch 2	87	-24.95	0.0839	5.96	0.0104	9.4	0.040	0.044	68.96
Potlatch 3	86	-24.86	0.3947	4.9	0.0209	22.0	0.023	0.048	68.7
Potlatch 4	85	-26.46	2.1259	3.95	0.1681	14.8	0.045	0.084	59.09
Potlatch 5	84	-25.49	1.8473	4.82	0.1739	12.4	0.016	0.033	61.02
Clearwater1	73	-25.58	0.225	2.99	0.0161	16.3	0.015	0.045	70.12
Clearwater2	72	-25.25	0.2051	3.19	0.0157	15.2	0.009	0.031	73.18
Clearwater3	71	-25.35	0.0951	3.57	0.0098	11.3	0.010	0.019	72.96
Clearwater4	70	-23.06	0.0219	0.81	0.0028	9.1	0.014	0.033	73.28
Clearwater5	69	-24.52	0.12	1.30	0.01	13.92	0.010	0.025	72.48
Asotin3	79	-27.87	1.2837	3.38	0.099	15.1	0.037	0.042	54.65
Asotin4	78	-28.4	2.6409	3.63	0.1888	16.3	0.023	0.044	54.18
Asotin5	77	-27.3	0.6963	4.32	0.0599	13.6	0.032	0.025	55.53
Asotin6	76	-28.51	2.5841	3.62	0.1815	16.6	0.030	0.052	55.12
Asotin7	75	-28.15	3.4098	3.88	0.2489	16.0	ND	0.043	54.63
GR1	65	-24.43	0.2135	4.32	0.0196	12.7	0.030	0.031	56.61
GR2	64	-25.58	0.7296	3.93	0.0515	16.5	0.028	0.046	55.47
GR3	63	-23.15	0.1212	4.35	0.0127	11.1	0.199	0.086	57.69
GR4	62	-22.23	0.1147	4.36	0.0098	13.7	ND	0.030	57.49
GR5	61	-25.92	1.8636	3.34	0.1334	16.3	0.03	0.026	55.43
Salmon 1	43	-18.49	0.0513	1.93	0.0038	15.8	0.017	0.035	71.75
Salmon 2	44	-19.07	0.0443	1.81	0.0038	13.6	ND	0.075	73.68

Salmon 3	45	-20.24	0.0387	1.95	0.0031	14.6	ND	0.016	73.89
Salmon 4	46	-20.76	0.0427	1.84	0.0036	13.8	ND	ND	75.46
Sample 6	47	-20.535	0.0413	0.825	0.0043	11.2	0.02	0.041	73.16
HC1	56	-21.22	0.0873	5.31	0.0089	11.4	0.045	0.029	47.53
HC6	55	-14.72	0.2636	6.96	0.013	23.7	0.029	0.017	52.04
HC2	54	-13.08	0.2917	4.12	0.0219	15.5	0.033	0.011	56.08
HC3	53	-21.44	0.0721	1.12	0.0058	14.5	0.044	0.001	52.4
HC4	52	-24.63	0.4742	6.24	0.027	20.5	0.053	ND	50.23
Average		-23.58	0.71	3.56	0.05	14.78	0.03	0.04	62.12
Std deviation		3.81	0.95	1.58	0.07	3.26	0.04	0.02	8.94
CV%		-16.2	133.8	44.4	132.4	22.1	106.8	52.8	14.4
R^2 (n=30)		$d^{13}\text{C}_{\text{VPDB}} \times 1000$							
		$d^{13}\text{C}_{\text{VPDB}} \times 1000$	1.00	C%	$d^{15}\text{N}_{\text{air}} \times 1000$				
		C%	-0.60	1.00	1.00	N%			
		$d^{15}\text{N}_{\text{air}} \times 1000$	-0.06	0.20	1.00	C/N			
		N%	-0.61	0.99	0.21	1.00	Sc46		
		C/N	0.10	0.25	0.32	0.20	1.00	La140	
		Sc46	0.13	-0.16	-0.34	-0.16	-0.01	1.00	SiO ₂
		La140	0.11	-0.13	-0.31	-0.13	-0.01	1.00	1.00
		SiO ₂	0.03	-0.25	-0.21	-0.24	-0.17	-0.78	-0.75
		Al ₂ O ₃	-0.04	0.14	0.46	0.14	0.09	-0.92	-0.91
		Fe ₂ O ₃	-0.06	0.26	0.75	0.26	0.18	-0.22	-0.18
		MnO	0.11	-0.12	-0.27	-0.13	0.00	1.00	-0.51
		MgO	-0.16	0.28	0.50	0.26	0.23	0.26	-0.76

CaO	-0.07	0.18	0.72	0.16	0.20	-0.42	-0.37	-0.30
Na ₂ O	0.23	-0.50	-0.18	-0.52	-0.17	-0.30	-0.30	0.31
K ₂ O	0.15	-0.30	-0.55	-0.30	-0.21	-0.51	-0.45	0.85
TiO ₂	-0.13	0.24	0.53	0.24	0.03	0.21	0.21	-0.76
P ₂ O ₅	0.10	-0.13	-0.29	-0.13	0.00	1.00	1.00	-0.75
LOI	0.09	-0.09	-0.28	-0.09	0.01	1.00	1.00	-0.75
Sc	0.03	0.03	0.10	0.02	0.09	0.89	0.87	-0.96
V	-0.09	0.28	0.71	0.28	0.14	-0.33	-0.29	-0.40
Co	0.13	-0.50	-0.55	-0.50	-0.35	-0.26	-0.25	0.78
Ga	0.10	-0.12	-0.27	-0.12	0.00	1.00	1.00	-0.76
Rb	0.06	-0.10	-0.62	-0.09	-0.15	-0.28	-0.26	0.70
Sr	0.00	-0.33	-0.10	-0.34	-0.18	-0.69	-0.67	0.65
Y	-0.23	0.15	0.36	0.17	-0.13	-0.65	-0.52	0.10
Zr	-0.40	0.18	0.05	0.20	-0.17	-0.53	-0.49	0.39
Nb	0.10	-0.12	-0.29	-0.12	-0.01	1.00	1.00	-0.75
Cs	0.13	-0.05	-0.35	-0.05	0.03	0.98	0.98	-0.71
Ba	0.02	-0.24	-0.25	-0.23	-0.20	-0.81	-0.75	0.91
La	-0.20	-0.09	-0.21	-0.06	-0.25	-0.35	-0.33	0.49
Ce	-0.20	-0.09	-0.19	-0.07	-0.25	-0.32	-0.29	0.44
Pr	-0.23	-0.08	-0.21	-0.06	-0.26	-0.22	-0.19	0.35
Nd	-0.26	-0.01	-0.05	0.01	-0.23	-0.47	-0.43	0.45
Sm	-0.28	0.02	0.05	0.04	-0.20	-0.15	-0.11	0.05
Eu	-0.36	0.29	0.64	0.31	-0.03	-0.43	-0.32	-0.25
Gd	-0.29	0.12	0.29	0.14	-0.11	-0.12	-0.06	-0.19
Tb	-0.23	0.13	0.31	0.15	-0.09	0.12	0.12	-0.40
Dy	-0.25	0.19	0.43	0.21	-0.06	-0.43	-0.31	-0.12
Ho	-0.22	0.20	0.46	0.22	-0.05	-0.55	-0.39	-0.09
Er	-0.24	0.20	0.33	0.22	-0.06	-0.11	-0.06	-0.30

Tm	-0.22	0.18	0.25	0.20	-0.08	0.02	0.05	-0.36
Yb	-0.19	0.17	0.26	0.19	-0.07	0.10	0.11	-0.41
Lu	-0.22	0.21	0.27	0.23	-0.04	0.00	0.03	-0.36
Hf	0.09	-0.12	-0.30	-0.12	-0.01	1.00	1.00	-0.74
Ta	0.07	-0.01	-0.36	0.00	-0.20	0.72	0.70	-0.57
W	0.08	-0.46	-0.54	-0.45	-0.32	-0.25	-0.24	0.80
Th	-0.19	0.00	-0.04	0.01	-0.16	-0.77	-0.76	0.78
U	-0.51	0.45	-0.16	0.46	-0.04	-0.46	-0.42	0.36

