Data Gaps Investigation Report

Index Shooting Range
Mt. Baker-Snoqualmie National Forest

Prepared for

USDA Forest Service

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March 2015

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INDEX SHOOTING RANGE
MT. BAKER-SNOQUALMIE NATIONAL FOREST, WASHINGTON

Prepared by:

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REGION 6, WASHINGTON

MARCH 2015

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Acronyms and Abbreviations

CUL	cleanup level
DGI	Data Gaps Investigation
EE/CA	Engineering Evaluation/Cost Analysis
LUC	land use control
MTCA	Model Toxics Control Act
O&M	operations and maintenance
mg/kg	milligram(s) per kilogram
USDA	United States Department of Agriculture
USFS	USDA Forest Service
yd^3	cubic yard

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1.0 Introduction

This report describes the 2014 Data Gaps Investigation (DGI) for the former Index Sportsman Club shooting range in Index, Washington. The former shooting range is located within the Mt. Baker-Snoqualmie National Forest, approximately 0.5 mile west of Index (Figure 1).

The Index Shooting Range was in use from 1947 through 2009 and consisted of a clubhouse and two trap houses that contained target launching equipment. A series of shooting stations were also located on the south side of the range and shot was fired to the north of the clearing into a forested area.

The purposes of the DGI are to:

- Further delineate the lateral and vertical extent of lead impacts in the near-surface soil and clarify current volume of contaminated soil to be remediated to eliminate direct exposure to lead-impacted soil;
- Review (and revise) the costs of the Alternative 3 – Excavation and Off-Site Disposal presented in the Final Engineering Evaluation/Cost Analysis (EE/CA) prepared by URS (2011);
- Review (and revise) the costs of the proposed Alternative 4 – On-Site Capping original proposed remedy presented in the EE/CA (URS 2011); and
- Recommend and cost a new proposed alternative (if applicable).

1.1 Background Documentation

The primary source of data evaluated during the DGI is the *Final Engineering Evaluation/Cost Analysis, Index Shooting Range, Mt. Baker-Snoqualmie National Forest* (URS 2011). This report summarized the site characterization, site cleanup criteria, identification of removal action objectives, identification and analysis of removal action alternatives, comparative analysis of removal action alternatives, and recommended removal action alternative (on-site capping).

1.2 Report Organization

This report is organized as follows:

- **Section 1.0, Introduction**, identifies the location of the former Index Sportsman Club shooting range, presents the purpose(s) of the DGI, and identifies background documentation evaluated during the DGI.
- **Section 2.0, Sampling and Analysis and Soil Volume Estimation,** discusses the DGI soil sampling event, laboratory results, and new estimation of volume of lead-impacted soil.
- **Section 3.0, Evaluation of Removal Action Alternatives,** discusses the evaluation of costs and presents a comparison between the EE/CA and this DGI associated with the costs for Alternatives 3 and 4.
- **Section 4.0, Conclusions and Recommendations,** presents conclusions based on the results from the DGI and recommendations for selection of the preferred Removal Action Alternative.
- **Section 5.0, References,** presents references for documents used to prepare this report.

2.0 Sampling and Analysis and Soil Volume Estimation

DGI soil sampling was conducted during June 2014. A summary of DGI sampling is presented on Table 1 and on Figure 2. The rationale for the sampling locations selected during the DGI event was based on addressing two data gaps in the original soil sampling:

- A lateral extent data gap in the 0- to 6-inch interval. Sample locations DGI-10 through DGI-16 and DGI-18 through DGI-22 were chosen to further delineate the lateral extent of surface soils with total lead above the Model Toxics Control Act (MTCA) Method A Cleanup Level (CUL) of 250 milligrams/kilogram (mg/kg).
- A vertical extent data gap in the 6- to 12-inch interval. Sample locations DGI-01 through DGI-08 were chosen to further delineate vertical extent of soils at the approximate same locations where URS (2011) reported total lead above the MTCA Method A CUL in the 0- to 6-inch interval.

Samples were analyzed for total lead by ALS Laboratories, Kelso, WA, a Washington Department of Ecology–approved laboratory. All samples were screened through a #10 sieve by the laboratory prior to analysis. Laboratory analytical data sheets are presented in Appendix A.

A revised estimate of the volume of soil that contains total lead concentrations above the MTCA Method A CUL was calculated based on:

- site soil data presented in URS (2011); and
- soil data collected during the DGI in 2014.

2.1 Summary of Analytical Results

A summary of laboratory analytical results for the 2014 DGI sampling event is presented on Table 2 showing:

- Six samples (DGI-09, DGI-11, DGI-12, DGI-16, DGI-20, and DGI-21) collected from the 0- to 6-inch interval have reported concentrations of total lead above the MTCA Method A CUL of 250 mg/kg. While DGI-12 has a reported concentration of total lead above the MTCA Method A CUL (303 mg/kg), the concentration of duplicate sample DGI-10 was below the MTCA Method A CUL (156 mg/kg).
- Three samples (DGI-05, DGI-06, and DGI-08) collected from the 6- to 12-inch interval have reported concentrations above the MTCA Method A CUL. Those samples confirm the elevated levels of lead in the surface samples at those locations as presented in URS (2011).

A summary of lead concentrations for all sample events at the site is presented on Figure 3.

2.2 Soil Volume Estimation

The purpose of the DGI soil sampling event was to further delineate the lateral and vertical extent of total lead concentrations in site soil above the MTCA Method A CUL of 250 mg/kg. The DGI data have been combined with prior soil data reported in URS (2011) as presented on Table 3.

The estimated volume of soil with concentrations of total lead above the MTCA CUL is approximately 2,050 cubic yards (yd^3), as shown on Table 4. The estimated volume is based on the following factors:

- The areal extent of total lead above MTCA Method A in the 0- to 6-inch interval is approximately 2.02 acres, or approximately 88,000 square feet (Figure 4).
- The areal extent of total lead above MTCA Method A in the 6- to 12-inch interval is approximately 0.52 acres, or approximately 22,600 square feet (Figure 5).
- The maximum depth of soil with total lead concentrations above MTCA Method A is 12 inches.

3.0 Evaluation of Removal Action Alternatives

The main purpose of the DGI was to re-evaluate removal action alternatives that were presented in the EE/CA (URS 2011). The four alternatives selected for detailed analysis in the EE/CA were:

- Alternative 1 – No Action
- Alternative 2 – On-site Treatment
- Alternative 3 – Excavation and Off-site Disposal
- Alternative 4 – On-Site Capping

Alternatives 1 and 2 were not re-evaluated as part of this DGI. Alternative 1 is the No Action alternative; therefore, no evaluation was deemed necessary. Alternative 2 (On-site Treatment) was by far the most costly of the alternatives presented in URS (2011); therefore, no re-evaluation was performed because the alternative was cost prohibitive and re-evaluation would have yielded the same result.