Bed samples

Location name	ID	Al ₂ O ₃ %	Fe ₂ O ₃ %	MnO %	MgO %	CaO %	Na ₂ O %	K ₂ O %	TiO ₂ %	P ₂ O ₅ %
Potlatch 1	88	14.22	7.68	0.127	2	3.82	2.47	1.73	1.364	0.23
Potlatch 2	87	11.47	7.3	0.112	1.74	4.17	2.32	1.47	1.26	0.25
Potlatch 3	86	11.46	7.15	0.112	1.69	3.91	2.2	1.57	1.272	0.23
Potlatch 4	85	12.79	7.01	0.085	1.49	3.06	1.9	1.61	1.319	0.21
Potlatch 5	84	13.23	7.39	0.116	1.74	3.42	2.09	1.62	1.405	0.23
Clearwater1	73	12.33	4.45	0.075	1.41	3.03	3	2.3	0.882	0.14
Clearwater2	72	12.71	3.4	0.052	1.13	2.66	2.93	2.48	0.558	0.11
Clearwater3	71	12.14	3.71	0.062	1.11	2.86	2.86	2.16	0.75	0.11

Clearwater4	70	11.17	4.48	0.088	1.42	3.41	2.42	1.79	0.807	0.09
Clearwater5	69	12.62	3.63	0.058	1.17	2.81	2.89	2.37	0.645	0.11
Asotin3	79	13.92	10.45	0.14	2.93	6.06	2.87	1.37	2.184	0.3
Asotin4	78	13.05	8.81	0.11	2.48	5.18	2.54	1.34	1.814	0.24
Asotin5	77	14.1	10.11	0.138	2.93	6.07	2.84	1.4	2.089	0.3
Asotin6	76	12.86	8.9	0.109	2.54	5	2.4	1.4	1.785	0.24
Asotin7	75	12.68	7.82	0.111	2.16	4.45	2.41	1.39	1.547	0.24
GR1	65	14.5	10.43	0.148	2.95	6.45	3.12	1.44	1.964	0.4
GR2	64	14.89	10.2	0.151	2.89	6.26	3.04	1.34	1.993	0.27
GR3	63	14.27	10.07	0.143	2.88	6.42	3.1	1.42	1.945	0.29
GR4	62	14.32	10.41	0.155	2.93	6.6	3.13	1.46	2.024	0.3
GR5	61	13.96	9.45	0.151	2.86	5.56	2.77	1.38	1.66	0.28
Salmon 1	43	12.79	3.26	0.068	1.29	2.92	2.99	2.65	0.533	0.14
Salmon 2	44	12.32	2.36	0.043	0.89	2.24	3.08	2.88	0.361	0.06
Salmon 3	45	12.32	2.2	0.039	0.74	1.97	2.99	2.9	0.33	0.06
Salmon 4	46	12.74	1.97	0.03	0.68	1.84	3.05	3.16	0.279	0.07
Sample 6	47	12.63	3.14	0.065	0.95	2.33	3.02	2.86	0.615	0.12
HC1	56	15.23	15.68	0.23	2.28	7.19	3.08	0.98	3.461	0.46
HC6	55	15.17	12.17	0.186	2.89	7.63	2.7	0.75	1.51	0.22
HC2	54	13.67	10.7	0.192	2.41	4.74	2.48	1.45	2.074	0.18
HC3	53	13.64	12.39	0.178	4.24	8.19	2.97	0.97	2.156	0.2
HC4	52	15.17	12.39	0.176	3.72	8.16	3.15	0.97	2.193	0.26
Average		13.28	7.64	0.12	2.08	4.61	2.76	1.75	1.43	0.21
Std deviation		1.14	3.65	0.05	0.92	1.93	0.35	0.65	0.74	0.10
CV%		8.6	47.9	44.4	44.3	41.8	12.6	37.2	52.0	46.0

R^2 (n=30)

d¹³C_{VPDB} x

	1000		C%							
	$d^{15}N_{air} \times 1000$		N%							
	C/N									
	Sc46									
	La140									
	SiO ₂	Al ₂ O ₃								
	Al ₂ O ₃	1.00	Fe ₂ O ₃ (T)							
Fe ₂ O ₃	0.46	1.00	MnO							
MnO	-0.90	-0.13	1.00		MgO					
MgO	0.08	0.81	0.26	1.00	CaO					
CaO	0.62	0.93	-0.32	0.78	1.00		Na ₂ O			
Na ₂ O	0.41	-0.02	-0.30	-0.06	0.22	1.00	K ₂ O			
K ₂ O	0.19	-0.75	-0.46	-0.86	-0.59	0.43	1.00		TiO ₂	
TiO ₂	0.10	0.90	0.24	0.84	0.73	-0.09	-0.84	1.00	P ₂ O ₅	
P ₂ O ₅	-0.91	-0.15	1.00	0.25	-0.34	-0.30	-0.44	0.22	1.00	
LOI	-0.91	-0.15	1.00	0.25	-0.34	-0.32	-0.45	0.22	1.00	
Sc	-0.62	0.36	0.87	0.67	0.17	-0.28	-0.80	0.65	0.86	
V	0.54	0.97	-0.25	0.78	0.93	0.05	-0.64	0.86	-0.26	
Co	-0.04	-0.76	-0.28	-0.85	-0.60	0.35	0.81	-0.80	-0.26	
Ga	-0.90	-0.12	1.00	0.27	-0.31	-0.30	-0.46	0.25	1.00	
Rb	0.02	-0.81	-0.28	-0.86	-0.74	0.18	0.93	-0.83	-0.27	
Sr	0.67	-0.06	-0.67	-0.25	0.21	0.82	0.56	-0.28	-0.67	
Y	0.53	0.51	-0.46	0.19	0.49	0.49	-0.02	0.37	-0.46	
Zr	0.37	-0.01	-0.47	-0.25	-0.01	-0.01	0.01	-0.10	-0.47	
Nb	-0.91	-0.15	1.00	0.24	-0.34	-0.34	-0.31	0.22	1.00	

Cs	-0.90	-0.23	0.98	0.16	-0.44	-0.44	-0.36	0.14	0.98
Ba	0.54	-0.43	-0.74	-0.67	-0.24	-0.24	0.50	-0.62	-0.73
La	0.14	-0.31	-0.33	-0.43	-0.25	-0.25	0.02	-0.36	-0.32
Ce	0.11	-0.28	-0.29	-0.41	-0.27	-0.24	0.00	-0.31	-0.28
Pr	0.02	-0.28	-0.18	-0.37	-0.24	-0.27	-0.05	-0.26	-0.18
Nd	0.27	-0.12	-0.41	-0.33	-0.09	0.01	0.01	-0.20	-0.41
Sm	0.05	0.08	-0.08	-0.07	0.01	-0.13	-0.13	0.12	-0.09
Eu	0.45	0.78	-0.26	0.53	0.71	-0.11	-0.11	0.70	-0.27
Gd	0.11	0.40	-0.03	0.22	0.28	-0.20	-0.20	0.43	-0.04
Tb	0.01	0.50	0.14	0.36	0.34	-0.23	-0.23	0.59	0.13
Dy	0.38	0.59	-0.26	0.31	0.50	-0.13	-0.13	0.52	-0.27
Ho	0.46	0.62	-0.33	0.32	0.56	-0.11	-0.11	0.51	-0.34
Er	0.15	0.54	-0.02	0.36	0.42	-0.25	-0.25	0.56	-0.03
Tm	0.06	0.50	0.07	0.36	0.35	-0.27	-0.27	0.57	0.06
Yb	0.01	0.51	0.13	0.39	0.34	-0.30	-0.30	0.58	0.12
Lu	0.08	0.51	0.06	0.38	0.37	-0.27	-0.27	0.56	0.05
Hf	-0.91	-0.16	1.00	0.24	-0.35	-0.30	-0.30	0.21	1.00
Ta	-0.61	-0.05	0.70	0.12	-0.29	-0.25	-0.25	0.31	0.70
W	-0.07	-0.80	-0.27	-0.87	-0.65	0.27	0.27	-0.84	-0.25
Th	0.57	-0.20	-0.77	-0.48	-0.05	0.20	0.20	-0.43	-0.76
U	0.29	-0.17	-0.42	-0.23	-0.14	-0.08	-0.08	-0.25	-0.41