The Estimated Removal Action Cost Summary (Table 6 of URS 2011) presents capital costs only for the four Removal Action Alternatives. Operations and maintenance (O&M) and total present worth costs were omitted from URS (2011). For the purpose of comparison, an estimate of O&M costs (e.g., land use control [LUC] restrictions and annual inspections) and total present worth costs has been included in the analysis. Alternative 3 would not include O&M costs, because implementation of that alternative would result in unrestricted use of the site. For Alternative 4, the cost for O&M was based on a 20-year duration and includes annual LUC inspections that would need to be implemented at the site.

Alternatives 3 and 4 were re-evaluated as discussed in Sections 3.1 and 3.2, respectively. A comparison of major assumptions between the EE/CA and the DGI that were used for developing the capital costs of Alternative 3 and Alternative 4 is presented in Table 5 and Table 6, respectively.

3.1 Alternative 3 – Excavation and Off-site Disposal

A comparison of Alternative 3 costs is presented on Table 7. The estimated total capital cost of Alternative 3 presented in the EE/CA (URS 2011) was **$1,701,000**. The estimated total capital cost of Alternative 3 per the DGI is **$782,000**. As implementation of Alternative 3 would result in unrestricted land use, the capital cost is the same as the total present worth cost.

Factors that contributed to the lower DGI total capital cost include the following:

- The EE/CA assumed a footprint of lead-impacted soils of 2.5 acres while the DGI, based on the additional soil sampling data reported in Section 2, assumes a footprint of 2.02 acres.
- The EE/CA appears to have assumed approximately $25,000 per acre for clearing and grubbing while the DGI assumes a cost of approximately $7,500 per acre.
- The EE/CA assumed excavation of the entire footprint to a depth of one foot while the DGI assumes an excavation depth of 6 inches within the entire footprint plus additional excavation to one foot within a smaller (0.52 acre) hotspot area, based on additional soil sampling data.
- The EE/CA assumed an over-excavation contingency of 20 percent plus an additional 20 percent contingency on the total Removal Action Construction cost (for a total contingency of approximately 45 percent on excavation soil volume) while the DGI assumes a contingency of 20 percent on the total Removal Action Construction cost (to cover over-excavation).

- The EE/CA assumed a contingency of 20 percent for backfilled soils plus an additional 20 percent contingency on the total Removal Action Construction cost (for a total contingency of approximately 45 percent on backfill soil volume) while the DGI assumes a contingency of 20 percent on the total Removal Action Construction cost.
- The EE/CA included a cost for placement of a 6-inch layer of EKO-brand compost while the DGI assumes use of a 3-way topsoil mix will be sufficient to establish seed and plant growth.

Other differences between the EE/CA and the DGI:

- Per discussions with the United States Department of Agriculture (USDA) Forest Service (USFS) Region 6 staff during the kick-off meeting, Alternative 3 would include procurement of sparse to medium-density trees (in addition to seeding), for planting by others.
- Per discussions with the USFS during the kick-off meeting, trees removed during clearing would be decked on-site, for public use as firewood.

Factors unchanged from the EE/CA:

- Wetland delineation remains as a task to be completed.
- Well decommissioning remains as a task to be completed.
- O&M monitoring remains as a task to be completed.
- Oversight/reporting remains as a task to be completed.

3.2 Alternative 4 – On-site Capping

A comparison of Alternative 4 costs is presented on Table 8. The estimated total capital cost of Alternative 4 presented in the EE/CA (URS 2011) was **$842,000**. Assuming an O&M cost of approximately $300,000 over 30 years for LUC restrictions and inspections, the estimated present worth cost would be **$1,042,000**. The estimated total capital cost of Alternative 4 per the DGI is **$573,000**, with an estimated present worth cost of **$773,000**.

Factors that contributed to the lower DGI total capital cost include the following:

- The EE/CA assumed a footprint of lead-impacted soils of 2.5 acres while the DGI, based on additional soil sampling data (reported in Section 2), assumes a footprint of 2.02 acres.
- The EE/CA appears to assume approximately $7,300 per acre for clearing and grubbing (leaving trees and stumps in-place) while the DGI assumes a cost of approximately $7,500 per acre (including removal of trees and stumps).
- The EE/CA assumed a contingency of 20 percent for backfilled soils plus an additional 20 percent contingency on the total Removal Action Construction cost (for a total contingency of approximately 45 percent on backfill soil volume) while the DGI assumes a contingency of 20 percent on the total Removal Action Construction cost.
- The EE/CA included a cost for placement of a 6-inch layer of EKO compost while the DGI assumes use of a 3-way topsoil mix would be sufficient to establish seed and plant growth.

Other differences between the EE/CA and the DGI:

- Well decommissioning would be completed under Alternative 4 (per the DGI).
- Per discussions with the USFS during the kick-off meeting, Alternative 4 would include procurement of sparse to medium-density trees (in addition to seeding), for planting by others.

- Per discussions with the USFS during the kick-off meeting, trees removed during clearing would be decked on-site, for public use as firewood.

Factors unchanged from the EE/CA:

- Wetland delineation remains as a task to be completed.
- O&M monitoring remains as a task to be completed.
- Oversight/reporting remains as a task to be completed.

4.0 Conclusions and Recommendations

Conclusions and recommendations based on the results of the DGI are discussed in Sections 4.1 and 4.2.

4.1 Conclusions

This DGI resulted in capital costs for Alternatives 3 and 4 that are substantially lower than capital costs presented in the EE/CA. This result was mainly due to re-estimation (and decrease) in the volume of lead-contaminated soil. Following are some of the key results:

- Approximately 2.02 acres contain near surface (0- to 6-inch interval) lead contamination above the MTCA Method A CUL of 250 mg/kg.
- Approximately 0.52 acre contain subsurface (6- to 12-inch interval) lead contamination above the MTCA Method A CUL of 250 mg/kg.
- The USFS has approved clearing of vegetation and trees within the 2.02-acre footprint.
- Alternative 3 (Excavation and Off-site Disposal) capital costs, as presented in Section 3.1, total approximately **$782,000**. There are no present worth costs (i.e., post removal O&M costs) associated with Alternative 3.
- Alternative 4 (On-site Capping) capital costs, as presented in Section 3.2, total approximately **$573,000**. Present worth costs associated with Alternative 4 are estimated at **$773,000**, assuming $10,000 spent per year for 20 years to cover maintenance and reporting of LUCs.