Bed samples

Location name	ID	LOI %	Sc ppm	V ppm	Co ppm	Ga ppm	Rb ppm	Sr ppm	Y ppm	Zr ppm
Potlatch 1	88	6.19	19	188	65	19	59	354	34	281
Potlatch 2	87	1.8	18	193	124	16	36	289	22	162
Potlatch 3	86	2.57	18	188	103	16	43	296	27	174
Potlatch 4	85	9.93	17	172	66	18	61	256	34	305
Potlatch 5	84	7.78	18	181	62	18	60	279	34	290
Clearwater1	73	1.42	11	93	194	16	61	379	37	458
Clearwater2	72	1.56	9	67	180	16	70	394	21	220
Clearwater3	71	1.04	9	76	247	15	58	378	33	354
Clearwater4	70	0.77	13	88	206	14	47	344	38	224
Clearwater5	69	1.26	9	71	196	16	66	394	28	270
Asotin3	79	4.58	27	335	53	20	42	327	28	211
Asotin4	78	9.66	22	277	63	19	45	307	25	218
Asotin5	77	4.11	26	304	55	20	42	331	27	225
Asotin6	76	8.4	23	263	62	19	47	288	26	221
Asotin7	75	10.87	20	224	54	18	48	289	27	215
GR1	65	2.03	28	312	77	20	36	383	30	176
GR2	64	3.66	28	296	50	21	37	393	27	185
GR3	63	1.66	27	309	73	20	35	393	26	180
GR4	62	1.53	27	323	80	20	34	407	37	204
GR5	61	6.67	25	259	45	19	40	382	29	187
Salmon 1	43	0.99	10	67	148	17	83	372	24	122
Salmon 2	44	0.92	7	46	172	13	71	370	15	133
Salmon 3	45	0.89	5	41	186	14	80	364	13	115
Salmon 4	46	0.97	5	35	173	14	86	372	11	121

Sample 6	47	0.97	7	60	205	15	79	384	27	324
HC1	56	3.49	34	444	62	25	25	370	44	245
HC6	55	4.11	29	290	48	19	21	311	26	125
HC2	54	4.93	24	367	53	19	42	268	28	191
HC3	53	2.2	39	448	94	20	22	344	27	129
HC4	52	3.65	39	436	62	22	22	401	26	133
Average	3.69	19.77	215.10	108.60	17.93	49.93	347.30	27.70	213.27	
Std deviation	3.05	9.77	129.50	62.95	2.73	18.73	45.19	7.12	78.45	
CV%	82.8	49.4	60.2	58.0	15.2	37.5	13.0	25.7	36.8	

R^2 (n=30)

$d^{13}C_{VPDB} \times 1000$

C%

$d^{15}N_{air} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

K ₂ O											
TiO ₂											
P ₂ O ₅	LOI										
LOI	1.00	Sc									
Sc	0.87	1.00	V								
V	-0.26	0.24	1.00	Co							
Co	-0.28	-0.64	-0.72	1.00	Ga						
Ga	1.00	0.88	-0.24	-0.29	1.00	Rb					
Rb	-0.27	-0.67	-0.73	0.69	-0.29	1.00	Sr				
Sr	-0.69	-0.65	0.02	0.49	-0.67	0.32	1.00	Y			
Y	-0.46	-0.19	0.49	-0.07	-0.45	-0.29	0.29	1.00	Zr		
Zr	-0.46	-0.47	0.02	0.33	-0.47	0.21	0.33	0.71	1.00		
Nb	1.00	0.86	-0.26	-0.26	1.00	-0.26	-0.67	-0.44	-0.45		
Cs	0.98	0.80	-0.32	-0.26	0.98	-0.13	-0.71	-0.51	-0.44		
Ba	-0.74	-0.90	-0.29	0.65	-0.74	0.74	0.74	0.02	0.33		
La	-0.32	-0.47	-0.30	0.59	-0.33	0.34	0.34	0.61	0.82		
Ce	-0.28	-0.42	-0.27	0.57	-0.29	0.29	0.30	0.63	0.83		
Pr	-0.18	-0.32	-0.29	0.53	-0.19	0.25	0.23	0.62	0.82		
Nd	-0.41	-0.46	-0.12	0.48	-0.41	0.21	0.36	0.75	0.90		
Sm	-0.09	-0.06	0.03	0.21	-0.08	-0.09	0.10	0.78	0.80		
Eu	-0.27	0.13	0.76	-0.48	-0.25	-0.58	0.07	0.83	0.41		
Gd	-0.04	0.14	0.33	-0.11	-0.03	-0.37	-0.01	0.86	0.66		
Tb	0.13	0.35	0.41	-0.28	0.15	-0.50	-0.14	0.79	0.51		
Dy	-0.27	0.03	0.54	-0.21	-0.25	-0.43	0.11	0.95	0.63		
Ho	-0.34	-0.02	0.59	-0.22	-0.32	-0.44	0.15	0.97	0.63		
Er	-0.03	0.23	0.47	-0.28	-0.01	-0.49	-0.07	0.88	0.55		
Tm	0.07	0.30	0.42	-0.28	0.08	-0.48	-0.13	0.83	0.52		
Yb	0.12	0.35	0.41	-0.31	0.13	-0.51	-0.19	0.80	0.50		
Lu	0.06	0.29	0.43	-0.29	0.07	-0.48	-0.13	0.83	0.55		

Hf	1.00	0.86	-0.28	-0.25	1.00	-0.26	-0.67	-0.45	-0.44
Ta	0.70	0.61	-0.13	-0.18	0.70	-0.07	-0.49	0.01	0.00
W	-0.27	-0.65	-0.76	0.99	-0.28	0.72	0.44	-0.08	0.33
Th	-0.76	-0.82	-0.12	0.60	-0.77	0.44	0.60	0.60	0.82
U	-0.40	-0.46	-0.13	0.23	-0.41	0.35	0.29	0.50	0.80

Bed samples

Location name	ID	Nb ppm	Cs ppm	Ba ppm	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm
Potlatch 1	88	14	2.1	720	47.6	94.7	10.6	40.2	8.2	1.79
Potlatch 2	87	7	0.8	679	22.7	47.1	5.38	22.3	4.8	1.56
Potlatch 3	86	9	1.1	730	29	57.2	6.85	27.2	5.8	1.61
Potlatch 4	85	14	2.4	662	59.1	109	11.8	44.6	8.7	2.13
Potlatch 5	84	15	2.1	666	44.2	86.6	9.86	38.3	7.6	1.75
Clearwater1	73	14	1.5	791	87.2	171	18	66.4	11.7	1.67
Clearwater2	72	9	1.7	858	41.8	79.8	8.57	31.7	5.6	1.16
Clearwater3	71	12	1.2	751	84	163	17.2	62.5	11.2	1.57
Clearwater4	70	12	0.9	648	69.1	135	14.1	51	8.9	1.48
Clearwater5	69	11	1.5	835	55.5	106	11.3	41.7	7.4	1.31
Asotin3	79	12	1.4	632	25.5	51.7	6.04	25.2	5.5	1.74
Asotin4	78	12	1.7	577	27.4	55.2	6.33	25.6	5.7	1.58
Asotin5	77	14	1.4	718	27.4	54.9	6.53	26.4	5.9	1.8
Asotin6	76	12	1.8	630	29	58.2	6.75	27.2	5.8	1.68
Asotin7	75	11	1.9	576	28.6	57.9	6.63	26.8	5.7	1.6
GR1	65	10	1.1	695	27.2	53.1	6.18	25.4	5.7	1.76
GR2	64	11	1.2	706	22.3	45.8	5.56	23	5.2	1.74
GR3	63	10	1	696	22.2	45.4	5.53	23	5.3	1.72
GR4	62	10	1	701	53	92.8	9.72	36.3	7.5	2.34
GR5	61	11	1.5	657	25.6	51.4	6.12	25.4	5.9	1.57
Salmon 1	43	15	2	822	44.5	83.6	8.74	31.5	5.8	1.25
Salmon 2	44	3	1.8	896	23	43	4.93	18.1	3.3	0.8
Salmon 3	45	7	1.8	954	20.6	38.6	4.5	16.2	3.1	0.75
Salmon 4	46	7	2	989	19.4	36.2	4.26	15.2	2.9	0.74
Sample 6	47	14	1.9	899	48.4	90.9	10.1	36	6.2	1
HC1	56	17	0.9	600	27.5	65.9	8.04	35.5	9	2.53

HC6	55	8	1.1	422	15.8	34.3	4.21	18.7	4.9	1.49
HC2	54	14	2.6	654	29.8	62.4	6.49	26	5.6	1.44
HC3	53	7	0.8	410	13.5	29.8	3.94	18.3	4.8	1.54
HC4	52	7	0.8	468	13.6	31.2	4.05	18.7	4.8	1.71
Average	10.97	1.50	701.40	36.15	71.06	7.94	30.81	6.28	1.56	
Std deviation	3.17	0.50	140.39	19.52	36.62	3.66	12.70	2.09	0.41	
CV%	28.9	33.4	20.0	54.0	51.5	46.1	41.2	33.2	26.0	

R^2 (n=30)

$d^{13}C_{VPDB} \times 1000$

C%

$d^{15}N_{air} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

K₂O

TiO₂

P ₂ O ₅									
LOI									
Sc									
V									
Co									
Ga									
Rb									
Sr									
Y									
Zr	Nb								
Nb	1.00	Cs							
Cs	0.98	1.00	Ba						
Ba	-0.73	-0.67	1.00	La					
La	-0.30	-0.30	0.33	1.00	Ce				
Ce	-0.26	-0.27	0.27	0.99	1.00	Pr			
Pr	-0.16	-0.17	0.19	0.98	0.99	1.00	Nd		
Nd	-0.39	-0.41	0.29	0.97	0.98	0.96	1.00	Sm	
Sm	-0.06	-0.11	-0.09	0.85	0.89	0.92	0.91	1.00	Eu
Eu	-0.26	-0.34	-0.24	0.24	0.26	0.26	0.39	0.55	1.00
Gd	-0.02	-0.09	-0.28	0.64	0.68	0.72	0.74	0.93	0.78
Tb	0.15	0.07	-0.46	0.46	0.51	0.56	0.56	0.83	0.80
Dy	-0.25	-0.32	-0.19	0.54	0.57	0.58	0.68	0.81	0.90
Ho	-0.32	-0.39	-0.16	0.51	0.54	0.54	0.66	0.76	0.89
Er	-0.01	-0.08	-0.38	0.49	0.53	0.57	0.61	0.82	0.84
Tm	0.09	0.02	-0.43	0.48	0.53	0.57	0.59	0.82	0.79
Yb	0.14	0.07	-0.48	0.45	0.50	0.55	0.55	0.80	0.76
Lu	0.08	0.01	-0.44	0.47	0.52	0.57	0.59	0.82	0.76
Hf	1.00	0.98	-0.72	-0.29	-0.25	-0.15	-0.38	-0.06	-0.27
Ta	0.72	0.73	-0.52	0.03	0.09	0.18	0.01	0.29	-0.01

W	-0.25	-0.24	0.65	0.61	0.58	0.55	0.49	0.22	-0.48
Th	-0.75	-0.72	0.67	0.85	0.82	0.75	0.87	0.59	0.22
U	-0.39	-0.33	0.32	0.69	0.69	0.67	0.72	0.59	0.20

Bed samples

Location name	ID	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm
Potlatch 1	88	7.4	1.1	6.3	1.2	3.5	0.5	3.2	0.55
Potlatch 2	87	4.6	0.7	4.1	0.8	2.2	0.31	2.1	0.32
Potlatch 3	86	5.9	0.9	5.3	1	3	0.42	2.8	0.46
Potlatch 4	85	8.1	1.3	7.6	1.4	4.2	0.62	4	0.63
Potlatch 5	84	6.9	1.1	6.1	1.2	3.5	0.5	3.4	0.55
Clearwater1	73	9	1.3	7.1	1.3	4	0.59	3.9	0.64
Clearwater2	72	4.7	0.7	4	0.8	2.2	0.32	2.2	0.37
Clearwater3	71	8.5	1.2	6.6	1.2	3.5	0.5	3.2	0.55
Clearwater4	70	7.3	1.1	6.6	1.3	4	0.59	3.8	0.62
Clearwater5	69	6	0.9	5	1	2.8	0.43	2.8	0.45
Asotin3	79	5.5	0.9	5.3	1	2.8	0.41	2.7	0.43
Asotin4	78	5.4	0.9	5.1	1	2.9	0.42	2.7	0.46
Asotin5	77	5.7	0.9	5.3	1	3	0.44	3	0.5
Asotin6	76	5.8	0.9	5.3	1	3	0.45	2.8	0.49
Asotin7	75	5.5	0.9	5	1	3	0.43	2.8	0.49
GR1	65	5.8	0.9	5.5	1.1	3	0.44	2.9	0.47
GR2	64	5.1	0.9	5	1	2.9	0.42	2.7	0.47
GR3	63	5.5	0.9	5.1	1	2.8	0.41	2.7	0.46
GR4	62	7.6	1.3	7.4	1.4	4	0.56	3.5	0.55
GR5	61	5.6	0.9	5.5	1.1	3.2	0.46	3.1	0.51
Salmon 1	43	4.9	0.7	4.2	0.8	2.4	0.35	2.2	0.38
Salmon 2	44	2.7	0.4	2.3	0.4	1.3	0.2	1.4	0.21
Salmon 3	45	2.4	0.4	2.1	0.4	1.2	0.19	1.2	0.21
Salmon 4	46	2.4	0.4	2.1	0.4	1.2	0.19	1.2	0.2

Sample 6	47	4.7	0.8	4.4	0.9	2.7	0.4	2.7	0.47
HC1	56	9.4	1.6	9	1.7	4.9	0.7	4.5	0.73
HC6	55	5.2	0.9	5.3	1.1	3	0.42	2.9	0.48
HC2	54	5.6	0.9	5.4	1.1	3	0.46	3.1	0.51
HC3	53	5.4	0.9	5.4	1.1	2.9	0.44	2.8	0.47
HC4	52	5.5	0.9	5.5	1.1	3	0.44	2.7	0.46
Average		5.80	0.92	5.30	1.03	2.97	0.43	2.83	0.47
Std deviation		1.70	0.27	1.52	0.29	0.83	0.12	0.75	0.12
CV%		29.3	28.9	28.6	27.8	28.0	27.0	26.4	25.8

R^2 (n=30)

$d^{13}C_{VPDB} \times 1000$

C%

$d^{15}N_{air} \times 1000$

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

Hf	-0.02	0.14	-0.26	-0.33	-0.02	0.08	0.13	0.07
Ta	0.31	0.43	0.13	0.07	0.34	0.42	0.45	0.44
W	-0.11	-0.28	-0.22	-0.23	-0.28	-0.28	-0.31	-0.29
Th	0.39	0.17	0.43	0.45	0.27	0.21	0.16	0.22
U	0.43	0.27	0.40	0.40	0.35	0.33	0.31	0.38

Bed samples Location name	ID	Hf ppm	Ta ppm	W ppm	Th ppm	U ppm
Potlatch 1	88	7.2	1	388	11.8	3.1
Potlatch 2	87	4	0.6	873	5.1	1.3
Potlatch 3	86	4.5	0.7	803	6.7	1.6
Potlatch 4	85	6.9	1	466	14.4	2.8
Potlatch 5	84	7.4	1.1	403	10.7	2.7
Clearwater1	73	12	1.1	1400	25.1	3.7
Clearwater2	72	5.8	0.7	1360	11.1	2.1
Clearwater3	71	9.1	0.9	1760	23.1	3
Clearwater4	70	5.6	1	1490	16.6	2.3
Clearwater5	69	6.9	0.8	1420	15.5	2.4
Asotin3	79	5.3	0.9	219	5.9	2
Asotin4	78	5.6	0.9	303	6.5	2.4
Asotin5	77	5.8	1	226	6.1	1.9
Asotin6	76	5.7	0.9	304	6.9	2.3
Asotin7	75	5.8	0.9	305	7	2.7
GR1	65	4.5	0.7	362	5.9	1.6
GR2	64	4.7	0.8	177	4.9	2
GR3	63	4.6	0.8	362	4.7	1.6
GR4	62	5.2	0.7	413	12	1.6
GR5	61	4.9	0.9	191	5.6	3.5
Salmon 1	43	3.2	1.3	1120	10.8	2.1
Salmon 2	44	0.9	0.5	1060	6	1.4
Salmon 3	45	2.7	0.7	1310	6.2	1.5
Salmon 4	46	2.8	0.7	1230	6.1	1.5
Sample 6	47	7.2	1.4	1410	13.8	2.7
HC1	56	6.3	1.4	145	4	1.3
HC6	55	3.1	0.5	126	2.5	0.9
HC2	54	4.9	1.1	177	7.4	1.7
HC3	53	3.3	0.5	352	2.1	0.7