4.2 Recommendations

Alternative 3 (Excavation and Off-site Disposal) is recommended as the preferred removal action alternative for the following reasons:

- If present worth costs that would likely be incurred for Alternative 1 (No-Action), Alternative 2 (On-site Treatment), and Alternative 4 (On-site Capping) are included in the total costs, then Alternative 3 (Excavation and Off-site Disposal) would be the lowest-cost alternative.
- Completion of Alternative 3 would provide the USFS with unrestricted use of the Index site, whereas completion of any of the other alternatives would result in restricted use and the need for implementation of institutional controls and/or LUCs.

If capital costs presented in Section 3.1 for Alternative 3 exceed USFS funds, we recommend the following steps whereby costs might be further reduced by USFS:

- Find a suitable USFS source of clean backfill to be used as a substitute for purchasing 3-way topsoil mix. If transport costs are fixed, the cost savings would amount to approximately $30,000.
- Use clean top cover from outside of the 2.02-acre footprint as a substitute for purchasing and transporting the 3-way topsoil mix. Cost savings would amount to approximately $47,000.

5.0 References

URS. 2011. *Final Engineering Evaluation/Cost Analysis, Index Shooting Range, Mt. Baker – Snoqualmie National Forest*. Prepared for the USDA Forest Service. November.

Tables

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Table 1. Summary of DGI Soil Sampling Event

Sample ID	Location	Sample Depth 0-6"	6-12"	Rationale/Uncertainty
DGI-01	Near SS-03	--	X	Vertical Extent between 6-12"
DGI-02	Near SS-04	--	X	Vertical Extent between 6-12"
DGI-03	Near SS-05	--	X	Vertical Extent between 6-12"
DGI-04	Near TA-12	--	X	Vertical Extent between 6-12"
DGI-05	Near TA-13	--	X	Vertical Extent between 6-12"
DGI-06	Near TA-14	--	X	Vertical Extent between 6-12"
DGI-07	Near TA-15	--	X	Vertical Extent between 6-12"
DGI-08	Near TA-16	--	X	Vertical Extent between 6-12"
DGI-09	Near MW-2	X		SW lateral extent
DGI-10	Duplicate of DGI-12	X		SW lateral extent
DGI-11	30' SW of DGI-09	X		SW lateral extent
DGI-12	60' S of TA-15; 60' E of TA-16	X		SE lateral extent
DGI-13	60' SE of DGI-12	**A**		SE lateral extent
DGI-14	60' E of TA-15	X		E lateral extent
DGI-15	60' E of DGI-14	**A**		E lateral extent
DGI-16	50' S of SS-05	X		E lateral extent
DGI-18	30' NE of SS-05	X		NE lateral extent
DGI-19	60' NE of SS-04	X		N lateral extent
DGI-20	60' W of SS-04	X		N lateral extent
DGI-21	30' NW of SS-03	X		NW lateral extent

A = Archive Sample - Not analyzed as preceding sample was <250 mg/kg

Table 2. Summary of DGI Analytical Data

		Sample Depth		
Sample ID	**Location**	**0-6"**	**6-12"**	**Pb (mg/kg)**
DGI-01	Near SS-03	--	X	193
DGI-02	Near SS-04	--	X	43
DGI-03	Near SS-05	--	X	16.3
DGI-04	Near TA-12	--	X	29.6
DGI-05	Near TA-13	--	X	691
DGI-06	Near TA-14	--	X	975
DGI-07	Near TA-15	--	X	126
DGI-08	Near TA-16	--	X	918
DGI-09	Near MW-2	X		38,400
DGI-10	Duplicate of DGI-12	X		156
DGI-11	30' SW of DGI-09	X		430
DGI-12	60' S of TA-15; 60' E of TA-16	X		303
DGI-14	60' E of TA-15	X		72.7
DGI-16	50' S of SS-05	X		423
DGI-18	30' NE of SS-05	X		150
DGI-19	60' NE of SS-04	X		37.4
DGI-20	60' W of SS-04	X		2780
DGI-21	30' NW of SS-03	X		2120

Results above MTCA criteria (250 mg/kg) are shown in green highlight.

Table 3. Summary of Site Analytical Data

	Pb (mg/kg)		
	Sample Depth		
Location	**0-6"**	**6-12"**	**>12"**
DGI-10/DGI-12	229	--	--
DGI-11	430	--	--
DGI-14	72.7	--	--
DGI-16	423	--	--
DGI-18	150	--	--
DGI-19	37.4	--	--
DGI-20	2780	--	--
DGI-21	2120	--	--
SS-01	--	*193*	*55.7*
SS-02	140	--	55.7
SS-03/DGI-01	*1,580*	193	*78.3*
SS-04/DGI-02	*720*	43	--
SS-05/DGI-03	*515*	16.3	*13*
SS-06	*23*	--	*7.6*
SS-07	*69*	--	*14*
SS-08	*8.6*	--	--
SS-09	*69*	--	*14*
SS-10	*8.1*	--	--
TA-03	*18.8*	--	--
TA-04	--	*20*	*6*
TA-05	--	*37*	--
TA-06	*17.2*	*17*	*6*
TA-07	*8.2*	--	*8*
TA-08	*93.5*	--	*15*
TA-09	*18.0*	--	--
TA-10	*53.1*	--	--
TA-12/DGI-04	*2,440*	29.6	--
TA-13/DGI-05	*7,140*	691	*44.3*
TA-14/DGI-06	*58,100*	975	--
TA-15/DGI-07	*10,200*	126	--
TA-16/DGI-08	*1,130*	918	--
MW-2/DGI-09	38,400	--	--

Results above MTCA criteria (250 mg/kg) are shown in green highlight.
Results in italics are from URS 2011.
DGI-10/DGI-12 is the average of the environmental sample and the duplicate sample.