HC4	52	3.5	0.4	136	2	0.8
Average		5.31	0.86	676.37	8.88	2.04
Std deviation		2.13	0.25	526.51	5.69	0.76
CV%		40.0	29.4	77.8	64.0	37.4

R^2 (n=30)

$d^{13}C_{VPDB}$ x

1000

C%

$d^{15}N_{air}$ x

1000

N%

C/N

Sc46

La140

SiO₂

Al₂O₃

Fe₂O₃

MnO

MgO

CaO

Na₂O

K₂O

TiO₂

P₂O₅

LOI

Sc

V

Co

Ga

Rb

Sr					
Y					
Zr					
Nb					
Cs					
Ba					
La					
Ce					
Pr					
Nd					
Sm					
Eu					
Gd					
Tb					
Dy					
Ho					
Er					
Tm					
Yb					
Lu	Hf				
Hf	1.00	Ta			
Ta	0.71	1.00	W		
W	-0.24	-0.17	1.00	Th	
Th	-0.74	-0.37	0.60	1.00	U
U	-0.39	0.01	0.27	0.71	1.00

5j Original Source B Data

Location name	Sample ID	Sample type	$\delta^{13}\text{C}$	C%	$\delta^{15}\text{N}$	N%
Potlatch River 1	191	BD	-22.79	0.0585	2.99	0.0082
Potlatch River 2	192	BD	-23.8	0.0728	6.37	0.0113
Potlatch River 3	193	BD	-25.56	0.321	4.8	0.031
Potlatch River 4	194	BD	-26.3	1.825	2.85	0.139
Potlatch River 5	195	BD	-26.08	0.898	4.1	0.081
Potlatch River 6	196	BK	-25.65	2.559	4.69	0.113
Potlatch River 7	197	Ag	-26.82	2.148	7.17	0.195
Clearwater 1	206	BD	-25.18	1.292	6.26	0.136
Clearwater 2	207	BD	-28.23	0.732	4.18	0.063
Clearwater 3	208	BD	-27.52	1.235	3.48	0.103
Clearwater 4	209	BD	-28.2	2.793	2.92	0.189
Clearwater 5	210	BD	-26.33	0.233	5.1	0.025
Clearwater 6	211	BK	-28.4	6.311	3.2	0.479
Clearwater 7	212	Ag	-24.93	0.408	5.06	0.028
Clearwater 8	213	BK	-26.07	0.181	1.86	0.014
Asotin Creek 1	198	Ag	-20.37	0.0624	2.07	0.0086
Asotin Creek 2	199	BK	-21.15	0.094	1.64	0.0112
Asotin Creek 3	200	BD	-22.02	0.074	2.47	0.009
Asotin Creek 4	201	BD	-21.9	0.026	2.59	0.0034
Asotin Creek 5	202	BD	-21.33	0.0403	1.95	0.0052
Asotin Creek 6	203	BD	-25.69	1.272	2.95	0.074

Asotin Creek 7	204	BD	-24.32	0.215	2.2	0.022
Asotin Creek 8	205	BK	-26.92	2.629	5.63	0.227
Grande Ronde 1	214	BD	-21.45	0.261	1.91	0.035
Grande Ronde 2	215	BD	-20.51	0.173	2.24	0.025
Grande Ronde 3	216	BD	-20.42	0.1206	1.68	0.0159
Grande Ronde 4	217	BD	-22.06	0.0965	3.19	0.0121
Grande Ronde 5	218	BD	-22.39	0.190	2.53	0.021
Grande Ronde 6	219	BK	-26.05	1.650	4.13	0.135
Grande Ronde 7	220	BK	-21.93	0.646	7.84	0.050
Grande Ronde 8	221	Ag	-25.84	2.284	6.04	0.189
Grande Ronde 9	222	BK	-25.97	0.842	5.15	0.072
Salmon River 1	231	BD	-22.44	0.0408	8.569	0.0153
Salmon River 2	232	BD	-18.35	0.0901	8.49	0.0109
Salmon River 3	233	BD	-21.3	0.207	5.78	0.033
Salmon River 4	234	BD	-24.05	0.126	5.95	0.0203
Salmon River 5	235	BD	-20.59	0.142	6.19	0.027
Salmon River 6	236	BK	-24.73	0.525	4.27	0.049
			-25.64	1.966	6.36	0.191
Hell's Canyon 1	223	BD	-25.37	4.598	6	0.451
Hell's Canyon 2	224	BD				
Hell's Canyon 3	225	BD	-21.02	0.0865	2.78	0.0095
Hell's Canyon 4	226	BD	-14.51	0.0748	2.45	0.0026
Hell's Canyon 6	227	BD	-14.51	0.0748	2.45	0.0026
Hell's Canyon 5 ?	228	BK	-23.38	0.1399	3.07	0.0117
Hell's Canyon 7	229	BK	-20.52	0.0538	3.34	0.0047
Hell's Canyon 8	230	Ag	-21.59	0.1571	3.1	0.0116

Agriculture soil				
Average	-23.91	1.01	4.69	0.09
Std deviation	2.79	1.11	2.09	0.10
CV%	-11.67	109.43	44.62	111.81
Bank soil Average	-24.62	1.42	4.07	0.11
Std deviation	2.53	1.88	1.77	0.14
CV%	-10.30	132.16	43.43	133.02
Bed soil Average	-22.54	0.42	2.76	0.04
Std deviation	3.20	0.56	0.83	0.04
CV%	-14.21	133.49	30.05	114.21

Grain
size%

Location name	Sample ID	Sample type	C/N (molar ratio)	< 150 µm	Sc46	La140
Potlatch River 1	191	BD	8.3	0.25		
Potlatch River 2	192	BD	7.5	0.70		
Potlatch River 3	193	BD	12.2	4.69		
Potlatch River 4	194	BD	15.3	48.38		
Potlatch River 5	195	BD	13.0	29.38		
Potlatch River 6	196	BK	26.5	29.32		
Potlatch River 7	197	Ag	12.9	47.26		
Clearwater 1	206	BD	11.0	0.45		
Clearwater 2	207	BD	13.6	0.62		
Clearwater 3	208	BD	14.1	3.03		
Clearwater 4	209	BD	17.2	0.12		
Clearwater 5	210	BD	11.1	0.93		
Clearwater 6	211	BK	15.4	34.16		
Clearwater 7	212	Ag	17.1	20.33		
Clearwater 8	213	BK	14.8	33.80		
Asotin Creek 1	198	Ag	8.5	59.54		
Asotin Creek 2	199	BK	9.8	30.92		
Asotin Creek 3	200	BD	9.9	39.07		
Asotin Creek 4	201	BD	8.9	75.96		
Asotin Creek 5	202	BD	9.0	10.38		
Asotin Creek 6	203	BD	20.0	46.46		
Asotin Creek 7	204	BD	11.6	1.66		
Asotin Creek 8	205	BK	13.5	16.09		
Grande Ronde 1	214	BD	8.8	10.98		

Grande Ronde 2	215	BD	8.2	4.21
Grande Ronde 3	216	BD	8.8	2.96
Grande Ronde 4	217	BD	9.3	8.54
Grande Ronde 5	218	BD	10.5	51.92
Grande Ronde 6	219	BK	14.3	33.95
Grande Ronde 7	220	BK	15.1	64.72
Grande Ronde 8	221	Ag	14.1	28.38
Grande Ronde 9	222	BK	13.7	55.44
Salmon River 1	231	BD	3.1	15.45
Salmon River 2	232	BD	9.6	1.87
Salmon River 3	233	BD	7.4	3.18
Salmon River 4	234	BD	7.2	8.46
Salmon River 5	235	BD	6.1	9.15
Salmon River 6	236	BK	12.5	37.50
			12.0	
Hell's Canyon 1	223	BD	11.9	7.69
Hell's Canyon 2	224	BD		0.35
Hell's Canyon 3	225	BD	10.6	15.71
Hell's Canyon 4	226	BD	33.6	2.64
Hell's Canyon 6	227	BD	33.6	3.68
Hell's Canyon 5 ?	228	BK	14.0	1.98
Hell's Canyon 7	229	BK	13.4	10.97
Hell's Canyon 8	230	Ag	15.8	35.81

Agriculture soil

Average	13.67	38.26	-	-
Std deviation	3.32	15.48	-	-
CV%	24.26	40.47	-	-

Bank soil Average	14.80	31.71	-	-
Std deviation	4.17	18.07	-	-
CV%	28.19	56.99	-	-
 Bed soil Average	 13.21	 26.34	 -	 -
Std deviation	6.91	23.91	-	-
CV%	52.32	90.78	-	-

Location name	Sample ID	Sample type	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO
Potlatch River 1	191	BD	75.47	12.10	2.46	0.04	0.74	2.13
Potlatch River 2	192	BD						
Potlatch River 3	193	BD						
Potlatch River 4	194	BD						
Potlatch River 5	195	BD						
Potlatch River 6	196	BK	53.11	13.57	13.09	0.20	2.71	4.94
Potlatch River 7	197	Ag	66.62	13.21	4.52	0.12	1.06	1.96
Clearwater 1	206	BD	72.25	11.11	5.78	0.12	1.34	3.02
Clearwater 2	207	BD						
Clearwater 3	208	BD						
Clearwater 4	209	BD						
Clearwater 5	210	BD						
Clearwater 6	211	BK	66.61	13.11	5.01	0.08	1.54	2.83
Clearwater 7	212	Ag	69.11	12.57	4.41	0.07	1.26	2.80
Clearwater 8	213	BK	60.30	13.46	6.35	0.13	0.99	2.19
Asotin Creek 1	198	Ag	64.78	12.86	5.37	0.11	1.42	2.42
Asotin Creek 2	199	BK	54.57	14.24	11.34	0.15	3.15	6.56
Asotin Creek 3	200	BD	54.53	14.02	11.03	0.15	3.04	6.16
Asotin Creek 4	201	BD						
Asotin Creek 5	202	BD						
Asotin Creek 6	203	BD						
Asotin Creek 7	204	BD						
Asotin Creek 8	205	BK						
Grande Ronde 1	214	BD	55.80	13.12	11.42	0.16	2.96	6.50
Grande Ronde 2	215	BD						

Grande Ronde 3	216	BD						
Grande Ronde 4	217	BD						
Grande Ronde 5	218	BD						
Grande Ronde 6	219	BK	53.04	14.07	12.07	0.17	2.93	6.08
Grande Ronde 7	220	BK						
Grande Ronde 8	221	Ag	61.71	14.88	6.32	0.17	1.08	2.05
Grande Ronde 9	222	BK	55.85	14.16	9.56	0.15	2.64	6.06
Salmon River 1	231	BD	72.58	12.88	2.48	0.04	0.86	2.06
Salmon River 2	232	BD						
Salmon River 3	233	BD						
Salmon River 4	234	BD						
Salmon River 5	235	BD	73.57	12.07	3.81	0.10	1.09	2.61
Salmon River 6	236	BK	69.78	13.38	4.03	0.07	1.64	2.99
Hell's Canyon 1	223	BD	48.82	15.08	14.05	0.18	2.83	7.93
Hell's Canyon 2	224	BD						
Hell's Canyon 3	225	BD						
Hell's Canyon 4	226	BD						
Hell's Canyon 6	227	BD						
Hell's Canyon 5 ?	228	BK	48.39	13.66	17.03	0.26	1.68	4.95
Hell's Canyon 7	229	BK	57.55	13.92	8.08	0.15	1.84	3.96
Hell's Canyon 8	230	Ag	49.96	14.54	9.23	0.14	2.50	5.09
Agriculture soil								
Average			62.44	13.61	5.97	0.12	1.46	2.86
Std deviation			7.48	1.03	1.98	0.04	0.60	1.29
CV%			11.98	7.60	33.13	30.85	40.81	44.97

Bank soil Average	57.69	13.73	9.62	0.15	2.12	4.51
Std deviation	6.84	0.39	4.21	0.06	0.75	1.59
CV%	11.86	2.83	43.72	39.31	35.11	35.32
 Bed soil Average	 55.17	 13.57	 11.23	 0.15	 3.00	 6.33
Std deviation	0.90	0.64	0.28	0.01	0.06	0.24
CV%	1.63	4.69	2.46	6.91	1.89	3.80

Location name	Sample ID	Sample type	Na ₂ O	K ₂ O	TiO ₂	P ₂ O ₅	LOI	Sc	V
Potlatch River 1	191	BD	2.75	2.72	0.35	0.05	0.84	7.00	49.00
Potlatch River 2	192	BD							
Potlatch River 3	193	BD							
Potlatch River 4	194	BD							
Potlatch River 5	195	BD							
Potlatch River 6	196	BK	2.07	1.52	1.78	0.37	7.29	26.00	288.00
Potlatch River 7	197	Ag	2.10	2.25	0.92	0.20	7.64	11.00	97.00
Clearwater 1	206	BD	2.37	2.05	0.99	0.11	0.67	14.00	119.00
Clearwater 2	207	BD							
Clearwater 3	208	BD							
Clearwater 4	209	BD							
Clearwater 5	210	BD							
Clearwater 6	211	BK	2.53	2.15	0.96	0.16	3.69	11.00	99.00
Clearwater 7	212	Ag	2.92	2.46	0.85	0.12	1.88	9.00	86.00
Clearwater 8	213	BK	1.69	1.65	1.14	0.25	10.22	15.00	141.00
Asotin Creek 1	198	Ag	2.13	2.03	1.05	0.14	6.07	13.00	121.00
Asotin Creek 2	199	BK	2.87	1.40	2.36	0.33	3.42	29.00	375.00
Asotin Creek 3	200	BD	2.76	1.36	2.20	0.30	4.08	29.00	347.00
Asotin Creek 4	201	BD							
Asotin Creek 5	202	BD							
Asotin Creek 6	203	BD							
Asotin Creek 7	204	BD							
Asotin Creek 8	205	BK							
Grande Ronde 1	214	BD	3.05	1.46	2.12	0.30	1.43	28.00	364.00
Grande Ronde 2	215	BD							

Grande Ronde 3	216	BD							
Grande Ronde 4	217	BD							
Grande Ronde 5	218	BD							
Grande Ronde 6	219	BK	2.75	1.32	2.29	0.32	4.94	30.00	374.00
Grande Ronde 7	220	BK							
Grande Ronde 8	221	Ag	1.89	1.66	1.13	0.20	9.85	14.00	138.00
Grande Ronde 9	222	BK	2.98	1.42	1.82	0.24	3.90	23.00	290.00
Salmon River 1	231	BD	3.10	3.08	0.38	0.09	1.19	6.00	43.00
Salmon River 2	232	BD							
Salmon River 3	233	BD							
Salmon River 4	234	BD							
Salmon River 5	235	BD	2.85	2.55	0.79	0.10	0.78	9.00	77.00
Salmon River 6	236	BK	2.71	2.40	0.62	0.12	1.94	11.00	86.00
Hell's Canyon 1	223	BD	3.19	1.14	3.19	0.43	1.81	31.00	380.00
Hell's Canyon 2	224	BD							
Hell's Canyon 3	225	BD							
Hell's Canyon 4	226	BD							
Hell's Canyon 6	227	BD							
Hell's Canyon 5 ?	228	BK	2.19	0.63	2.81	0.39	7.66	37.00	421.00
Hell's Canyon 7	229	BK	2.09	1.45	1.19	0.21	8.71	21.00	197.00
Hell's Canyon 8	230	Ag	2.61	1.14	1.61	0.39	12.74	25.00	244.00
Agriculture soil									
Average									
2.33 1.91 1.11 0.21 7.64 14.40 137.20									
Std deviation									
0.42 0.52 0.30 0.11 4.08 6.23 63.06									
CV%									
18.12 27.33 27.05 50.84 53.41 43.26 45.96									