Table 4. Estimated Volume of Lead-Contaminated Soil

Excavation Area	**Total Acres**	**ft^2/acre**	**Depth (ft)**	**Vol (ft^3)**	**Vol (yd^3)**
0-6" Interval	2.02	43,560	0.5	43,996	1,629
6-12" Interval	0.52	43,560	0.5	11,326	419
Total Estimated Volume of Soil (yd^3)					**2,049**
Conversion to LCY (1.25x)					2,561
Conversion to Tons (1.5x)					3,073

Table 5. Comparison of Alternative 3 Costs

Description	URS EE/CA (2011)	Tetra Tech DGI	Notes
Estimated Areal Extent of Lead-Impacted Soil (acres)	2.5	2.02	NA
Clearing, Grubbing, and Site Improvements (cost/acre)	25,000	7,500	NA
Estimated Volume of Lead-Impacted Soils (yd^3)	4,000	2,050	URS assumed one-foot depth of excavation throughout 2.5-acre footprint; DGI assumes 6-inch depth of excavation throughout 2.02-acre footprint and one-foot depth in smaller (0.52-acre) hotspot.
Approximate Contingency (%)	45	20	URS assumed 20% contingency for over-excavation and backfill of soils, then additional 20% contingency in summary Table 6 of EE/CA; DGI assumes 20% contingency.
Estimated Volume of Lead-Impacted Soils, Including Contingency (yd^3)	5760	2,460	NA
Estimated Weight of Lead-Impacted Soils, Including Contingency (tons)	8640	3690	NA
Estimated Volume of Backfilled Soils (yd^3)	2580	2,050	NA
Estimated Volume of Backfilled Compost (yd^3)	2580	0	URS assumed backfill thickness of compost at 6 inches throughout footprint; DGI assumes 3-way topsoil mix sufficient and compost not needed.

Table 6. Comparison of Alternative 3 Costs

Description	URS EE/CA (2011)	Tetra Tech DGI	Notes
Estimated Areal Extent of Lead-Impacted Soil (acres)	2.5	2	NA
Clearing, Grubbing, and Site Improvements (cost/acre)	7,300	7,500	URS cost assumes leaving trees and stumps in place; DGI cost assumes removal of trees and stumps.
Estimated Volume of Backfilled Soils for Soil Cap (yd^3)	7740	6,518	URS cost assumes 18-inch backfill thickness plus 6-inch EKO compost; DGI assumes 24-inch 3-way topsoil mix and compost not needed.
Estimated Volume of Backfilled Compost for Soil Cap (yd^3)	2580	0	URS assumed backfill thickness of compost at 6" throughout footprint; DGI assumes 3-way topsoil mix sufficient and compost not needed.
Approximate Contingency (%)	45	20	URS assumed 20% contingency for backfill, then additional 20% contingency in summary Table 6 of EE/CA; DGI assumes 20% contingency.

Table 7. Comparison of Alternative 3 Costs

Task	Description	Estimated Cost [1/]	DGI Estimated Cost	Variance
Wetland Delineation	Survey and delineate in work area	$15,000	$15,000	NC
Removal Action Construction	Mobilization/Demobilization	$124,418	$143,087	$18,669
	Erosion Control and Decon Station	$4,553	$4,553	NC
	Clearing, Grubbing and Site Improvements	$67,125	$15,150	-$51,975
	Monitoring Well Decomissioning	$1,422	$1,422	NC
	Excavate, Overexcavate Soil	$129,310	$109,000	-$20,310
	Load, Transport, and Dispose Soil	$677,160	$200,000	-$477,160
	On-site Treatment	$17,866	$25,000	$7,134
	Procure, Transport and Place Clean Backfilled Soil	$129,000	$77,150	-$51,850
	Purchase, Import, and Place Compost	$199,978	N/A	-$199,978
	Seed Application and Restoration	$6,269	$6,269	NC
	Purchase and Delivery of Plants	NA	$10,000	$10,000
	O&M Monitoring	$11,500	$11,500	NC
	Removal Action Construction Subtotal	**$1,369,000**	**$603,000**	**-$766,000**
	20 % Contingency	$273,800	$120,600	-$153,200
	Removal Action Construction Total	**$1,643,000**	**$724,000**	**-$919,000**
Oversight/Reporting	Work Plan, CQAP, HASP	$15,000	$15,000	NC
	Removal Action Oversight	$18,000	$18,000	NC
	Removal Action Report	$10,000	$10,000	NC
	Oversight/Reporting Total	**$43,000**	**$43,000**	NC
TOTAL CAPITAL COST		**$1,701,000**	**$782,000**	**-$919,000**
O&M	LUC Restrictions and Inspections	$0	$0	NC
Net Present Worth	Capital Cost + O&M	**$1,701,000**	**$782,000**	**-$919,000**

[1/] Source: URS (2011)

NC = No Change

Table 8. Comparison of Alternative 4 Estimated Costs

Task	Description	Estimated Cost [1/]	DGI Estimated Cost	Variance
Wetland Delineation	Survey and delineate in work area	$15,000	$15,000	NC
Removal Action Construction	Mobilization/Demobilization	$59,655	$143,087	$83,432
	Erosion Control and Decon Station	$4,553	$4,553	NC
	Clearing, Grubbing and Site Improvements	$18,208	$15,150	-$3,058
	Monitoring Well Decomissioning	$0	$1,422	NC
	Procure, Transport and Place Clean Backfilled Soil	$356,040	$239,910	-$116,130
	Purchase, Import, and Place Compost	$199,978	N/A	-$199,978
	Seed Application and Restoration	$6,269	$6,269	NC
	Purchase and Delivery of Plants	$0	$10,000	$10,000
	O&M Monitoring	$11,500	$11,500	NC
	Removal Action Construction Subtotal	**$656,000**	**$432,000**	**-$224,000**
	20 % Contingency	$131,200	$86,400	-$44,800
	Removal Action Construction Total	**$787,000**	**$518,000**	**-$269,000**
Oversight/Reporting	Work Plan, CQAP, HASP	$15,000	$15,000	NC
	Removal Action Oversight	$15,000	$15,000	NC
	Removal Action Report	$10,000	$10,000	NC
	Oversight/Reporting Total	**$40,000**	**$40,000**	NC
TOTAL CAPITAL COST		**$842,000**	**$573,000**	**-$269,000**
O&M [2/]	LUC Restrictions and Inspections	$200,000	$200,000	NC
Net Present Worth	Capital Cost + O&M	**$1,042,000**	**$773,000**	**-$269,000**

[1/] Source: URS (2011)