Bank soil Average	2.43	1.55	1.66	0.27	5.75	22.56	252.33
Std deviation	0.44	0.51	0.73	0.09	2.81	8.97	126.31
CV%	18.03	32.62	44.17	35.18	48.80	39.78	50.05
 Bed soil Average	 2.91	 1.41	 2.16	 0.30	 2.76	 28.50	 355.50
Std deviation	0.21	0.07	0.05	0.00	1.87	0.71	12.02
CV%	7.06	5.01	2.45	0.00	68.02	2.48	3.38

Location name	Sample ID	Sample type	Co	Ga	Rb	Sr	Y	Zr	Nb
Potlatch River 1	191	BD	243.00	15.00	72.00	400.00	10.00	117.00	4.00
Potlatch River 2	192	BD							
Potlatch River 3	193	BD							
Potlatch River 4	194	BD							
Potlatch River 5	195	BD							
Potlatch River 6	196	BK	71.00	20.00	57.00	305.00	34.00	207.00	11.00
Potlatch River 7	197	Ag	43.00	17.00	83.00	276.00	32.00	321.00	13.00
Clearwater 1	206	BD	216.00	14.00	53.00	326.00	36.00	278.00	10.00
Clearwater 2	207	BD							
Clearwater 3	208	BD							
Clearwater 4	209	BD							
Clearwater 5	210	BD							
Clearwater 6	211	BK	135.00	17.00	71.00	332.00	48.00	573.00	16.00
Clearwater 7	212	Ag	93.00	17.00	71.00	390.00	40.00	446.00	15.00
Clearwater 8	213	BK	40.00	18.00	65.00	243.00	33.00	260.00	13.00
Asotin Creek 1	198	Ag	35.00	17.00	70.00	273.00	28.00	274.00	13.00
Asotin Creek 2	199	BK	66.00	21.00	40.00	338.00	29.00	230.00	13.00
Asotin Creek 3	200	BD	36.00	20.00	40.00	328.00	28.00	217.00	11.00
Asotin Creek 4	201	BD							
Asotin Creek 5	202	BD							
Asotin Creek 6	203	BD							
Asotin Creek 7	204	BD							
Asotin Creek 8	205	BK							
Grande Ronde 1	214	BD	117.00	20.00	37.00	358.00	27.00	291.00	11.00
Grande Ronde 2	215	BD							

Grande Ronde 3	216	BD								
Grande Ronde 4	217	BD								
Grande Ronde 5	218	BD								
Grande Ronde 6	219	BK	48.00	21.00	39.00	349.00	30.00	284.00	12.00	
Grande Ronde 7	220	BK								
Grande Ronde 8	221	Ag	52.00	19.00	73.00	266.00	29.00	292.00	14.00	
Grande Ronde 9	222	BK	43.00	20.00	37.00	397.00	25.00	155.00	10.00	
Salmon River 1	231	BD	160.00	15.00	90.00	373.00	17.00	165.00	13.00	
Salmon River 2	232	BD								
Salmon River 3	233	BD								
Salmon River 4	234	BD								
Salmon River 5	235	BD	157.00	14.00	70.00	363.00	29.00	336.00	19.00	
Salmon River 6	236	BK	122.00	17.00	82.00	385.00	21.00	242.00	14.00	
Hell's Canyon 1	223	BD	57.00	24.00	31.00	362.00	39.00	227.00	19.00	
Hell's Canyon 2	224	BD								
Hell's Canyon 3	225	BD								
Hell's Canyon 4	226	BD								
Hell's Canyon 6	227	BD								
Hell's Canyon 5 ?	228	BK	65.00	23.00	26.00	304.00	43.00	276.00	16.00	
Hell's Canyon 7	229	BK	34.00	18.00	45.00	257.00	22.00	164.00	8.00	
Hell's Canyon 8	230	Ag	34.00	19.00	47.00	304.00	23.00	145.00	8.00	
Agriculture soil										
Average			51.40	17.80	68.80	301.80	30.40	295.60	12.60	
Std deviation			24.36	1.10	13.24	51.38	6.27	107.73	2.70	
CV%			47.39	6.15	19.24	17.03	20.62	36.45	21.44	

Bank soil Average	69.33	19.44	51.33	323.33	31.67	265.67	12.56
Std deviation	36.01	2.07	18.42	52.13	9.11	123.89	2.65
CV%	51.94	10.64	35.88	16.12	28.77	46.63	21.11
Bed soil Average	76.50	20.00	38.50	343.00	27.50	254.00	11.00
Std deviation	57.28	0.00	2.12	21.21	0.71	52.33	0.00
CV%	74.87	0.00	5.51	6.18	2.57	20.60	0.00

Location name	Sample ID	Sample type	Cs	Ba	La	Ce	Pr	Nd	Sm
Potlatch River 1	191	BD	1.20	974.00	20.20	36.50	4.31	14.50	2.70
Potlatch River 2	192	BD							
Potlatch River 3	193	BD							
Potlatch River 4	194	BD							
Potlatch River 5	195	BD							
Potlatch River 6	196	BK	3.00	644.00	34.00	71.30	8.51	32.20	6.90
Potlatch River 7	197	Ag	3.20	733.00	51.00	96.40	11.30	38.90	7.40
Clearwater 1	206	BD	1.00	762.00	53.10	99.60	11.50	38.30	6.90
Clearwater 2	207	BD							
Clearwater 3	208	BD							
Clearwater 4	209	BD							
Clearwater 5	210	BD							
Clearwater 6	211	BK	2.30	731.00	112.00	214.00	24.60	83.40	14.80
Clearwater 7	212	Ag	1.80	868.00	105.00	195.00	22.30	73.60	13.00
Clearwater 8	213	BK	3.10	671.00	39.00	76.10	9.14	32.70	6.80
Asotin Creek 1	198	Ag	3.30	658.00	44.50	85.60	9.87	35.00	6.80
Asotin Creek 2	199	BK	1.20	682.00	28.80	56.40	7.30	26.90	5.90
Asotin Creek 3	200	BD	1.20	656.00	26.40	52.00	6.71	25.10	5.60
Asotin Creek 4	201	BD							
Asotin Creek 5	202	BD							
Asotin Creek 6	203	BD							
Asotin Creek 7	204	BD							
Asotin Creek 8	205	BK							
Grande Ronde 1	214	BD	0.90	710.00	24.00	47.20	6.23	23.80	5.50

Grande Ronde 2	215	BD							
Grande Ronde 3	216	BD							
Grande Ronde 4	217	BD							
Grande Ronde 5	218	BD							
Grande Ronde 6	219	BK	1.20	652.00	25.90	51.80	6.74	26.20	5.90
Grande Ronde 7	220	BK							
Grande Ronde 8	221	Ag	3.50	731.00	41.80	91.90	9.60	34.00	6.80
Grande Ronde 9	222	BK	1.10	712.00	23.00	45.20	5.83	22.70	5.00
Salmon River 1	231	BD	2.40	941.00	31.80	60.00	6.31	22.60	4.10
Salmon River 2	232	BD							
Salmon River 3	233	BD							
Salmon River 4	234	BD							
Salmon River 5	235	BD	1.70	823.00	67.60	127.00	13.00	44.10	7.40
Salmon River 6	236	BK	2.30	798.00	36.80	67.40	7.85	26.10	4.90
Hell's Canyon 1	223	BD	1.00	557.00	27.20	65.60	7.94	35.00	8.60
Hell's Canyon 2	224	BD							
Hell's Canyon 3	225	BD							
Hell's Canyon 4	226	BD							
Hell's Canyon 6	227	BD							
Hell's Canyon 5 ?	228	BK	1.80	495.00	27.50	62.00	8.31	33.60	8.40
Hell's Canyon 7	229	BK	2.80	580.00	19.90	41.10	5.11	19.30	4.40
Hell's Canyon 8	230	Ag	2.90	434.00	20.80	42.70	5.27	19.70	4.50
Agriculture soil									
Average									
2.94 684.80 52.62 102.32 11.67 40.24 7.70									
Std deviation									
0.67 159.40 31.39 56.05 6.36 20.02 3.16									
CV%									
22.89 23.28 59.66 54.78 54.48 49.75 41.09									

Bank soil Average	2.09	662.78	38.54	76.14	9.27	33.68	7.00
Std deviation	0.80	87.51	28.25	53.00	5.89	19.24	3.17
CV%	38.18	13.20	73.30	69.61	63.62	57.13	45.30
Bed soil Average	1.05	683.00	25.20	49.60	6.47	24.45	5.55
Std deviation	0.21	38.18	1.70	3.39	0.34	0.92	0.07
CV%	20.20	5.59	6.73	6.84	5.25	3.76	1.27

Location name	Sample ID	Sample type	Eu	Gd	Tb	Dy	Ho	Er	Tm
	A-452								

Potlatch River 1	191	BD	0.83	2.20	0.30	2.00	0.40	1.10	0.16
Potlatch River 2	192	BD							
Potlatch River 3	193	BD							
Potlatch River 4	194	BD							
Potlatch River 5	195	BD							
Potlatch River 6	196	BK	1.85	6.90	1.10	6.70	1.30	3.80	0.54
Potlatch River 7	197	Ag	1.64	6.40	1.00	5.90	1.10	3.40	0.50
Clearwater 1	206	BD	1.32	5.90	0.90	6.30	1.30	4.10	0.62
Clearwater 2	207	BD							
Clearwater 3	208	BD							
Clearwater 4	209	BD							
Clearwater 5	210	BD							
Clearwater 6	211	BK	1.98	11.50	1.60	9.30	1.70	5.10	0.72
Clearwater 7	212	Ag	1.73	9.60	1.40	7.80	1.50	4.30	0.60
Clearwater 8	213	BK	1.59	6.20	1.00	5.80	1.10	3.30	0.48
Asotin Creek 1	198	Ag	1.54	5.90	0.90	5.40	1.00	3.10	0.45
Asotin Creek 2	199	BK	1.92	6.00	0.90	5.80	1.10	3.20	0.46
Asotin Creek 3	200	BD	1.78	5.60	0.90	5.30	1.00	3.00	0.42
Asotin Creek 4	201	BD							
Asotin Creek 5	202	BD							
Asotin Creek 6	203	BD							
Asotin Creek 7	204	BD							
Asotin Creek 8	205	BK							
Grande Ronde 1	214	BD	1.80	5.70	0.90	5.60	1.10	3.10	0.43
Grande Ronde 2	215	BD							
Grande Ronde 3	216	BD							

Grande Ronde 4	217	BD							
Grande Ronde 5	218	BD							
Grande Ronde 6	219	BK	1.88	6.10	1.00	5.80	1.10	3.30	0.46
Grande Ronde 7	220	BK							
Grande Ronde 8	221	Ag	1.56	6.00	0.90	5.40	1.00	3.00	0.44
Grande Ronde 9	222	BK	1.67	5.10	0.80	4.90	1.00	2.80	0.40
Salmon River 1	231	BD	0.90	3.40	0.50	3.00	0.60	1.70	0.27
Salmon River 2	232	BD							
Salmon River 3	233	BD							
Salmon River 4	234	BD							
Salmon River 5	235	BD	1.16	5.70	0.90	5.00	1.00	3.10	0.49
Salmon River 6	236	BK	1.10	4.30	0.70	4.20	0.80	2.50	0.36
Hell's Canyon 1	223	BD	2.51	8.70	1.50	8.20	1.60	4.30	0.64
Hell's Canyon 2	224	BD							
Hell's Canyon 3	225	BD							
Hell's Canyon 4	226	BD							
Hell's Canyon 6	227	BD							
Hell's Canyon 5 ?	228	BK	2.43	8.80	1.40	8.80	1.70	4.70	0.66
Hell's Canyon 7	229	BK	1.26	4.30	0.70	4.30	0.80	2.50	0.34
Hell's Canyon 8	230	Ag	1.32	4.30	0.70	4.50	0.90	2.50	0.36
Agriculture soil									
Average									
1.56 6.44 0.98 5.80 1.10 3.26 0.47									
Std deviation									
0.15 1.94 0.26 1.23 0.23 0.67 0.09									
CV%									
9.80 30.12 26.41 21.15 21.32 20.42 18.79									
Bank soil Average									
1.74 6.58 1.02 6.18 1.18 3.47 0.49									

Std deviation	0.40	2.31	0.31	1.82	0.33	0.92	0.13
CV%	22.83	35.06	30.06	29.40	28.41	26.48	26.32
Bed soil Average	1.79	5.65	0.90	5.45	1.05	3.05	0.43
Std deviation	0.01	0.07	0.00	0.21	0.07	0.07	0.01
CV%	0.79	1.25	0.00	3.89	6.73	2.32	1.66

Location name	Sample ID	Sample type	Yb	Lu	Hf	Ta	W	Th	U
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A-455

Potlatch River 1	191	BD	1.10	0.18	2.60	0.30	1590.00	4.50	1.10
Potlatch River 2	192	BD							
Potlatch River 3	193	BD							
Potlatch River 4	194	BD							
Potlatch River 5	195	BD							
Potlatch River 6	196	BK	3.40	0.58	4.50	0.90	327.00	7.00	2.10
Potlatch River 7	197	Ag	3.20	0.56	7.50	1.10	270.00	11.90	3.40
Clearwater 1	206	BD	4.10	0.71	5.60	0.80	1450.00	12.00	2.00
Clearwater 2	207	BD							
Clearwater 3	208	BD							
Clearwater 4	209	BD							
Clearwater 5	210	BD							
Clearwater 6	211	BK	4.70	0.82	12.80	1.30	883.00	31.20	5.20
Clearwater 7	212	Ag	3.90	0.69	10.90	1.00	717.00	26.90	4.00
Clearwater 8	213	BK	3.10	0.55	6.20	1.00	192.00	9.00	2.70
Asotin Creek 1	198	Ag	3.00	0.51	6.80	1.10	186.00	10.40	2.80
Asotin Creek 2	199	BK	3.00	0.49	5.30	1.00	314.00	5.80	2.10
Asotin Creek 3	200	BD	2.80	0.49	4.60	0.80	75.00	5.30	1.90
Asotin Creek 4	201	BD							
Asotin Creek 5	202	BD							
Asotin Creek 6	203	BD							
Asotin Creek 7	204	BD							
Asotin Creek 8	205	BK							
Grande Ronde 1	214	BD	2.80	0.48	6.80	0.70	581.00	4.40	1.60
Grande Ronde 2	215	BD							
Grande Ronde 3	216	BD							

Grande Ronde 4	217	BD							
Grande Ronde 5	218	BD							
Grande Ronde 6	219	BK	2.90	0.52	6.50	0.80	134.00	5.10	1.90
Grande Ronde 7	220	BK							
Grande Ronde 8	221	Ag	2.90	0.51	6.70	1.10	239.00	9.70	3.10
Grande Ronde 9	222	BK	2.60	0.43	4.10	0.70	143.00	3.90	1.70
Salmon River 1	231	BD	1.80	0.27	4.20	1.00	1170.00	8.70	2.10
Salmon River 2	232	BD							
Salmon River 3	233	BD							
Salmon River 4	234	BD							
Salmon River 5	235	BD	3.30	0.53	8.00	1.50	1190.00	16.30	2.80
Salmon River 6	236	BK	2.30	0.39	5.50	1.10	971.00	9.40	2.60
Hell's Canyon 1	223	BD	4.00	0.61	5.90	1.30	131.00	3.90	1.40
Hell's Canyon 2	224	BD							
Hell's Canyon 3	225	BD							
Hell's Canyon 4	226	BD							
Hell's Canyon 6	227	BD							
Hell's Canyon 5 ?	228	BK	4.30	0.72	5.80	1.20	131.00	3.90	1.40
Hell's Canyon 7	229	BK	2.30	0.40	3.60	0.60	83.00	4.50	1.60
Hell's Canyon 8	230	Ag	2.30	0.41	3.70	0.60	90.00	4.60	1.60
Agriculture soil									
Average									
3.06 0.54 7.12 0.98 300.40 12.70 2.98									
Std deviation									
0.58 0.10 2.57 0.22 242.70 8.40 0.89									
CV%									
18.86 19.01 36.09 22.12 80.79 66.13 29.86									
Bank soil Average									
3.18 0.54 6.03 0.96 353.11 8.87 2.37									

Std deviation	0.84	0.15	2.71	0.23	336.38	8.62	1.15
CV%	26.37	26.73	44.98	24.04	95.26	97.23	48.45
Bed soil Average	2.80	0.49	5.70	0.75	328.00	4.85	1.75
Std deviation	0.00	0.01	1.56	0.07	357.80	0.64	0.21
CV%	0.00	1.46	27.29	9.43	109.08	13.12	12.12