[2/] Calculated at $10,000/year x 20 years

NC = No Change

Figures

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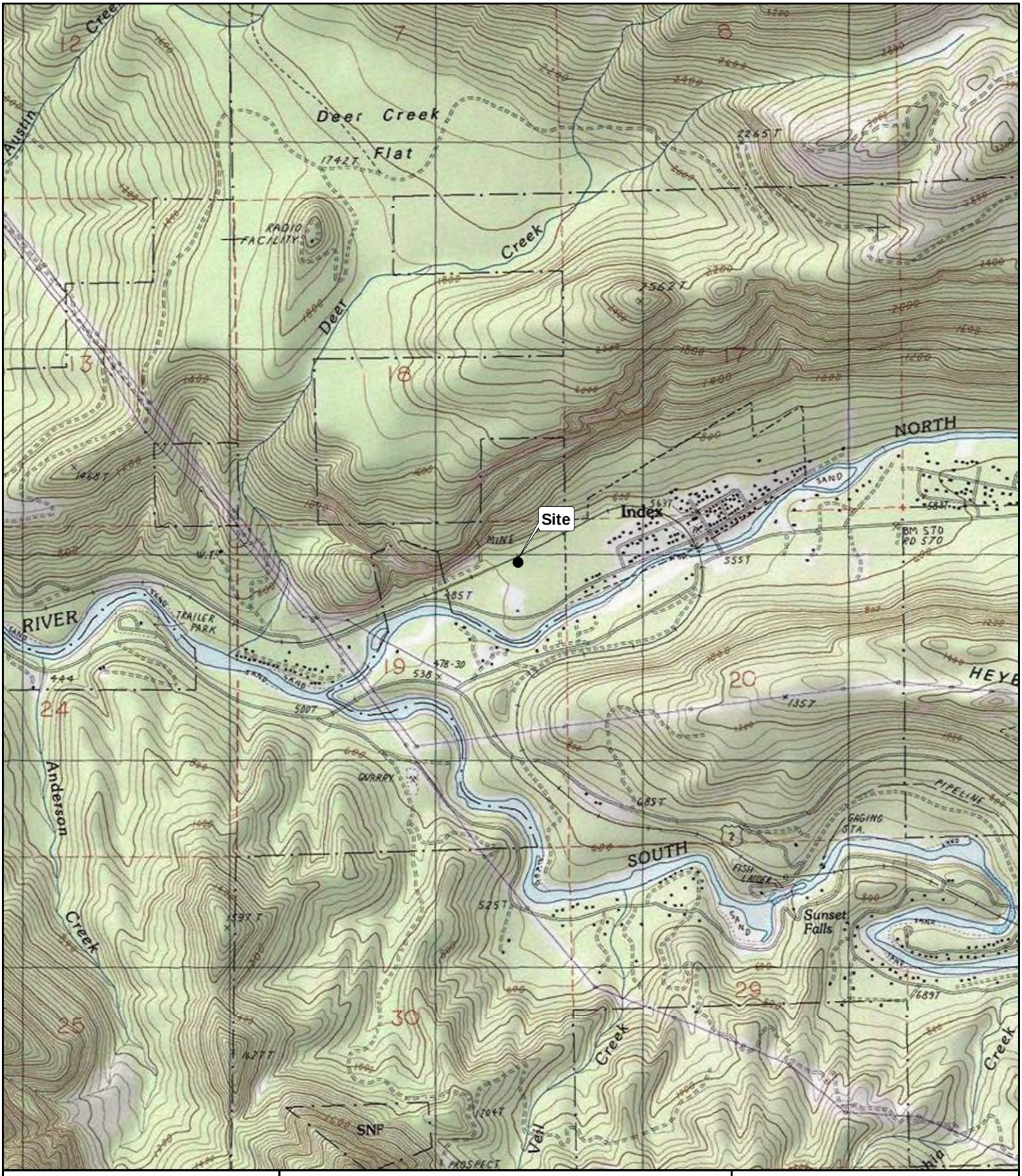


N

0 1,000 2,000 4,000

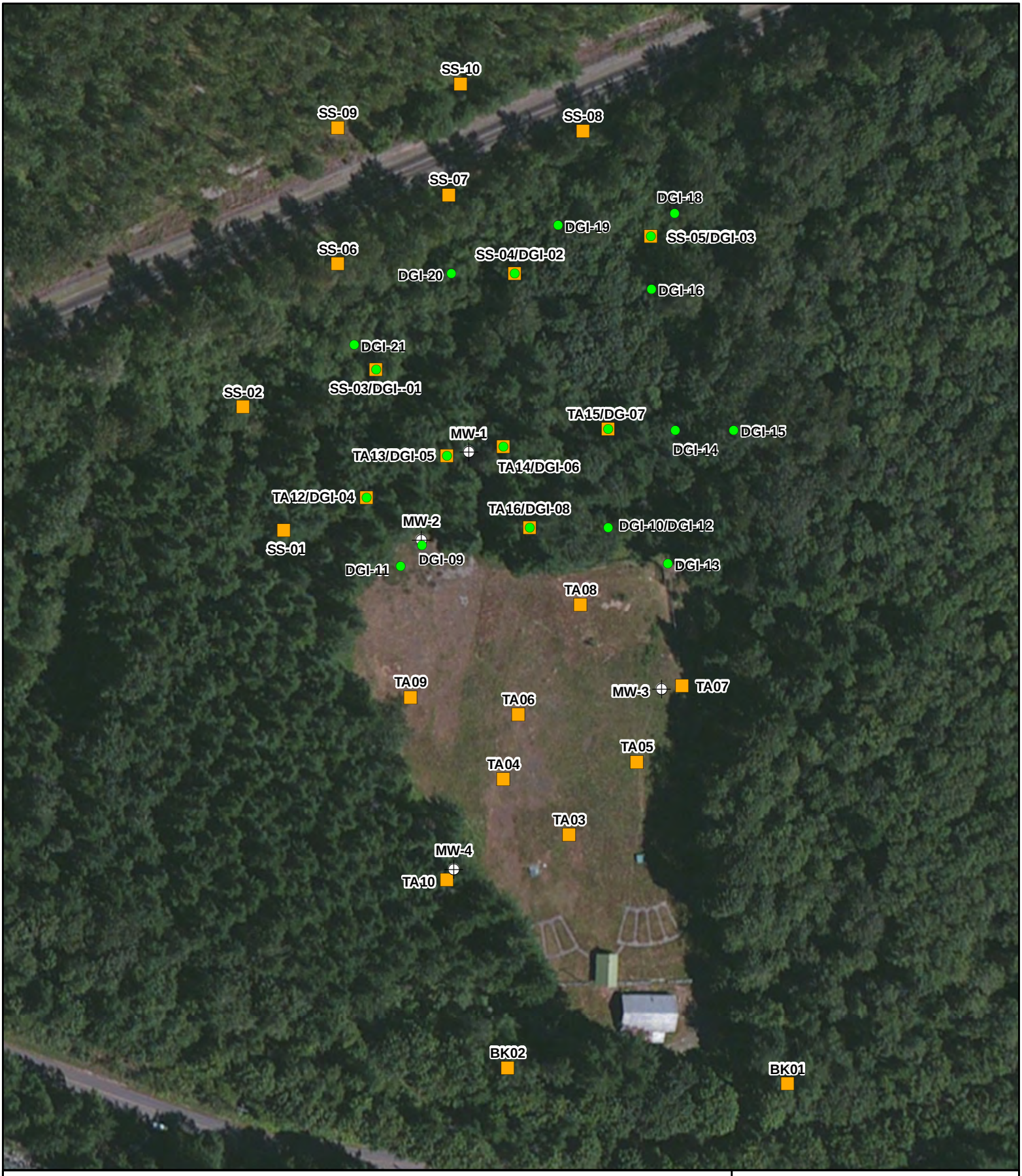
Feet

Figure 1
Site Vicinity

Index Shooting Range

Index, WA

R:\Projects_2014\Index\maps\DGI_Report\Figure1_Site_Vicinity.mxd



Legend

- DGI Soil Sample Location
- Prior Soil Sample Location (URS, 2011)
- Monitoring Well

N

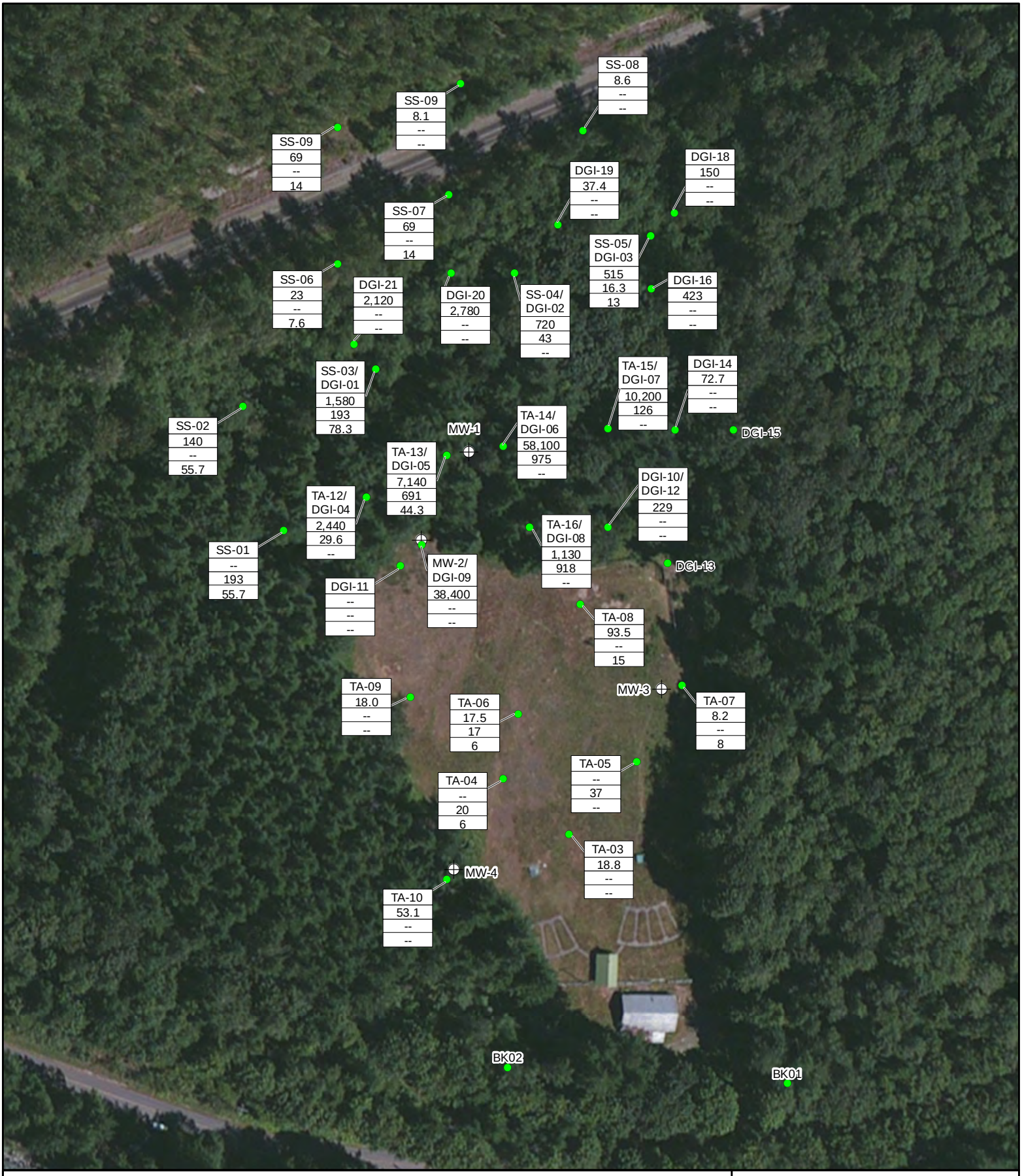
0 25 50 100

Feet

Figure 2
DGI Soil Sample Locations

Index Shooting Range
Index, WA

R:\Projects_2014\Index\maps\DGI_Report\Figure2_Soil_Sample_Locs.mxd



Legend

Monitoring Well

Soil Sample Location

Pb (mg/kg)

Sample Depth	Location
0 - 6"	
6 - 12"	
> 12"	

N

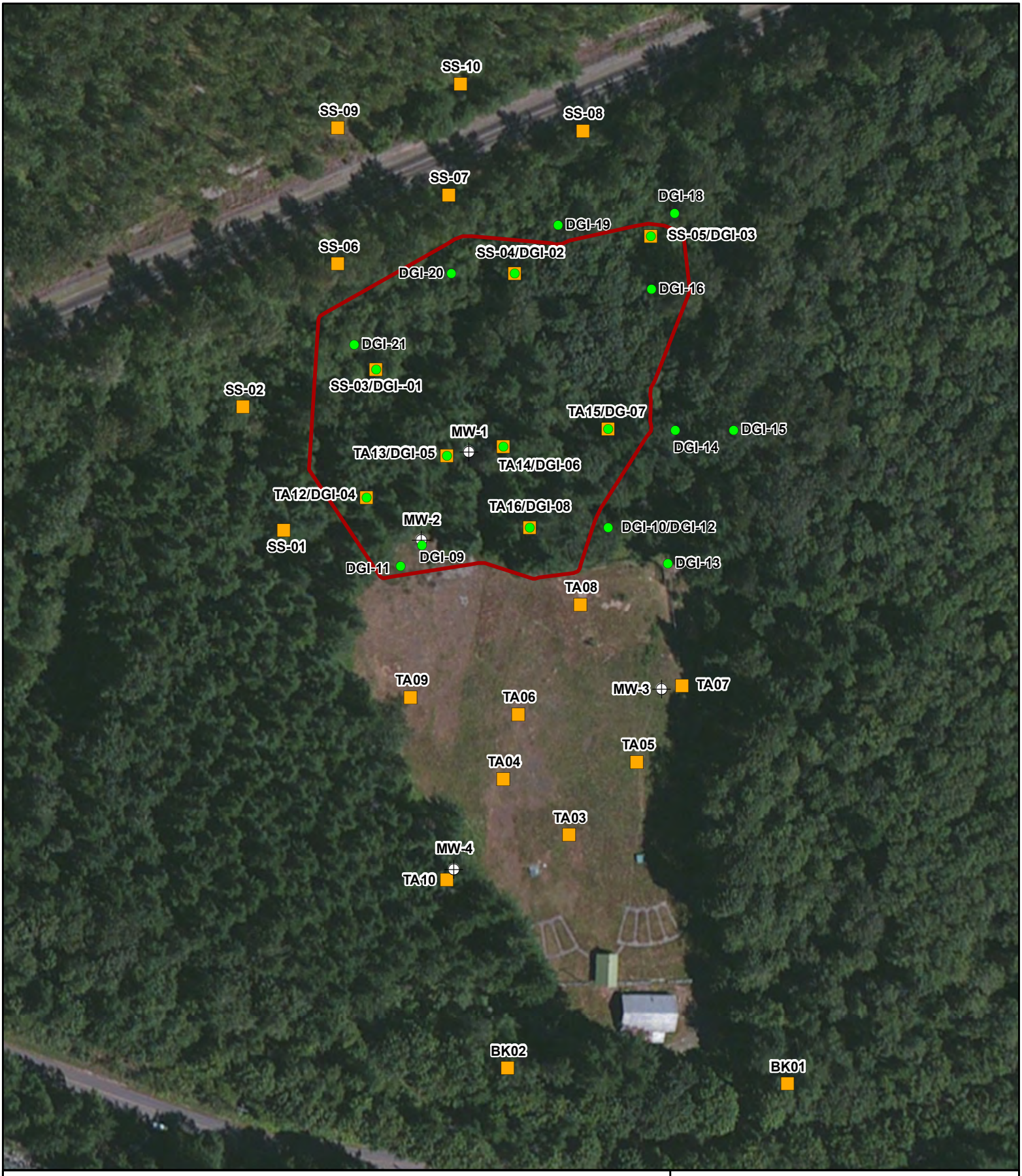
0 25 50 100

Feet

Figure 3
Site Analytical Data

Index Shooting Range
Index, WA

R:\Projects_2014\Index\maps\DGI_Report\Figure2_Soil_Sample_Locs.mxd



Legend

- DGI Soil Sample Location
- Prior Soil Sample Location (URS, 2011)
- Monitoring Well
- Contamination Zone - 0-6”

N

0 25 50 100

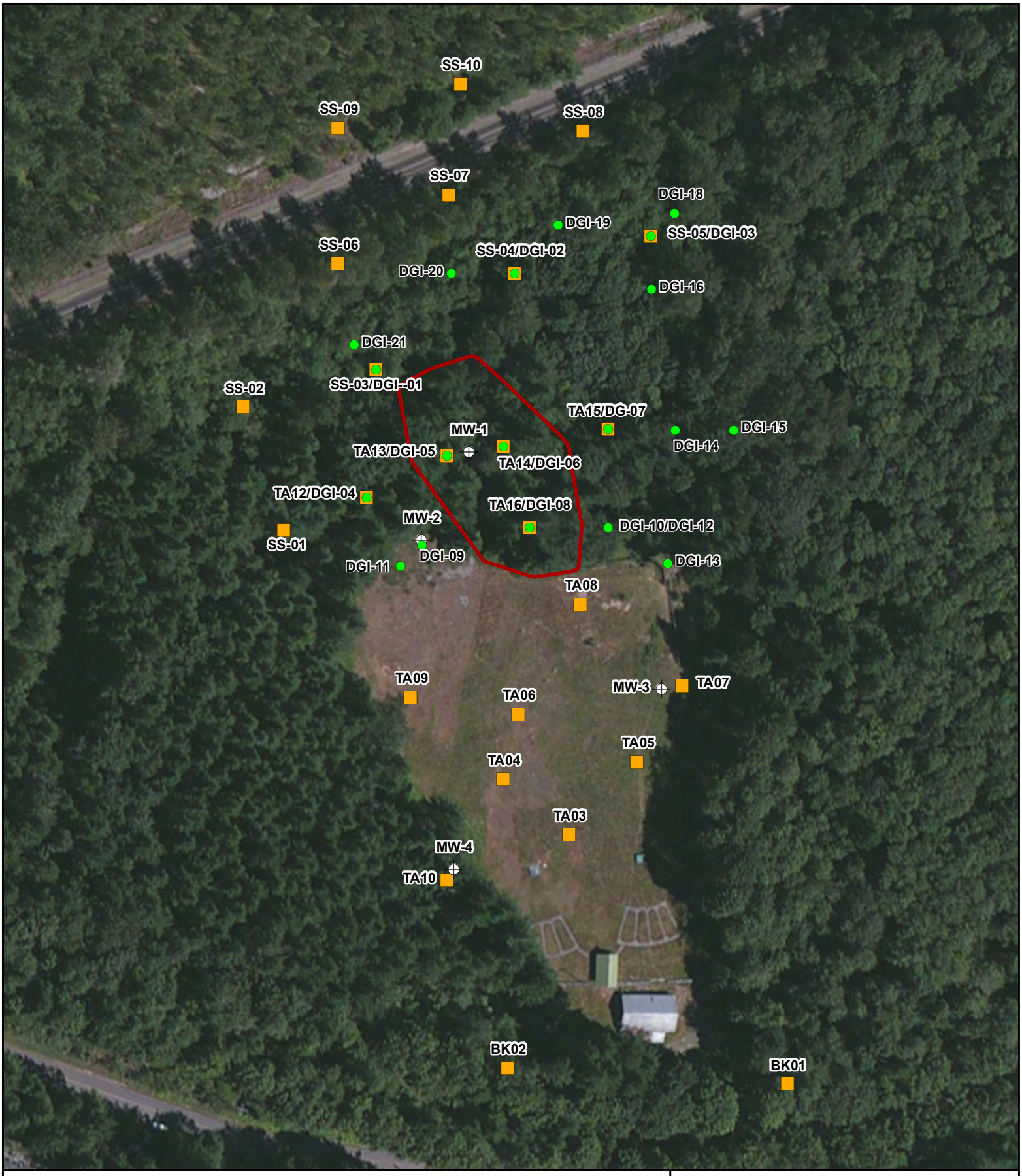
Feet

Figure 4
Estimated Volume of Lead – Contaminated Soil (0-6” Interval)

Index Shooting Range

Index, WA

R:\Projects_2014\Index\maps\DGI_Report\Figure4_Contaminated_Soil_0-6in.mxd



Legend

- DGI Soil Sample Location
- Prior Soil Sample Location (URS, 2011)
- Monitoring Well
- Contamination Zone – 6-12”

N

0 25 50 100

Feet

Figure 5
Estimated Volume of Lead – Contaminated Soil (6-12” Interval)

Index Shooting Range
Index, WA

R:\Projects_2014\Index\maps\DGI_Report\Figure5_Contaminated_Soil_6-12in.mxd

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Appendix A
Analytical Data Sheets

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ALS Environmental
ALS Group USA, Corp.
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Kelso, WA 98626
T: +1 360 577 7222
F: +1 360 636 1068
www.alsglobal.com

July 30, 2014 Analytical Report for Service Request No: K1406716

Mark Ingersoll
Tetra Tech NUS, Inc.
1059 Porphyry St.
Butte, MT 59701

RE: Index Sportsman Club/194-5001

Dear Mark:

Enclosed are the results of the samples submitted to our laboratory on July 02, 2014. For your reference, these analyses have been assigned our service request number K1406716.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3376. You may also contact me via Email at Gregory.Salata@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Gregory Salata, Ph.D.
Client Services Manager

GS/aj

RIGHT SOLUTIONS | RIGHT PARTNER

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-01 **Lab Code:** K1406716-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	193		N*

% Solids: 98.9

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-02 **Lab Code:** K1406716-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	43.0		N*

% Solids: 98.0

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-03 **Lab Code:** K1406716-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	16.3		N*

% Solids: 98.7

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-04 **Lab Code:** K1406716-004

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	29.6		N*

% Solids: 99.3

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-05 **Lab Code:** K1406716-005

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	691		N*

% Solids: 98.6

Comments:

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Tetra Tech NUS, Inc.
Project No.: 194-5001
Project Name: Index Sportsman Club
Matrix: SOIL

Service Request: K1406716
Date Collected: 06/30/14
Date Received: 07/02/14
Units: mg/Kg
Basis: DRY

Sample Name: DGI-06
Lab Code: K1406716-006

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	975		N*

% Solids: 99.7

Comments:

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Tetra Tech NUS, Inc.
Project No.: 194-5001
Project Name: Index Sportsman Club
Matrix: SOIL

Service Request: K1406716
Date Collected: 06/30/14
Date Received: 07/02/14
Units: mg/Kg
Basis: DRY

Sample Name: DGI-07
Lab Code: K1406716-007

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	126		N*

% Solids: 98.7

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-08 **Lab Code:** K1406716-008

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	918		N*

% Solids: 99.5

Comments:

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Tetra Tech NUS, Inc.
Project No.: 194-5001
Project Name: Index Sportsman Club
Matrix: SOIL

Service Request: K1406716
Date Collected: 06/30/14
Date Received: 07/02/14
Units: mg/Kg
Basis: DRY

Sample Name: DGI-09
Lab Code: K1406716-009

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	95.7	19.1	100.0	07/16/14	07/18/14	38400		N*

% Solids: 99.5

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-10 **Lab Code:** K1406716-010

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	156		N*

% Solids: 98.3

Comments:

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Tetra Tech NUS, Inc.
Project No.: 194-5001
Project Name: Index Sportsman Club
Matrix: SOIL

Service Request: K1406716
Date Collected: 06/30/14
Date Received: 07/02/14
Units: mg/Kg
Basis: DRY

Sample Name: DGI-12
Lab Code: K1406716-011

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	303		N*

% Solids: 97.8

Comments:

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-14 **Lab Code:** K1406716-012

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	72.7		N*

% Solids: 98.0

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-16 **Lab Code:** K1406716-013

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	423		N*

% Solids: 97.3

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-18 **Lab Code:** K1406716-014

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	150		N*

% Solids: 97.9

Comments:

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-19 **Lab Code:** K1406716-015

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	37.4		N*

% Solids: 98.8

Comments:

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Tetra Tech NUS, Inc.	**Service Request:**	K1406716
Project No.:	194-5001	**Date Collected:**	06/30/14
Project Name:	Index Sportsman Club	**Date Received:**	07/02/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: DGI-20 **Lab Code:** K1406716-016

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	2780		N*

% Solids: 97.6

Comments:

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Tetra Tech NUS, Inc.
Project No.: 194-5001
Project Name: Index Sportsman Club
Matrix: SOIL

Service Request: K1406716
Date Collected: 06/30/14
Date Received: 07/02/14
Units: mg/Kg
Basis: DRY

Sample Name: DGI-21
Lab Code: K1406716-017

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	1.9	0.4	2.0	07/16/14	07/18/14	2120		N*

% Solids: 99.0

Comments:

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Tetra Tech NUS, Inc.
Project No.: 194-5001
Project Name: Index Sportsman Club
Matrix: SOIL

Service Request: K1406716
Date Collected:
Date Received:
Units: mg/Kg
Basis: DRY

Sample Name: Method Blank
Lab Code: K1406716-MB

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6010C	2.0	0.4	2.0	07/16/14	07/18/14	0.4	U	N*

% Solids: 100.0

Comments:

ALS Environmental
ALS Group USA, Corp.
1317 South 13th Avenue
Kelso, WA 98626
T: +1 360 577 7222
F: +1 360 636 1068
www.alsglobal.com

October 17, 2014 Analytical Report for Service Request No: K1411192

Mark Ingersoll
Tetra Tech NUS, Inc.
1059 Porphyry St.
Butte, MT 59701

RE: Index/194-5001

Dear Mark:

Enclosed are the results of the sample submitted to our laboratory on October 10, 2014. For your reference, these analyses have been assigned our service request number K1411192.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3376. You may also contact me via Email at Gregory.Salata@alsglobal.com.

Respectfully submitted,

ALS Group USA Corp. dba ALS Environmental

Gregory Salata

Gregory Salata, Ph.D.
Client Services Manager

GS/aj

Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client: Tetra Tech NUS, Inc.
Project No.: 194-5001
Project Name: Index
Matrix: SOIL

Service Request: K1411192
Date Collected: 06/30/14
Date Received: 10/10/14
Units: mg/Kg
Basis: DRY

Sample Name: DGI-11
Lab Code: K1411192-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Lead	6020A	0.18	0.07	20.0	10/15/14	10/15/14	430		

% Solids: 87.2

Comments: