UPPER COLUMBIA RIVER

FINAL
Field Reconnaissance Plan
Upper Columbia River Site
Plant Tissue Study

Prepared for

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ACRONYMS AND ABBREVIATIONS

CCT	Colville Confederated Tribes
COI	contaminant of interest
DU	decision unit
EPA	U.S. Environmental Protection Agency
FRP	field reconnaissance plan
FSP	field sampling plan
GIS	geographic information system
GPS	global positioning system
HHRA	human health risk assessment
ID	identifier
QAPP	quality assurance project plan
RI/FS	remedial investigation and feasibility study
RSD	relative standard deviation
SOP	standard operating procedure
TA	Tribal allotment
TAI	Teck American Incorporated
TAL	Target Analyte List
TCRA	time-critical removal action

UNITS OF MEASURE

ft.	feet
mg/kg	milligrams per kilogram
ppm	parts per million
%	percent

1 INTRODUCTION

This document presents the field reconnaissance plan (FRP) for the Upper Columbia River (UCR) Plant Tissue Study. The UCR Plant Tissue Study (hereafter, "the study") will measure the concentration of metals in some of the plant species typically consumed or otherwise used by the Confederated Tribes of the Colville Reservation (CCT). As described in this FRP, vegetation growing in Tribal allotments (TAs) in the UCR Study Area (Figure 1) will be surveyed to assess suitability for plant tissue sampling. The study represents one of the tasks that will be completed as part of the UCR remedial investigation and feasibility study (RI/FS). The RI/FS is being conducted under a Settlement Agreement between Teck American Incorporated (TAI) and U.S. Environmental Protection Agency (EPA). TAI will lead this study under EPA oversight.

In June 2017, EPA directed TAI to, "Conduct a study that will primarily be focused on collection of plant tissue from the three Tribal allotments sampled in the 2014 Residential Soil Study that had concentrations of lead in soil above the [time critical removal action] TCRA action level (700 ppm[1] [parts per million]) plus a reference area" (USEPA 2017). Specifically, EPA's directive refers to three decision units (DUs) sampled from three CCT TAs as part of EPA's 2014 Residential Soil Study and for the purposes of this document we are calling these "high lead DUs." At this time, plant tissue reference areas have not been determined. Therefore, in lieu of a reference area, the current study will include comparison of plant tissue samples collected from the high lead DUs to tissues of the same plant species collected from one or more DUs with lower concentration of lead in soils (hereafter, "lower lead DUs") than the high lead DUs and that are located on TAs within the UCR Study Area (Figure 1).

Potential lower lead DUs have been identified using soil data from prior soil studies conducted as part of the UCR RI/FS (Ramboll Environ 2017, CH2M Hill 2016, Windward 2015). Data for these potential lower lead DUs and the three high lead DUs are summarized in Table 1. All of the high lead DUs and some of the potential lower lead DUs will be surveyed during field reconnaissance in August 2017. The objective of the August 2017 field reconnaissance is to identify one or more lower lead DUs with target

[1] As documented in EPA's August 6, 2015 "Action Memorandum for the Upper Columbia River Site Residential Properties Soil Removal near Northport, Stevens County, Washington," 700 ppm is the action level for lead that triggered removal action at properties sampled by EPA during the 2014 residential soil study. Actual implementation of removal actions in 2015 occurred at DUs with lead above 600 ppm based on voluntary agreement by TAI.

species (see Table 2 for list of target plant species) presence and abundance that matches those available in the high lead DUs. Selection of the subset of potential lower lead DUs for inclusion in the field reconnaissance effort will be determined in consultation with EPA and the CCT.[2]

The objective of the study is to collect data to support the human health risk assessment (HHRA). Specifically, the study will focus on exposures to contaminants of interest (COIs) that members of the CCT may experience if they consume vegetation growing in the UCR Study Area. Traditional tribal activities, such as handling or mouthing of plants, may also result in potential exposures to COIs on or in plants. Plant tissue and co-located soil samples will be collected from TAs previously sampled during the 2014 and 2016 UCR residential soil studies and the 2014 upland soil study.[3] The final list of areas to be sampled will be documented in the final quality assurance project plan (QAPP) for the study.[4] Selection of the lower lead DUs for inclusion in the field sampling phase will be informed by data collected during the reconnaissance phase and in consultation with EPA and the CCT. TAI will coordinate with EPA to ensure necessary consultation and coordination with CCT representatives is completed prior to reconnaissance and sample collection on any and all TAs.

The field efforts for this study consist of a field reconnaissance phase and a field sampling phase. The reconnaissance phase will occur in August 2017 and consist of visiting the high lead and lower lead DUs identified in Table 1. The purpose of the field reconnaissance phase is to determine the presence, abundance, and spatial distribution of target wild plants (see Table 2) on high lead DUs, and to select lower lead DUs with these same plant species that will be used as comparison DUs in the field sampling phase. The target species list for the study (see Section 2.4.3) is based on "Cultural Plant Sampling Reconnaissance Results and Information for EPA and Teck" (Lodestone 2017, included as Attachment 1). The field sampling phase will occur in the spring and late summer/early fall of 2018 and consists of collecting composite plant tissue samples and co-located composite soil samples at the three high lead DUs previously identified and at one or more lower lead DUs (based on presence and abundance of target plant species)

[2] Based on field reconnaissance, the boundaries of DUs previously sampled for soil may be adjusted within a given TA to optimize collection of target plant species.

[3] As each of the three high lead DUs is located upland of riparian areas associated with the UCR, representative plant species at these DUs may not include all of the plant species targeted for plant tissue sampling to inform the HHRA.

[4] Potential data gaps identified based on the reconnaissance with regard to target plant species will also be documented in the QAPP.

delineated during 2017 field reconnaissance efforts. Plant and soil samples collected during the study will be analyzed for target analyte list (TAL) metals (except mercury), fraction of organic carbon, and percent moisture.[5]

[5] TAL metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. Other potential parameters of interest will be determined in consultation with EPA and documented in the final QAPP.

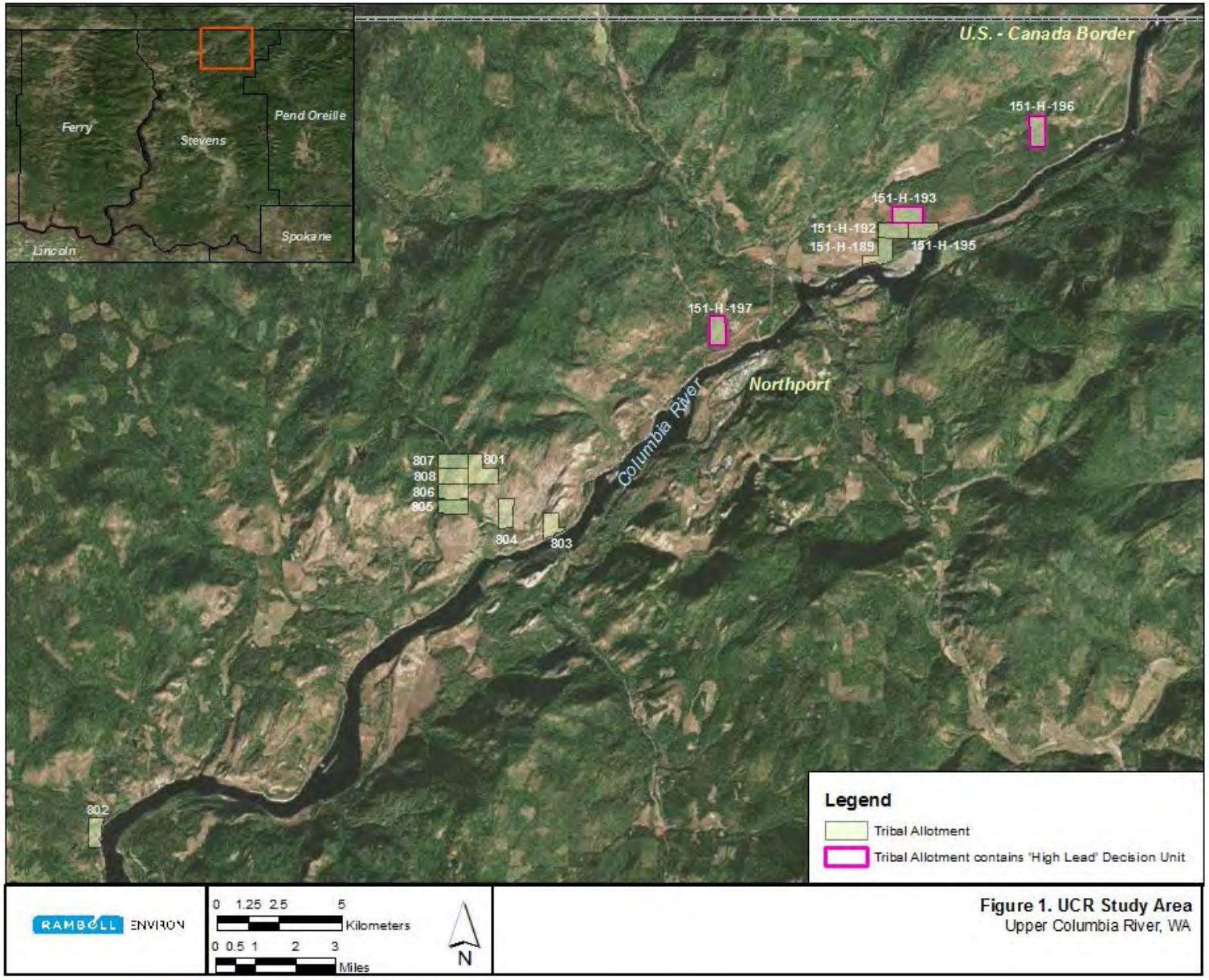

Figure 1. UCR Study Area
Upper Columbia River, WA

Table 1. Summary of Tribal Allotment Decision Units for Possible Survey during Field Reconnaissance

					Lead Concentration (mg/kg)				Arsenic Concentration (mg/kg)			
Tribal Allotment	**Decision Unit**	**Study**	**Decision Unit Acreage**	**N**	**Minimum**	**Average**	**Maximum**	**RSD (%)**	**Minimum**	**Average**	**Maximum**	**RSD (%)**
High Lead DUs[a]												
151-H-193	258	2014 Res	4.73	3	584	678	763	13.2	43.4	46.8	48.9	6.4
151-H-196	401	2014 Res	2.32	1	1120	1120	1120		80.8	80.8	80.8	
151-H-197	441	2014 Res	0.448	1	624	624	624		43.6	43.6	43.6	
Lower Lead DUs - Priority Group 1												
151-H-192	420	2014 Res	1.73	1	422	422	422		39.9	39.9	39.9	
151-H-193	259	2014 Res	2.83	1	226	226	226		19.7	19.7	19.7	
151-H-195	410	2014 Res	3.21	1	370	370	370		35	35	35	
151-H-197	442	2014 Res	0.217	1	243	243	243		21.7	21.7	21.7	
195-H-196	402	2014 Res	1.37	3	494	542	579	8.1	32.6	34.3	37	7
195-H-196	403	2014 Res	0.337	1	394	394	394		26	26	26	
801	801-O1	2016 Res	0.150	3	33.8	34.4	35.5	2.9	14.2	15.4	16.6	7.8
801	801-O3	2016 Res	1.53	1	37	37	37		15.1	15.1	15.1	
805	805-O1	2016 Res	0.195	1	45.4	45.4	45.4		12.6	12.6	12.6	
807	807-O1	2016 Res	0.062	3	33.3	34.5	35.4	3.2	11.3	11.5	11.8	2.5
808	808-O2	2016 Res	0.169	1	42.6	42.6	42.6		6.98	6.98	6.98	
151-H-197	440[c]	2014 Res	0.127	3	130	136	149	8	8.86	9.12	9.3	2.5
804[b]	804-O1[c,d]	2016 Res	0.425	3	102	121	133	13.9	7.43	7.74	7.93	3.5
804[b]	ADA-023[c,d]	2014 Upland	25.1	3	142	151	164	7.5	16	18.3	20.4	12.1
Lower Lead DUs - Priority Group 2												
801	801-O2[c]	2016 Res	0.077	1	77.9	77.9	77.9		22.3	22.3	22.3	
803	803-O3[c,d]	2016 Res	0.279	1	279	279	279		17.2	17.2	17.2	
805	805-O2[d]	2016 Res	0.387	3	48.5	54.1	58	9.2	5.19	5.31	5.42	2.2
806	806-O1[c,d]	2016 Res	0.85	1	33.7	33.7	33.7		9.76	9.76	9.76	
806	806-O2[c,d]	2016 Res	0.368	1	35.2	35.2	35.2		17.5	17.5	17.5	
806	806-O3[d]	2016 Res	0.033	1	60.2	60.2	60.2		7.95	7.95	7.95	
806	806-O4[c,d]	2016 Res	0.315	3	42.6	43.9	45.1	2.9	9.63	9.68	9.72	0.47
806	806-O5[c,d]	2016 Res	0.125	1	44.4	44.4	44.4		8.89	8.89	8.89	
808	808-O1[c,d]	2016 Res	0.519	3	37	40.1	42.4	7.0	6.12	6.6	6.97	6.6
151-H-189	430	2014 Res	1.69	1	246	246	246		14.8	14.8	14.8	
151-H-189	431[c]	2014 Res	5.82	3	93.6	104	111	8.7	7.92	8.37	8.78	5.2
151-H-189	432	2014 Res	0.082	1	279	279	279		14.8	14.8	14.8	
151-H-192	421	2014 Res	2.75	3	277	299	342	12.3	14.4	14.7	15.1	2.4
151-H-195	412	2014 Res	0.802	3	488	503	515	2.8	27.7	28.2	28.9	2.2
151-H-195	413	2014 Res	4.59	1	510	510	510		43.2	43.2	43.2	

					Lead Concentration (mg/kg)				Arsenic Concentration (mg/kg)			
Tribal Allotment	**Decision Unit**	**Study**	**Decision Unit Acreage**	**N**	**Minimum**	**Average**	**Maximum**	**RSD (%)**	**Minimum**	**Average**	**Maximum**	**RSD (%)**
804[b]	804-O2[c,d]	2016 Res	1.27	1	302	302	302		14.9	14.9	14.9	
Excluded DUs												
802	802-O1[d]	2016 Res	0.353	3	160	179	192	9.3	11.5	12.4	13.3	7.3
803	RFD-003[d,e]	2014 Upland	6.3	3	332	369	401	9.4	15	18.4	21	16.8
803	803-O1[d,e]	2016 Res	0.525	3	463	531	575	11.2	20.3	23.2	25.8	11.9
803	803-O2[d,e]	2016 Res	0.238	1	374	374	374		22.7	22.7	22.7	
151-H-195	411[e]	2014 Res	0.796	3	322	338	356	6.6	12.9	13.5	14.2	3.1

mg/kg = milligram(s) per kilogram (equivalent to parts per million [ppm])
N = Sample Size
RSD = relative standard deviation

Notes:

Data from UCR 2014 Residential Soil Study ("2014 Res"), 2016 Residential Soil Study ("2016 Res"), and 2014 Upland Soil Study ("2014 Upland").

[a] Per EPA's directive (USEPA 2017), all three high lead DUs will be surveyed.

[b] Tribal Allotment status being reviewed.

[c] DU appears to have sparse vegetation based on aerial photo review; assumption to be verified in field as necessary.

[d] Assigned lower priority or excluded due to great distance from all high lead DUs compared to other lower lead DUs in closer proximity.

[e] Excluded because DU represents relict floodplain soil or beach area that is unlikely to have target species presence and abundance that is similar to the three high lead DUs, all of which are located in upland areas. As each of the three high lead DUs is located upland of riparian areas associated with the UCR, representative plant species at these DUs may not include all of the plant species targeted for plant tissue sampling to inform the HHRA. Potential data gaps identified based on the reconnaissance with regard to target plant species will be documented in the QAPP.

1.1 PURPOSE AND OBJECTIVES

The purpose of this FRP is to document the approach and field procedures to execute field reconnaissance activities. The primary data required from the field reconnaissance efforts are surveys of presence, diversity, abundance, and spatial distribution of target wild plants on DUs with elevated soil lead, and on comparison DUs with lower soil lead levels (Attachment 2). Field reconnaissance efforts will take place on TAs where permission to access for field planning and sampling has been granted by the CCT and Bureau of Indian Affairs (Marchand 2017). The rationale and decision logic for selecting the number and types of target wild plants, and approach for collection of co-located soil samples for the study will be informed by this effort. Locations[6] where specific plant types and soil can be sampled will be determined through implementation of this FRP. Data obtained during field reconnaissance will be used to finalize the field sampling plan (FSP) and Quality Assurance Project Plan (QAPP) for the study, including development of target plant area sampling maps, species-specific, plant part-specific locations and co-located soil sampling areas, and planned sample types, numbers, and soil depths.

1.2 DOCUMENT ORGANIZATION

In addition to this introduction, the FRP includes the following sections and attachments:

- **Section 2** presents the field reconnaissance tasks and data collection procedures
- **Section 3** describes how the field data will be compiled and reported once the field reconnaissance (fieldwork) is completed
- **Attachment 1** provides a copy of Lodestone (2017) which informed the list of target plant species for the study
- **Attachment 2** provides Tribal allotment overview figures showing high lead and lower lead DUs and concentrations are also provided in this attachment
- **Attachment 3** provides the project-specific field form for the field reconnaissance
- **Attachment 4** provides the standard operating procedures (SOPs).

[6] Based on field reconnaissance, the boundaries of DUs previously sampled for soil may be adjusted within a given TA to optimize collection of target plant species.

2 FIELD RECONNAISSANCE APPROACH

This section describes field reconnaissance tasks, schedule, rationale, decision logic and criteria, and field data collection procedures.

2.1 TASKS

The field reconnaissance tasks include the following data collection activities:

- Communicate with and obtain necessary access permission prior to field reconnaissance
- Document species presence, quantities, and distribution of target wild plants consumed by the CCT on for each area surveyed
- Annotate potential vegetation sampling areas and soil sampling locations within each surveyed area in diagrams or on sketches
- Obtain global positioning system (GPS) coordinates to delineate proposed plant populations within each area surveyed
- Obtain georeferenced digital photographs of each proposed DU.

2.2 SCHEDULE

Field reconnaissance is scheduled for August 14 through 18, 2017. The field sampling effort is scheduled to occur in spring and late summer/early fall 2018, when desired parts (e.g., leaves or fruits) of most target plant species-plant parts are expected to be available.

2.3 FIELD RECONNAISSANCE RATIONALE AND DECISION LOGIC

The following sections describe the rationale and decision logic for how the three high lead DUs were selected for inclusion in the study, and the selection criteria that will be used to prioritize surveying of lower lead DUs to identify specific DUs for possible sampling and comparison to the three high lead DUs.

2.3.1 Selection of DUs for Sampling

In June 2017, EPA directed TAI to conduct a study that will primarily be focused on collection of plant tissue from the three Tribal allotments sampled in the 2014 Residential

Soil Study that had bioavailability-adjusted incremental composite concentrations of lead in soil above the TCRA action level (700 ppm: DU- 258, DU-401 and DU-441)[7] plus a reference area. EPA's June 2017 letter further specified that plant tissues from a reference area should be sampled, however, reference areas for the UCR Study Area have currently not been determined. During a June 22, 2017 meeting, EPA approved collecting plant samples within the UCR Study Area from DUs located on TAs that have lower lead concentrations in soil as an alternative to the specified reference area. Sampling of one or more lower lead areas in addition to the three high lead areas will allow for comparison of plant tissues potentially impacted by metals in soil over a range of concentrations within or across relatively proximal TAs where growing conditions and other factors that might also influence plant uptake would be expected to be most constant. Lower lead DUs for possible surveying were identified based on available incremental composite soil sample results from a list of DUs sampled on TAs as part of the 2014 Residential, 2016 Residential, and 2014 Upland UCR soil studies.

All of the high lead and up to 15 of the lower lead DUs listed in Table 1 will be surveyed during field reconnaissance for target species presence and abundance. Initial plant characterization will focus on the previously sampled DU boundaries where prior soil sampling has provided lead soil concentration data; however, in consultation with EPA, modification of the original boundaries may occur during field reconnaissance as needed to optimize plant sampling areas based on availability of targeted plant species. To ensure a greater probability that areas immediately outside the original DU boundaries will have soil lead concentrations similar to those originally reported, any expansion of a DU boundary will be limited to a distance of 100 feet (ft.) from the original DU boundary or to the TA boundary, if less than 100 ft. from a given boundary where expansion is deemed necessary. Within a TA, expansion beyond 100 ft. from an original boundary may also be considered and would necessitate further consultation with EPA. Following completion of the field reconnaissance effort, data will be compiled for each proposed DU. Selection of final high and lower lead areas for sampling will be determined in consultation with EPA and will be documented in the final QAPP for the study.

2.3.2 Selection Criteria for Lower Lead DUs

The presence of metals in upland plants may be due to both regional and localized sources. Regional sources may include deposition of ambient air constituents, current and

[7] The replicate average soil lead concentrations for DU-258 and DU-441 shown in Table A-1 are below 700 ppm lead when they are not adjusted using DU-specific bioavailability.

historic mining and smelting operations, municipal point and non-point sources, agricultural non-point sources, and erosion from naturally occurring mineralized zones.

One of the main goals of the field reconnaissance is to identify lower lead DUs suitable for comparison to the three high lead DUs identified by EPA in their June 14, 2017 letter. To obtain paired high and lower lead DU plant tissue samples, identification of one or more lower lead DUs comparable to each of the three high lead DUs will be necessary.

The presence, abundance, and location of vegetation will be characterized first at the high lead DUs, followed by characterization at a subset of the lower lead DUs. The results of the field reconnaissance will inform selection of the lower lead DUs based on their similarity in target species presence and abundance to the high lead DUs and will be described in the QAPP. Most importantly, the same target plant species and plant part need to be present and available for collection at both high and lower lead DUs selected for inclusion in the field sampling phase of the study.

Table 1 provides soil lead and arsenic concentrations, acreage, and other information for the high lead DUs as well as all other TA DUs for which soil lead data are available. The 30 of the 35 potential lower lead DUs shown in Table 1 are assigned to one of two priority groups (based on distance from high lead DUs and plant abundance from aerial photography). These groups will be used to focus the five-day field reconnaissance effort on those lower lead DUs most likely to be included as DUs for the field sampling phase. The survey will focus on those lower lead DUs that meet a combination of desired characteristics, accepting that any one DU is unlikely to meet all of the following: contain plant species mirroring the plant species found on high lead DUs; are relatively close in proximity to the high lead DUs to minimize differences in microclimate (Kim et al. 2015, Pourrut et al. 2011, Shahid et al 2016); represent a range of soil lead concentrations lower than the TCRA level of 700 ppm, where this range includes one or more DUs with soil lead levels less than 50 ppm and one or more DUs with soil lead levels between 100 to 200 ppm; represent upland sample areas (i.e., not relict floodplain soils or beaches[8]); and do not appear to be sparsely vegetated based on review of aerial photos. Five potential lower lead DUs have been assigned to an exclusion group. Four of these represent either a relict floodplain soil or beach rather than an upland sampled area and one is excluded because

[8] Relict floodplain and beach DUs are unlikely to have similar target species presence and abundance as the three high lead DUs, all of which are located in upland areas. Potential data gaps identified based on the reconnaissance with regard to target plant species will be documented in the QAPP.

it is substantially further from the other potential lower lead DUs that represent a similar soil lead concentration.

Up to 15 lower lead DUs will be surveyed during the field reconnaissance with the goal of surveying all of priority group 1, and including additional DUs as time permits. As shown in Table 1, the first priority group of lower lead DUs includes 14 DUs with a range of soil lead levels (34.4 ppm to 542 ppm, based on DU averages and unadjusted for bioavailability) and varying proximity to the high lead DUs (Figure 1). Six DUs with soil lead levels at the upper end of this range are in close proximity to the high lead DUs (see Attachment 2, Tribal allotment overview figures). These DUs are included due to the desire to minimize potential differences in soil type and microclimate compared to the higher lead DUs, thereby minimizing factors that influence metals uptake from soil. The remaining eight DUs included in priority group 1 are located further from the high lead DUs, but represent lower soil lead concentrations than those located in closer proximity. Priority group 2 DUs are those that are located further from the high lead DUs or appear to have sparse vegetation based on limited aerial photo review. As time permits, one or more of these DUs may be surveyed in the event priority group 1 DUs do not contain sufficient target plant species.

2.3.3 Criteria for Establishing Co-located Soil Samples

Existing incremental composite soil sample data are available for DUs identified for field reconnaissance (Table 1) and may be useful in informing the HHRA with regard to potential incidental ingestion of soils by people collecting plants. Collection of additional soil samples in proximity to identified target plant species will also be performed as part of the study to document co-located soil and plant tissue concentrations.

The extent of coverage and spatial distribution of specific plant types at the DUs will inform the soil sample collection design, which will be determined using information collected during the field reconnaissance. For example, it is possible that multiple plant species will occur within close proximity, in which case one composite soil sample could be used as the co-located soil sample for multiple species. Observations during field reconnaissance will be very important in determining what soil sampling methodology is feasible (i.e., one composite soil sample per each composite plant type-plant part sample, or, if one composite soil sample will represent multiple, plant type-plant part samples). Based on information from this field reconnaissance, the preferred approach will be determined in consultation with EPA and documented in the final QAPP.

2.3.4 Sampling Guideline Development

Field reconnaissance will be used to inform sampling approaches in the QAPP. The quantity of plants available by species in each DU will be important in determining the size of composite samples (i.e., the number of plants per composite) and the number of composite samples per plant type per DU. The field reconnaissance should provide enough insight into the quantity of plants available that achievable sampling guidelines can be generated and incorporated in the QAPP.

2.4 FIELD RECONNAISSANCE DATA COLLECTION PROCEDURES

The sections below provide details for field data collection based on the decision logic presented in Section 2.3.

2.4.1 Equipment and Supplies

The following planning documents will be needed and will accompany the field team to support the field reconnaissance data collection activities:

- This FRP (including attachments listed herein and extra field data forms)
- Electronic versions of property information and maps
- Site information packets for each property (each packet will contain hard copies of property-specific information, including copies of signed access agreements, aerial photographs with preliminary DU sketches, driving directions, and field forms to be completed during the site visit)
- The Field Contractor's project-specific health and safety plan.

The following equipment and supplies will be needed to perform the field reconnaissance and data collection:

- GPS unit with sub-meter accuracy (programmable unit such as Trimble GeoXT or GeoXH)
- Oversized prints showing DU boundaries on high resolution aerial photography
- Digital camera with integrated GPS (or include coordinates in photo logbook) (with replacement batteries and memory card capable of 200+ photographs per day)
- Mobile telephone
- 2-way radios

- Hand lens for plant identification
- Botanical field guides
- Logbook (write in the rain)
- Pin flags or ribbons
- Grabbers, plastic bags, permanent ink markers, labels, paper bags, plant clippers (and other plant material collection supplies)
- Dry-erase white boards and markers (approximately 2 ft. by 3 ft. in size).

2.4.2 Field Data Forms

Project-specific field reconnaissance field data forms have been developed and are provided in Attachment 3. The field data forms provide a systematic and structured template to assist with field documentation, and require entry of the following data fields:

- Property address, parcel number, and property number/DU designation from prior soil study
- Names of TAI, EPA, CCT, and Field Contractor representatives on-site and the name of the individual to contact if there is a question about the completed field data form
- Date and time
- Presence and abundance of target species
- Phenology of target plants
- General health of plants
- Spatial data identifier for observations

Field data collection protocols for populating the project-specific field forms and sketches are discussed further below. Photos will be recorded in a photo log.

2.4.3 Target Species

The target species for the field reconnaissance are included in Table 2. These species and common names were provided by the CCT during their reconnaissance investigations in 2017 (Lodestone 2017).

The target species are wild plants. Ornamental or planted species will not be included in abundance estimates.

The high lead DUs are located in upland areas, so it is unlikely that wetland or aquatic species will be present. Tule (*Schoenoplectus acutus*), green willow (*Salix exigua*), and red willow (*Cornus sericea*) are not likely to be found on the DUs.[9]

In addition, the mushroom species are ephemeral. The presence and abundance of fungal fruiting bodies are tied to various factors, like rain, that varies from year to year. Therefore, the amount of mushrooms available for collection will not be known until the field sampling events in 2018.

[9] Potential data gaps identified based on the reconnaissance with regard to target plant species will be documented in the QAPP.

Table 2. Target Species

Common Name	Scientific Name	Plants
Sarvisberry	*Amelanchier* spp.	Fruit
Kinnikinnik	*Arctostaphylos uva-ursi*	Leaves
White/silver sage	*Artemisia ludoviciana*	Leaves
Big sage	*Artemisia tridentata*	Leaves
Arrowleaf balsamroot	*Balsamorhiza sagittata*	Shoot, seeds, root
Black tree lichen	*Bryoria fremontii*	Whole organism
Puffball (wild mushroom)	*Calvatia gigantea*	Fruiting body
Camas	*Camassia quamash*	Root
Spring beauty/Indian potato	*Claytonia lanceolata*	Root
Shaggy mane (wild mushroom)	*Coprinus comatus*	Fruiting body
Red willow	*Cornus sericea*	Leaf, stem, bark, inner cambium
Hazelnut	*Corylus cornuta* var. *californica*	Nut
Wild strawberry	*Fragaria vesca*, *F. virginiana*	Fruit
Bitterroot	*Lewisia rediviva*	Root
Lomatium	*Lomatium* spp.	Root
Wild mint	*Mentha arvensis*	Leaves
Morel (wild mushroom)	*Morchella esculenta*	Fruiting body
Wild caraway/Indian carrot	*Perideridia gairdneri*	Root
Syringa/mock orange	*Philadelphus lewisii*	Branches
Whitebark pine	*Pinus albicaulis*	Nut
Ponderosa pine	*Pinus ponderosa*	Nut
Chokecherry	*Prunus virginiana*	Fruit
Wild rose	*Rosa* spp.	Rose hip, stem, root
Wild blackberry	*Rubus* spp.	Fruit
Wild thimbleberry	*Rubus parviflorus*	Fruit
Green willow (coyote willow)	*Salix exigua*	Leaf, stem, bark, inner cambium
Elderberry	*Sambucus* spp.	Fruit
Tule	*Schoenoplectus acutus*	Stalk
Soapberry	*Shepherdia canadensis*	Fruit
Western Red Cedar	*Thuja plicata*	Bark, root, outer root bark, bough, needle, branches, berry
Huckleberry	*Vaccinium* spp.	Fruit

Note:
This table is based on species and common names provided by Lodestone (2017).

2.4.4 Reconnaissance Method

The high lead DUs are relatively small (2.32, 4.73 and 0.448 acres) and the lower lead DUs range from 0.033 to 25.1 acres. Rather than establishing transects which are typically used to examine larger sites, an "intuitive controlled" approach will be taken. This method consists of meandering through the entire survey area, with more intensive focus on areas with appropriate habitat for the target species.

The steps for the reconnaissance are listed below:

1) Each morning a safety tailgate meeting will be conducted, per the Health and Safety Plan.
2) Upon arrival at the DU to be surveyed, a field data form will be started (see Attachment 3). One data form will be utilized for each DU surveyed.
3) The intuitive controlled meander will be conducted, marking the presence of target species on the data form and field maps with aerial photos. The survey may be expanded up to 100 ft. beyond the established DU boundary, in consultation with EPA, if doing so will optimize the number of target plant species recorded. Under no circumstances will survey extend beyond the TA boundary.
4) The phenology (flower, fruit, or senescent) of the target plants species will be recorded.
5) Once the traverse of the parcel is finished, the abundance (rather than stem count) will be recorded for each target species that occurs in the survey area. Abundance categories are included on the data form; less than 10 plants (low), 10 to 20 plants (medium), and 20 or more plants (high).
6) In addition to the abundance of the individual plants, notes will be taken on the amount of target materials that are present. For example, several target shrubs may be present, but they may be immature and not contain fruit.
7) The general health of the plants will also be recorded on the data form. The notes on health will be limited to prominent visible problems such as large amount of insect herbivory, insect galls, fungal infestation, or discolored leaves/needles.
8) A limited amount of plant materials may be gathered to aid species identification or sampling plan refinement, in consultation with EPA and CCT representatives (see Section 2.4.5). No root material will be collected from tribal allotments. No other ground disturbing activities will be conducted.
9) Photographs will be taken of general habitat and target species per Section 2.4.7.

10) GPS points will be taken of selected target species locations per Section 2.4.8. GPS coordinates will only be collected for plant species that are not common on the survey parcels to aid in locating those plants again during sampling events in 2018.

2.4.5 Plant Collection

A limited amount of plant material may be collected for sampling plan refinement. Plants may also be collected for identification in an office setting with use of a dissecting microscope. The evaluation of these materials would focus on weights of fruits (e.g. berries) and vegetative materials (e.g. leaves, stems, bark) in order to determine the required collection amounts during the sampling events in 2018. Only abundant or common materials would be collected.

None of the plant material will be sent to the laboratory for analysis. Therefore decontamination protocols will not be necessary. No preparation (e.g. peeling, cooking) would be done.[10]

No ground disturbance will occur at any of the DUs surveyed. No roots or materials that require digging will be collected.

2.4.6 GPS Data Collection

This section describes the protocol to obtain GPS coordinates for selected target species. GPS coordinates will be collected for locations of target plant species that are not common in the DUs surveyed.

Detailed operating procedures and procedures for verifying the accuracy and quality of GPS readings are provided in the operations manual for the specific GPS unit selected for use by the Field Contractor. The field team leader shall be experienced with operating the GPS units used during field reconnaissance and familiar with these procedures prior to obtaining field coordinates for this study.

The following steps describe the process to obtain and document GPS coordinates:

1) For a given species location, latitude-longitude coordinates will be consistently obtained and recorded in decimal degrees.

[10] Hazelnuts may need to be cracked open and the edible portion removed in order to provide information regarding the mass available per nut.

2) The GPS waypoints will be labeled with the target plant scientific name and parcel number.

3) At the conclusion of each field day, the Field Contractor will download the recorded GPS data files from the GPS unit onto a field laptop computer.

In other cases where satellite reception is consistently inadequate and impedes the use of a GPS unit in waypoint navigation and positioning, no GPS survey coordinates will be recorded in the field for these DUs. Instead, the location of the target species will be hand drawn field personnel on a field map. In addition, GPS data will not be collected for plants that are ubiquitous on a DU. For example, if ponderosa pine (*Pinus ponderosa*) is abundant across a given DU, that species will only be included on the sketch map.

2.4.7 Photographs

Representative digital photographs of habitat on each survey area will be obtained by the Field Contractor as the final step of the field reconnaissance. Representative photos of target species will also be taken on each parcel.

The following steps shall be followed to obtain, label, and manage digital photographs:

1) Take field photographs with a quality digital camera (at least 5 megapixels) that is capable of efficient download and archiving onto a field laptop as secondary backup.

2) For each DU, take at two or three representative habitat photographs.

3) For each habitat or target species photograph (or series of photographs), document the location onto the aerial photograph or field sketch. In addition, use the dry-erase whiteboard to identify and label the DU on the photographs with a unique ID "Study Location-Photo Type-P#" where:

   a. Study Location = unique 3- or 5-digit DU code from Table 1

   b. DU Type = Habitat or Target Species Name

   c. P# = unique picture number in sequence to match field location and field form.

4) Each photo will be recorded in a photo log.

5) At the conclusion of each day, download all the digital photographs onto the dedicated field computer and (if not done in the field) label each digital file (electronic photograph) as described in Step 3 above.

2.4.8 Schedule

Three high lead DUs and up to 15 lower lead DUs will be surveyed during the summer 2017 reconnaissance. The survey will occur between August 14 and August 18. The field work is estimated to take 5 days. This includes:

1) One day to visit three high lead DUs
2) Three days to visit up to 15 lower lead DUs
3) One contingency day for additional lower lead DU visits and any need to revisit DUs
4) Travel (mobilization/kickoff and demobilization) will occur before/after or on the first and final survey days, depending on staff travel arrangements

The high lead DUs will be visited first, followed by lower lead DUs. One contingency day is included since data may need to be collected on several lower lead DUs to determine which are most similar to the high lead DUs. That determination might not be made in the field.

2.4.9 Personnel

The personnel that is anticipated for this field reconnaissance effort:

- Field Contractor Botanist
- Field Contractor Field Supervisor/Assistant Biologist(s)
- CCT representative(s) including Tribe botanist
- EPA representative(s)
- TAI representative(s).

3 DATA COMPILATION AND REPORTING

This section describes the data compilation and reporting of the field reconnaissance data that will be used to finalize the FSP.

3.1 DATA COMPILATION

The Field Contractor will lead the effort for compilation of the field reconnaissance data. The following bullets outline the general procedures to compile the field reconnaissance data:

- Hardcopies of the field data forms, marked-up aerial photographs, and other notes for each DU will be assembled into a project notebook and organized into the same sequence as the master list. A cross-check for completeness between the master list and the field data forms will be done to ensure a complete set of hardcopy data. Missing information will be reconstructed from field notes and photographs as feasible.
- The GPS coordinate data will be compiled to update information for each DU surveyed within the master database (in Microsoft Access). Each record will include fields for unique reference identifiers (IDs), positional IDs, and related survey coordinates in latitude and longitude; an example of the fields defining the positional IDs for a DU is provided in Table 3.

Table 3. Examples of DU Positional IDs

DU ID for Type	Positional ID	Latitude	Longitude	Description
258	258-1	North-south position	East-west position	**position 1** for unique property ID 151-H-193
258	258-2	"	"	**position 2** for unique property ID 151-H-193
258	258-3	"	"	**position 3** for unique property ID 151-H-193
258	258-4	"	"	**position 4** for unique property ID 151-H-193

- GPS waypoint files will be downloaded, checked for completeness, and compared to the positional IDs for each DU to check for transcription errors. If there are discrepancies, coordinates from the GPS will be used to update the coordinates for the positional IDs. The GPS waypoint files will then be converted to the

geographic information system (GIS) coordinate system and used to update or replace the preliminary DU GIS shape files.

- Digital file IDs for photographs will be cross-checked against the master list for completeness; any extra or duplicate photographs will be purged (removed) from the active and dedicated project folder. The finished digital folder will be a sequence of files (electronic photographs) that illustrate each DU to assist field staff with locating plant species and setting up soil sampling for the field sampling effort.

3.2 REPORTING

Reporting of reconnaissance field data will be concise and include the following:

- A brief narrative description of the field reconnaissance activities that document when the work was completed, how it was conducted (or deviations from plan), number of DUs visited, and observations made that support study design
- Updated DU master list that identifies target available plant species–plant parts available to be targeted for collection within each DU and associated target season for collection. If plants are located outside the DU area for sampling these will be specifically noted.
- GIS-prepared maps (aerial photograph as base map) showing DUs with sufficient plant diversity, abundance, and coverage to support wild plant tissue sampling
- Copies of field data forms with collected data (such as, sketches, and reference IDs)
- Electronic copies of the entire report, including native files used to generate the report (such as survey data in Excel format, digital photographs, etc.).

4 REFERENCES

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ATTACHMENT 1

LODESTONE (2017) MEMORANDUM

Memorandum

Prepared for: Patti Bailey and Cindy Marchand, Confederated Tribes of the Colville Reservation

Prepared by: Whitney Fraser, Lodestone Environmental Consulting

Date: July 20, 2017

Subject: Cultural Plant Sampling Reconnaissance Results and Information for EPA and Teck

For background on the reasons for Cultural Plant Reconnaissance, please see the planning memorandum dated July 6 detailing the objectives and procedures.

To summarize, a group of Colville plant authorities (see Table 1) spent one day (July 7, 2017) visiting four Tribal allotments (see Attachment A for a map of allotments). Approximately 1.5 hours were spent in each of three locations: H-196; combined H-193, H-192, and H-195; and combined H-176 and H-179.

Table 1: Colville Plant Reconnaissance Team, November 1, 2016

Name	Department
Whitney Fraser – Field Lead	Contractor to Environmental Trust
Cindy Marchand	Environmental Trust
Kali Robson	History and Archaeology
Lola Campbell	History and Archaeology
Pendleton Moses	History and Archaeology

The plant crew identified the presence of plants cited as being used or consumed in the UCR Resources Survey (see Table 2). The marking protocol was amended from that detailed in the planning memorandum (orange flagging tape or pin flags to mark specific locations) because the History and Archaeology team had lately acquired a tablet computer with a GPS marking program. Results of the reconnaissance are listed in Table 3. GIS layers containing plant location information are being prepared by the History & Archaeology GIS Technician but are not available as of 7/20/2017.

Table 2: Plants identified in the UCR Resources Survey as used by more than 5% of people and as being potentially sourced locally.

Primary Target Plant Part	Target Plant Name	Latin Name
Leaves, shoots, bark, branches	Arrowleaf Balsamroot	*Balsamorhiza sagittata*
	Red Willow	*Cornus sericea*
	Green Willow (Coyote Willow)	*Salix exigua*
	Tule	*Schoenoplectus acutus*
	Kinnikinnick	*Arctostaphylos uva-ursi*
	Wild Mint	*Mentha arvensis*
	Sage (Big Sage)	*Artemisia tridentata*
	Sage (White/Silver Sage)	*Artemisia ludoviciana*
	Western red cedar	*Thuja plicata*
	Syringa (Mock Orange)	*Philadelphus lewisii*
	Black Tree Lichen (moss)	*Bryoria fremontii*
	Wild Mushrooms (Morels)	*Morchella esculenta*
	Wild Mushrooms (Shaggy Manes)	*Coprinus comatus*
	Wild Mushrooms (Puffballs)	*Calvatia gigantea*
Roots	Spring Beauty/Indian Potato	*Claytonia lanceolata*
	Wild Caraway/Indian Carrot	*Perideridia gairdneri*
	Camas	*Camassia quamash*
	Bitterroot	*Lewsia rediviva*
	Lomatiums	*Lomatium spp.*
Berries, fruit, nuts	Wild Rose	*Rosa spp.*
	Chokecherries	*Prunus virginiana*
	Wild Blackberries	*Rubus spp.*
	Soapberries	*Shepherdia canadensis*
	Wild Strawberries	*Fragaria vesca & F. virginiana*
	Huckleberries	*Vaccinium spp.*
	Hazelnuts	*Corylus cornuta var. californica*
	Elderberries	*Sambucus spp.*
	Sarvisberries	*Amelanchier spp.*
	Wild Thimbleberries	*Rubus parviflorus*
	Pine Nuts (Ponderosa or Whitebark)	

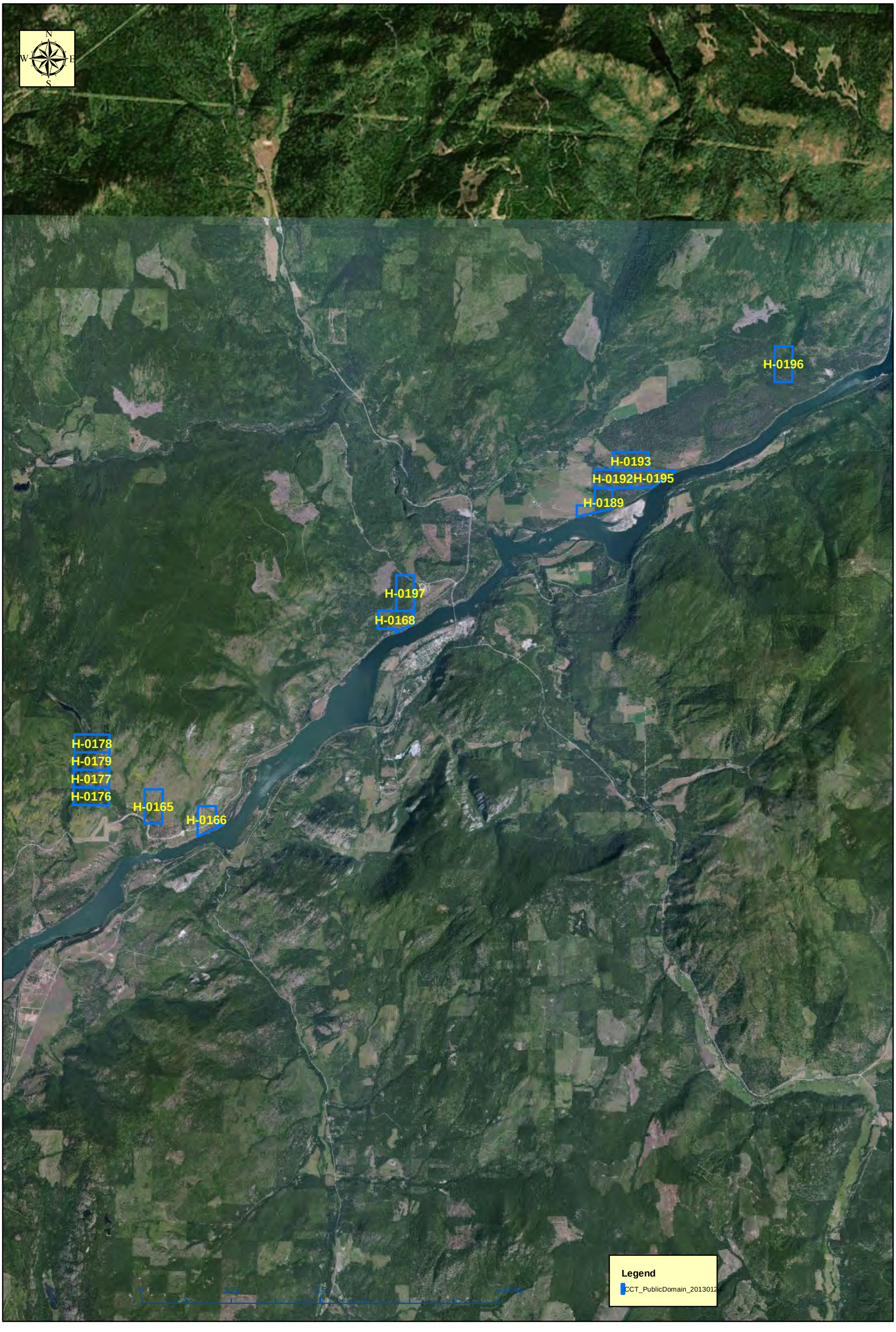
Table 3: Plants identified on Tribal allotments

Location	Plant Notes
Allotment H-196	**Abundant (likely to fulfill 3 x 12 composite scheme)** Kinnikinnick Dwarf Huckleberry – berries not out yet Hazelnut (see picture in Attachment B) **Sparse (may fulfill fewer than 3 x 12 composites)** Strawberry – few berries Chokecherry – allotment 193 much better Sarvisberry – allotment 193 much better **Present (but unlikely to fulfill multiple composites)** One large native juniper
Allotments H-193, H-192, and H-195 (contiguous)	**Abundant (likely to fulfill 3 x 12 composite scheme)** Hazelnut (see picture in Attachment B) Chokecherry Sarvisberry (see picture in Attachment B) Wild Rose Camas – seen in May 2017 visit **Sparse (may fulfill fewer than 3 x 12 composites)** Elderberry **Present (but unlikely to fulfill multiple composites)** Strawberry Dwarf Huckleberry
Allotments H-176 and H-179 (contiguous): these areas tested very low in soil lead, at or near background concentrations	**Abundant (likely to fulfill 3 x 12 composite scheme)** Hazelnut (see picture in Attachment B) Chokecherry Sarvisberry (see picture in Attachment B) Tule Mock Orange (Syringa) **Sparse (may fulfill fewer than 3 x 12 composites)** Strawberry Elderberry Wild Rose

ATTACHMENT A

Map of allotments

Upper Columbia River CorridorTrust Parcels



ATTACHMENT B

Pictures of Plants

Figure 1: Hazelnuts on tree (left) and peeled and cracked, edible nut separated (right)

Figure 2: Ripe sarvisberry (a.k.a. serviceberry) is dark blue

ATTACHMENT 2

TRIBAL ALLOTMENT OVERVIEW FIGURES

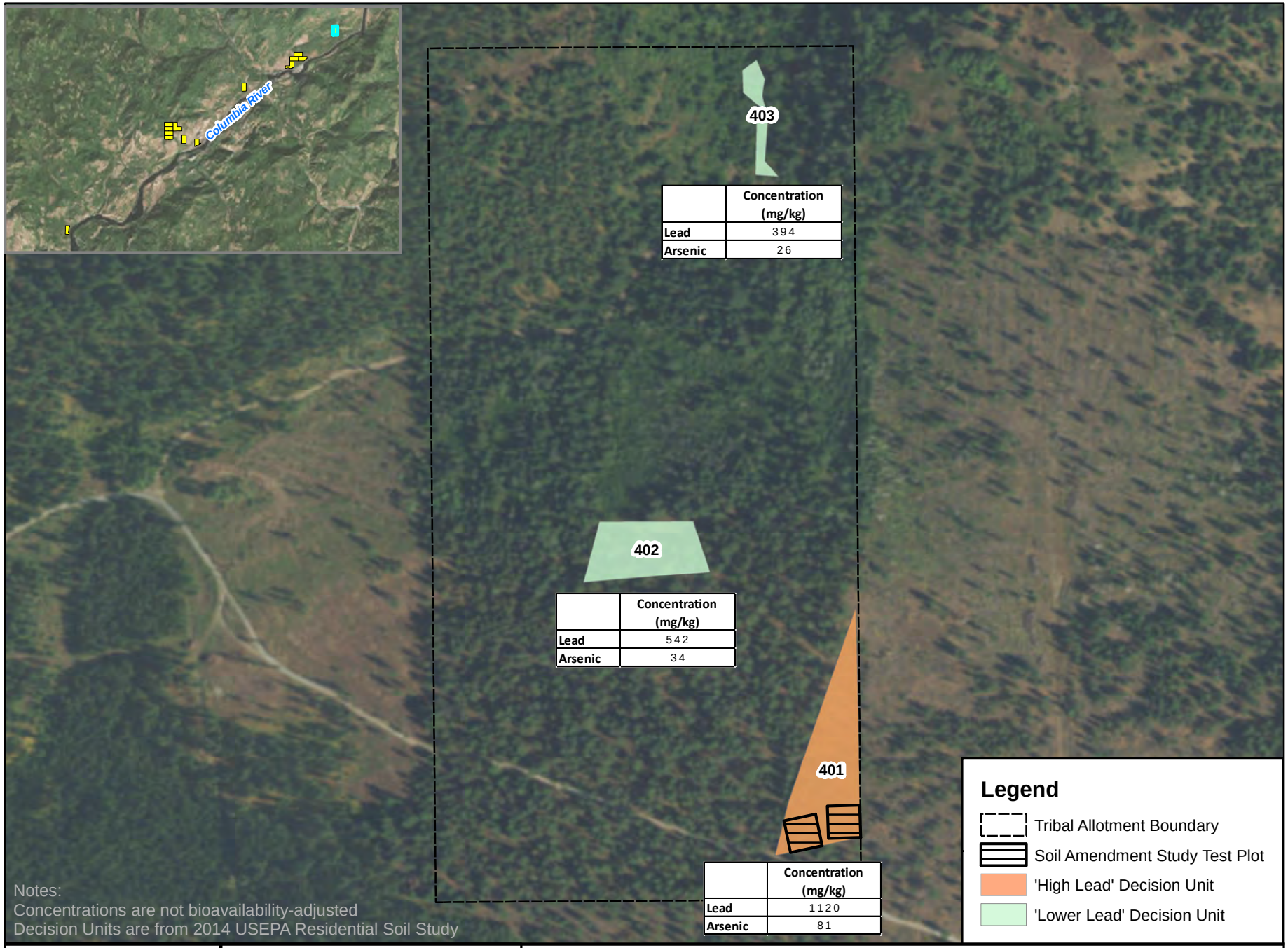


Figure A-1. 151-H-196 Tribal Allotment Overview
Upper Columbia River, WA

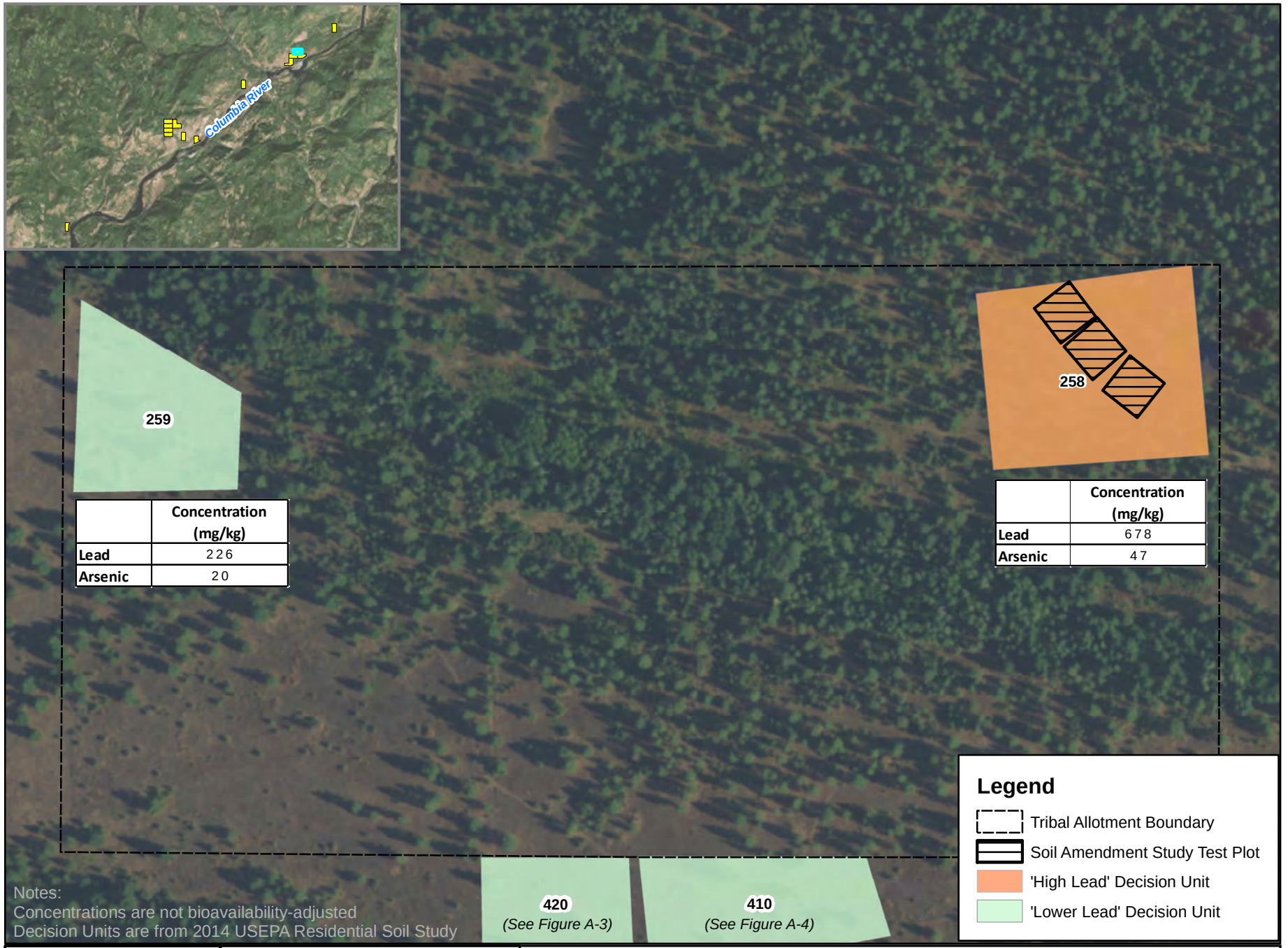


Figure A-2. 151-H-193 Tribal Allotment Overview
Upper Columbia River, WA

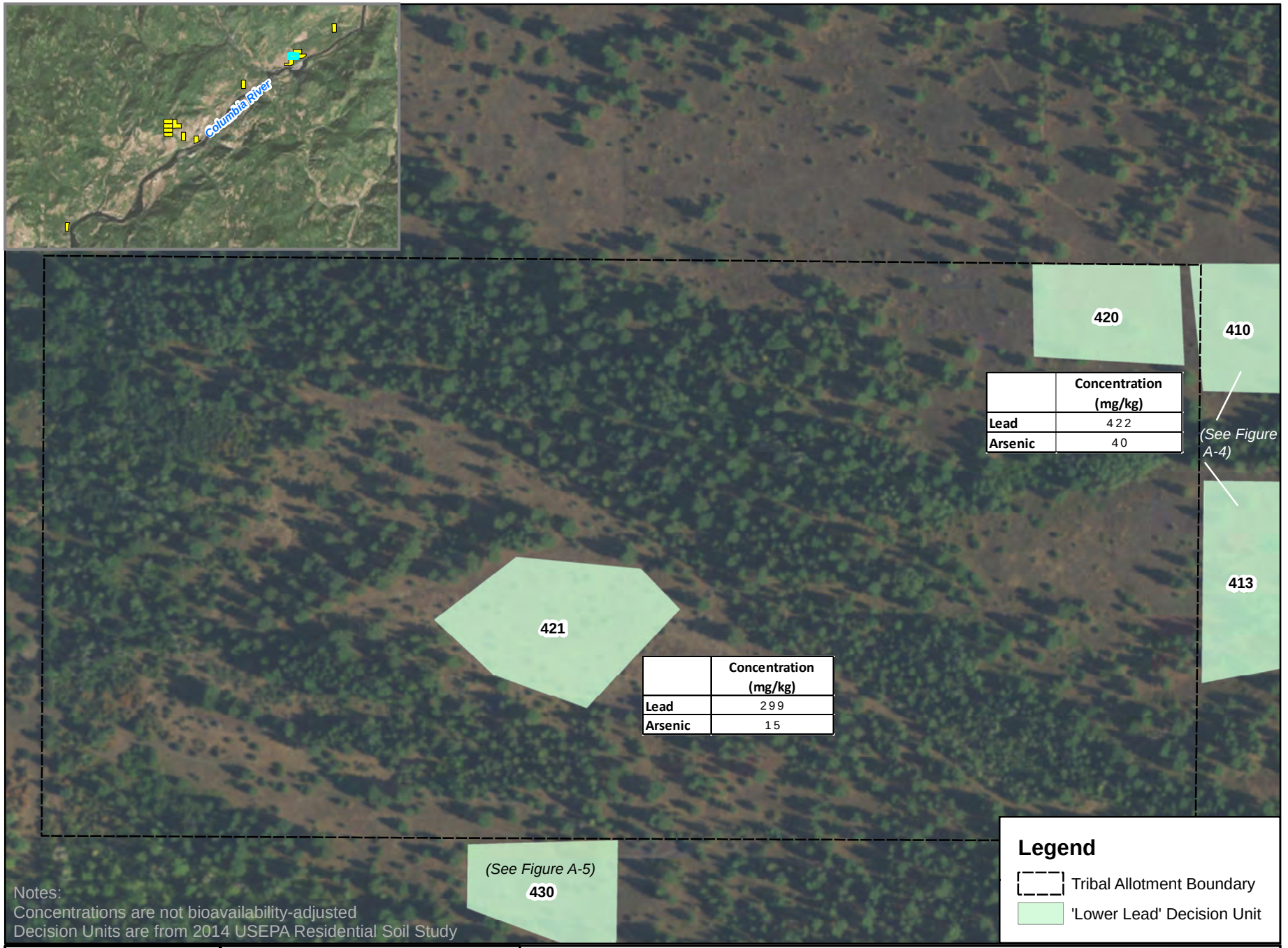


Figure A-3. 151-H-192 Tribal Allotment Overview
Upper Columbia River, WA

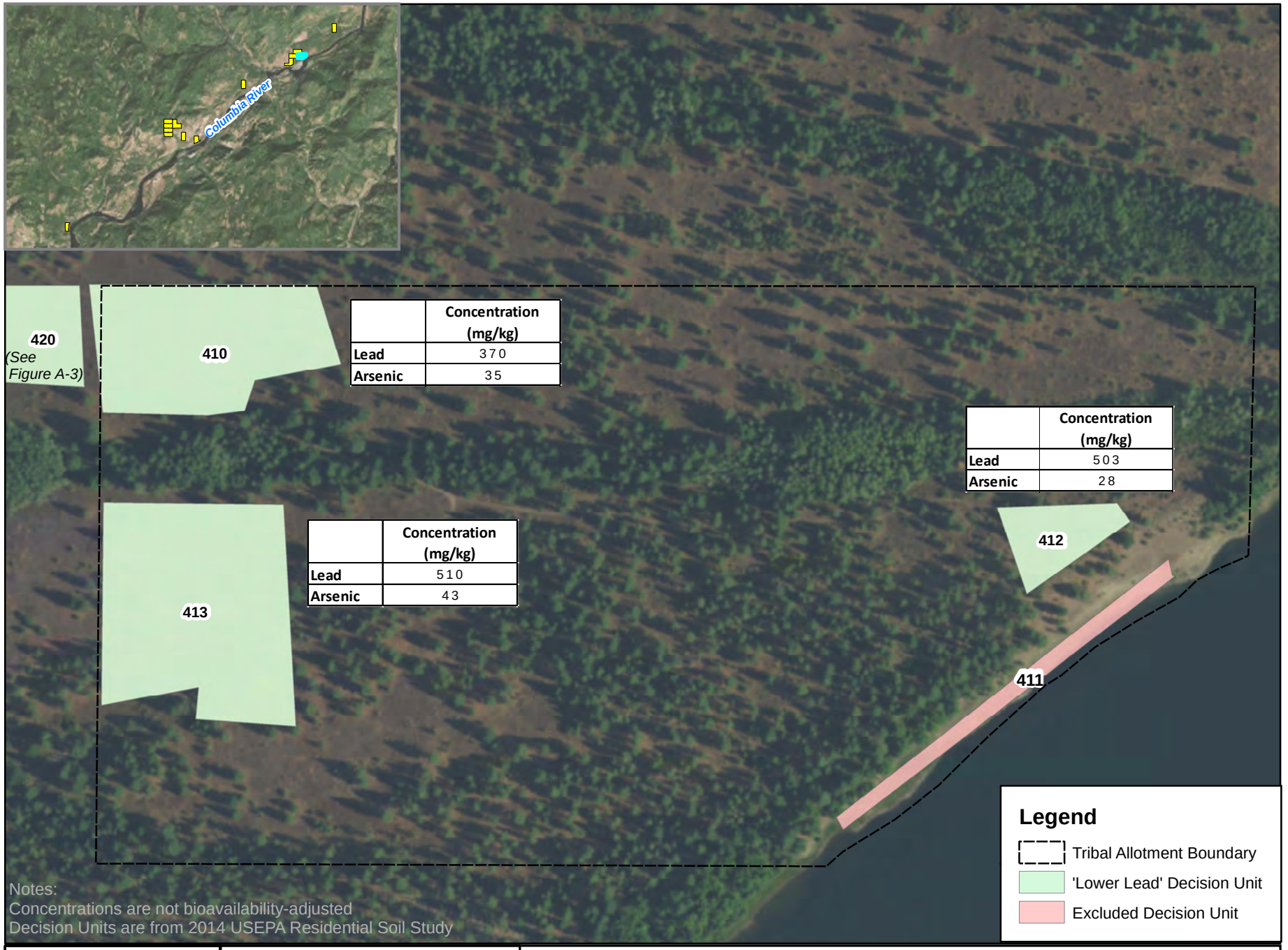


Figure A-4. 151-H-195 Tribal Allotment Overview
Upper Columbia River, WA

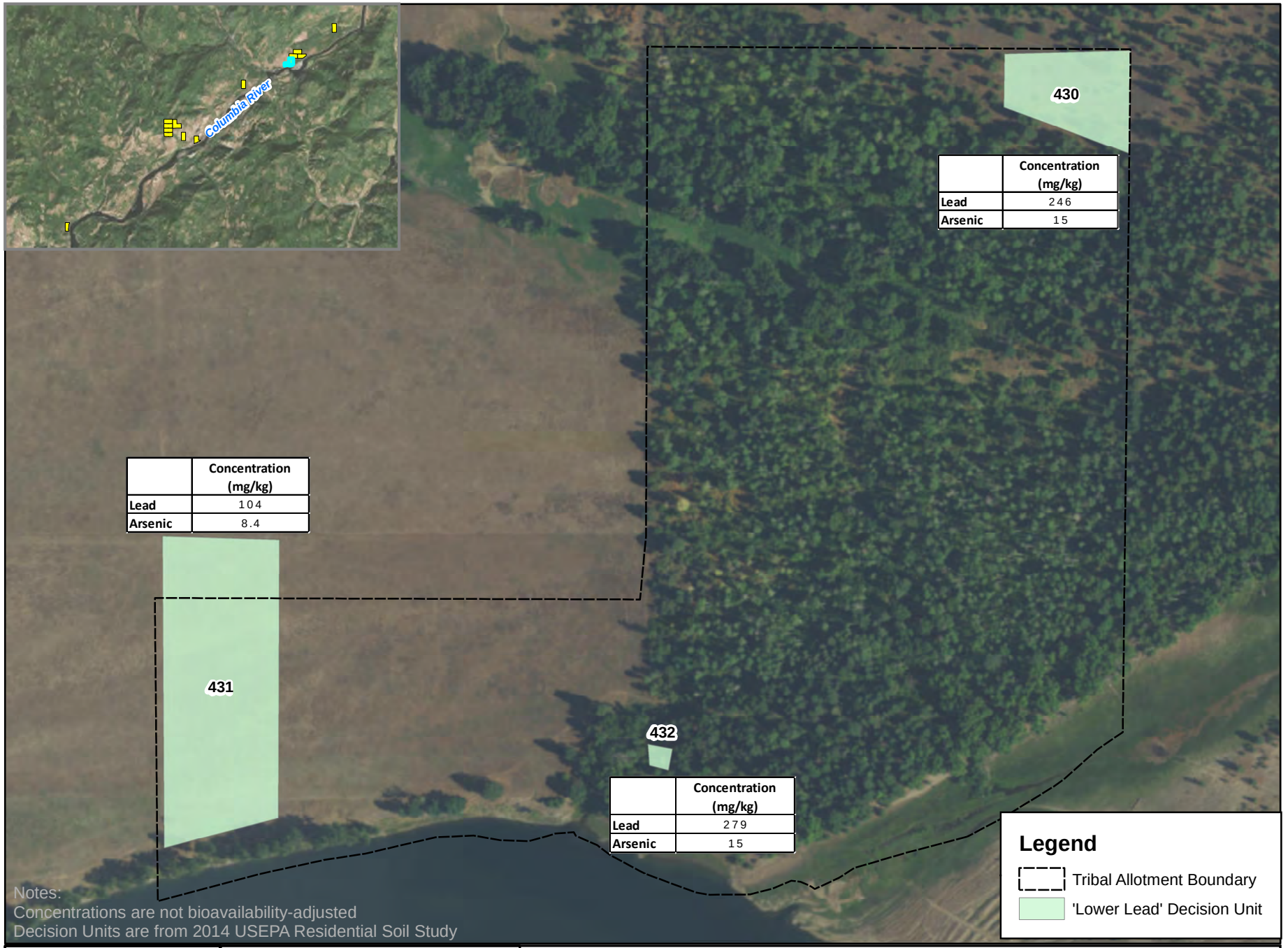


Figure A-5. 151-H-189 Tribal Allotment Overview
Upper Columbia River, WA

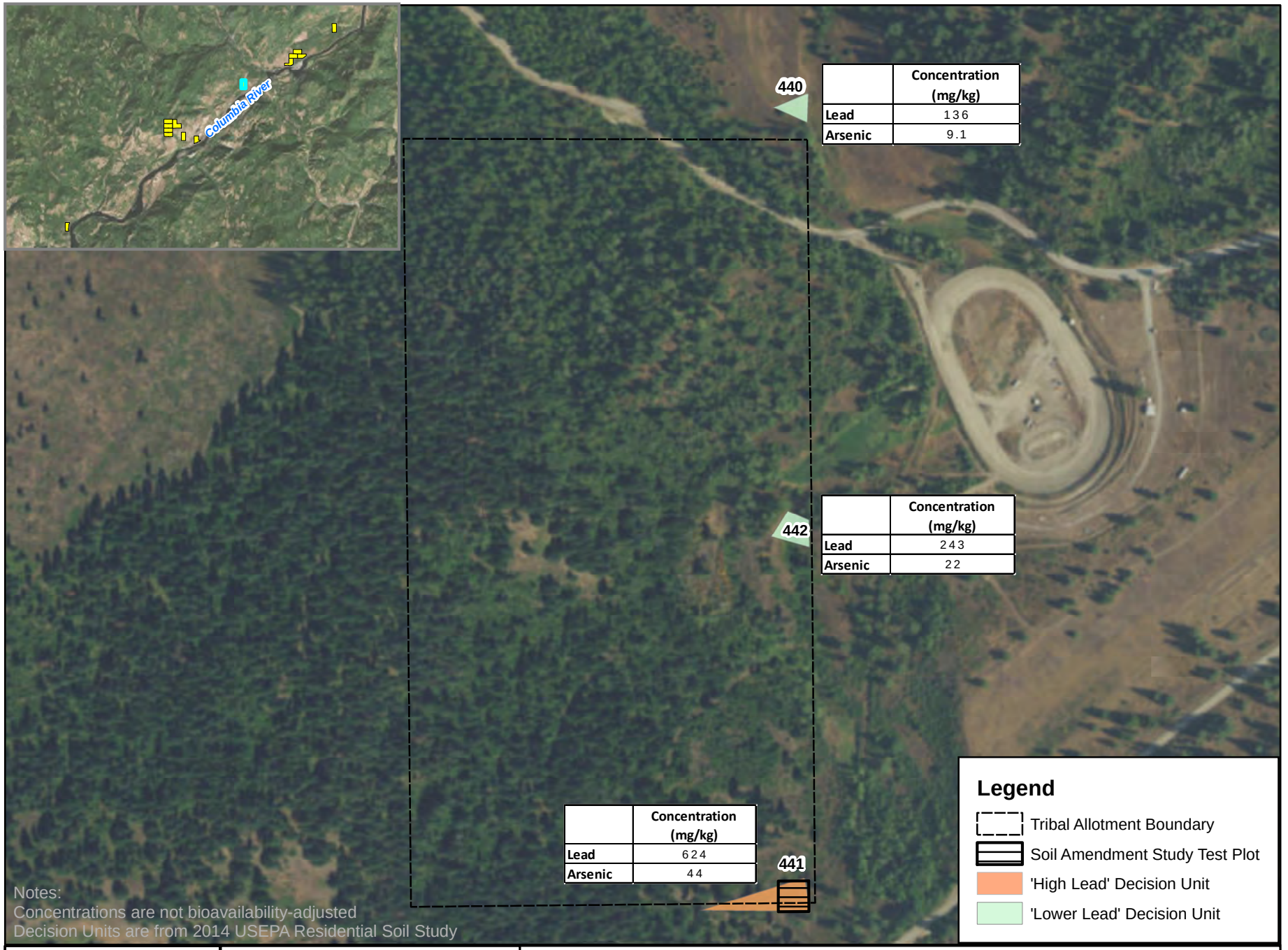


Figure A-6. 151-H-197 Tribal Allotment Overview
Upper Columbia River, WA

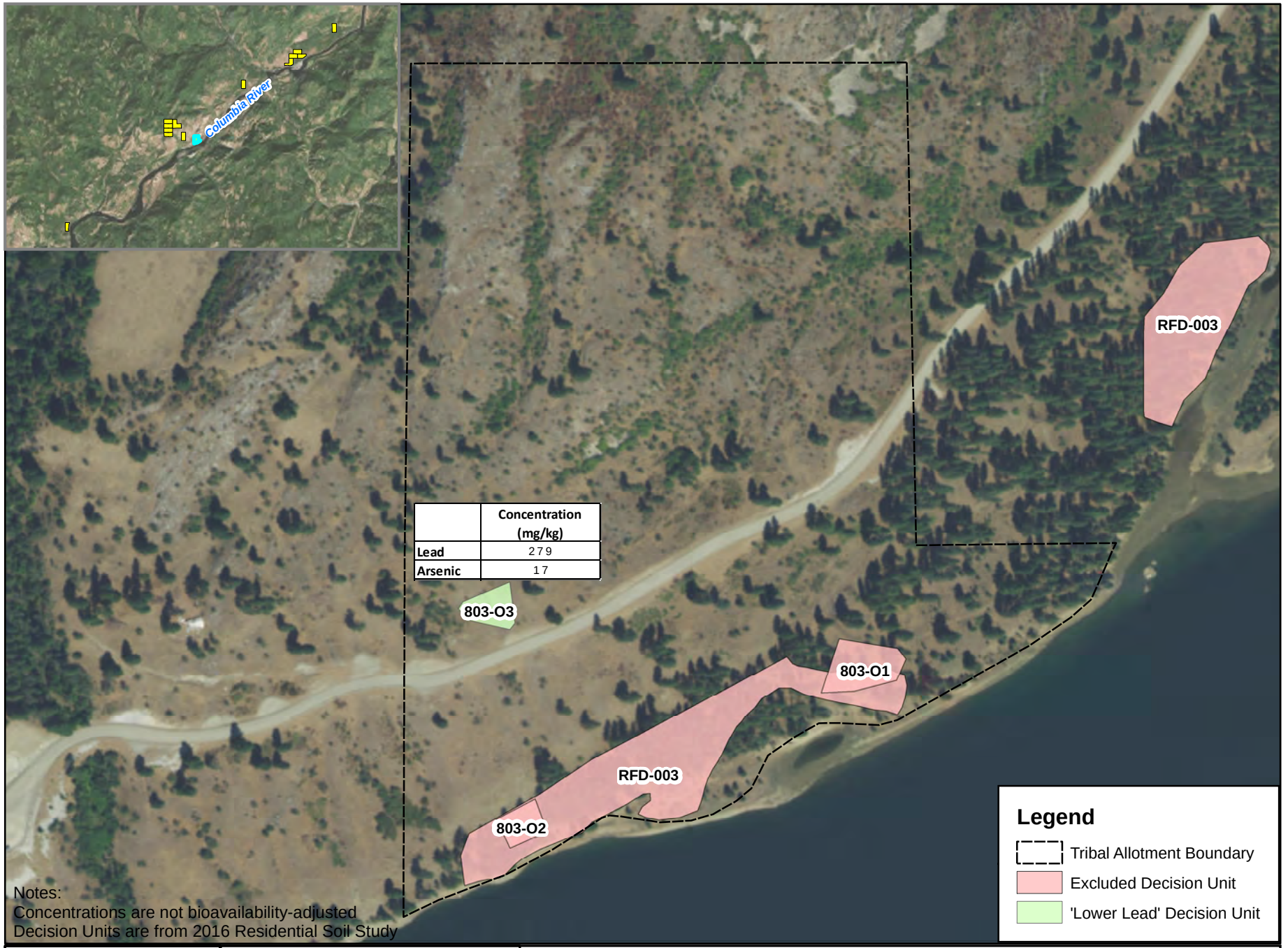


Figure A-7. 803 Tribal Allotment Overview
Upper Columbia River, WA

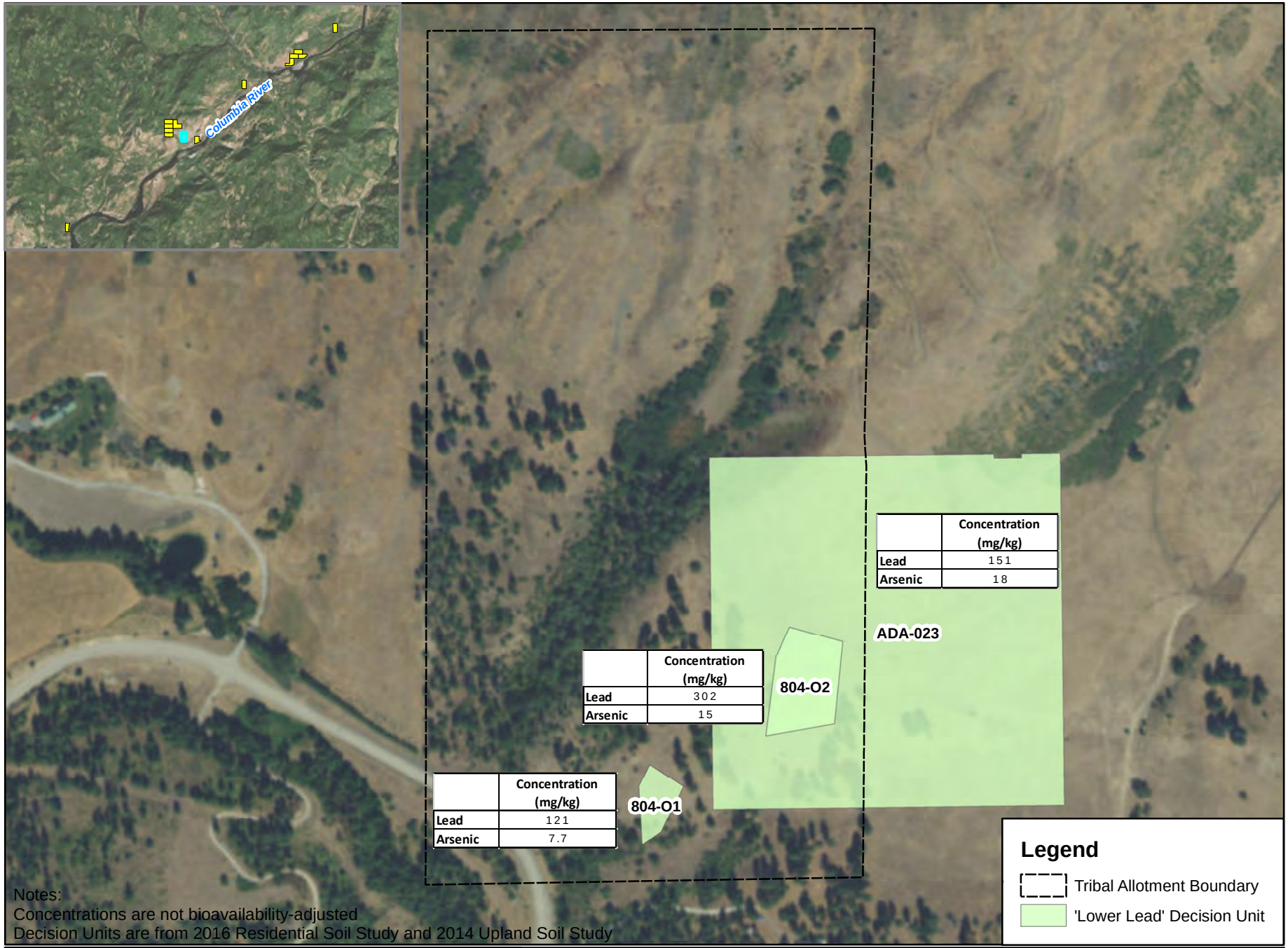


Figure A-8. 804 Tribal Allotment Overview
Upper Columbia River, WA

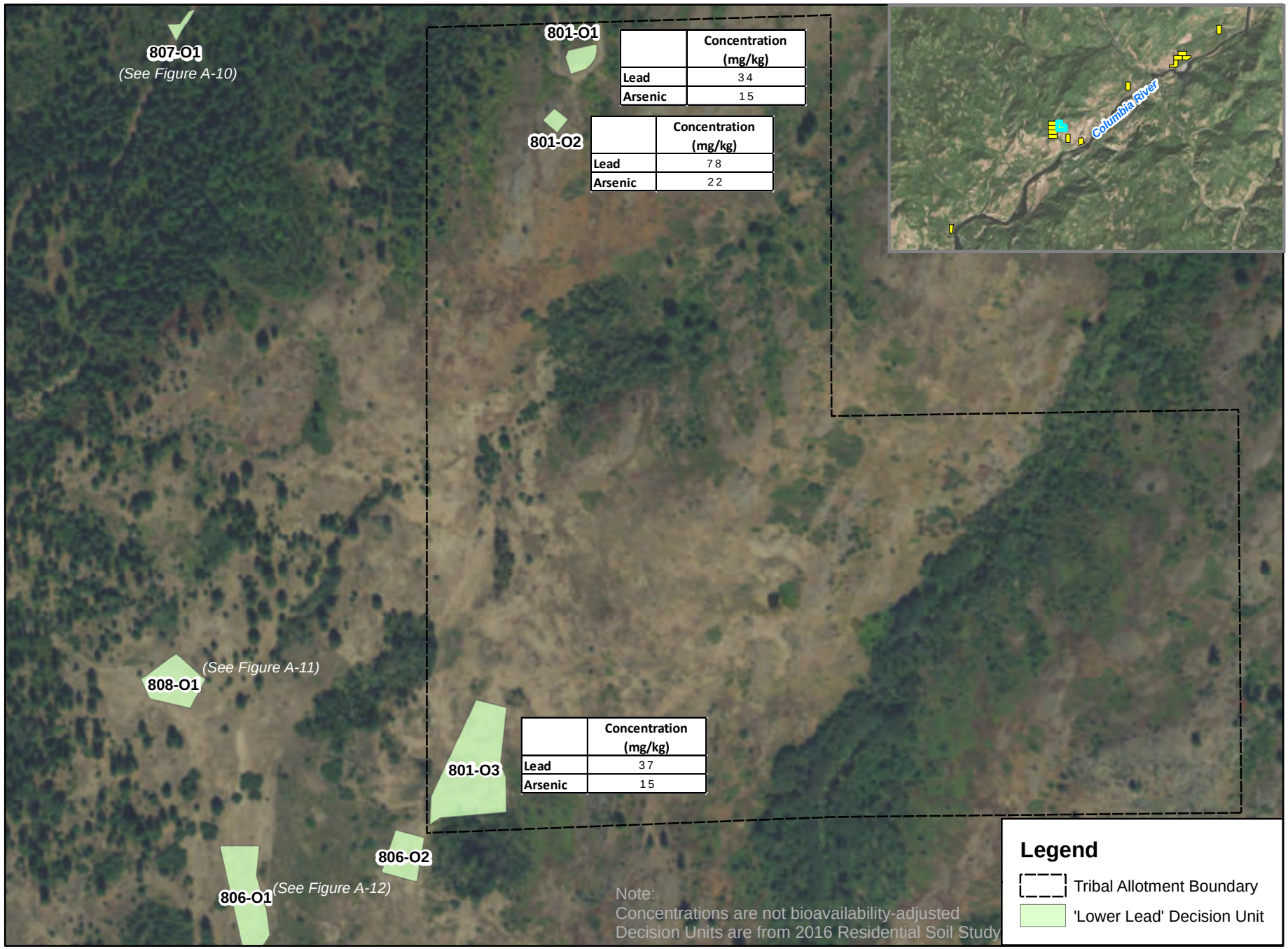
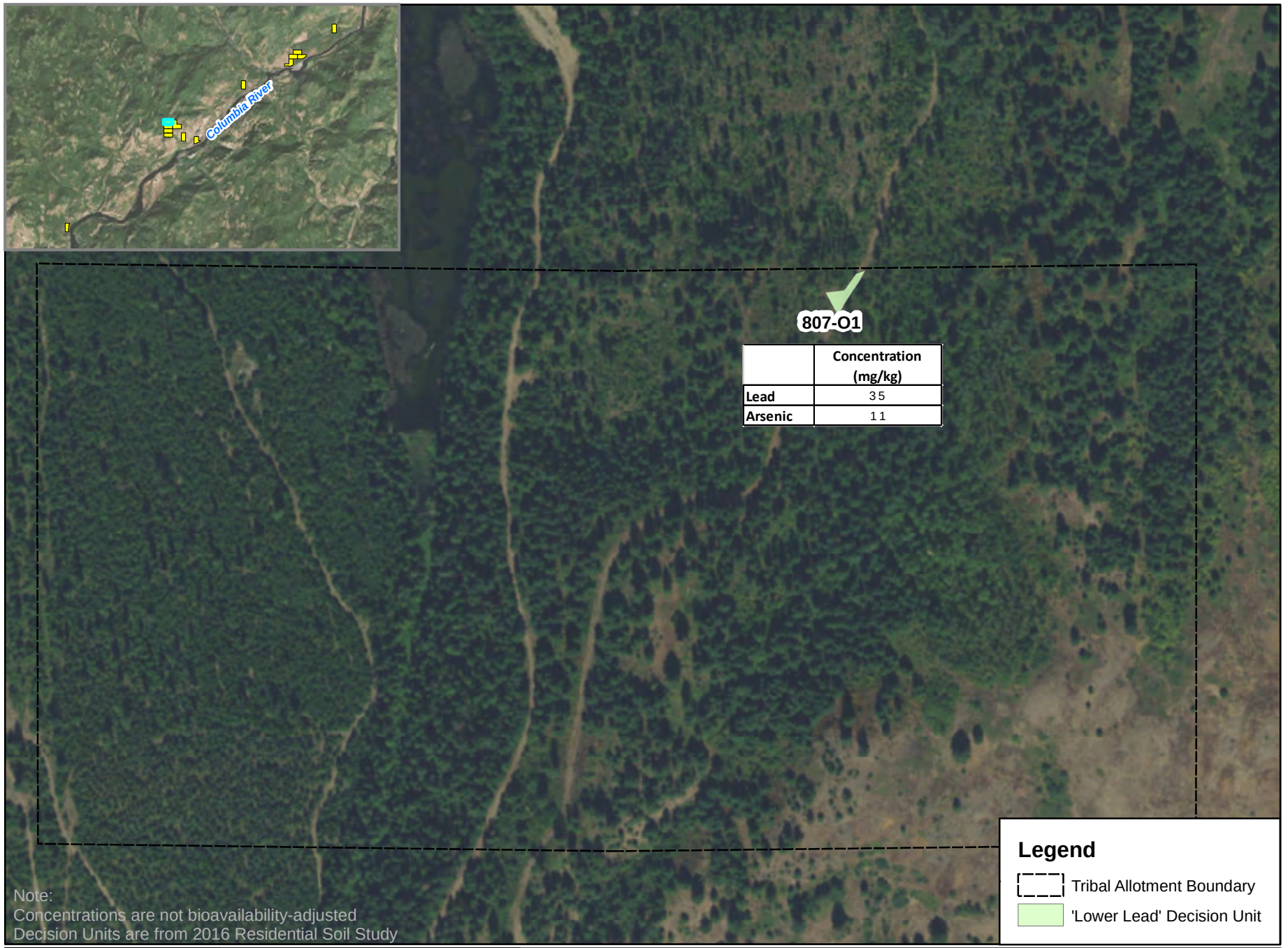


Figure A-9. 801 Tribal Allotment Overview
Upper Columbia River, WA



RAMBOLL ENVIRON

Figure A-10. 807 Tribal Allotment Overview
Upper Columbia River, WA

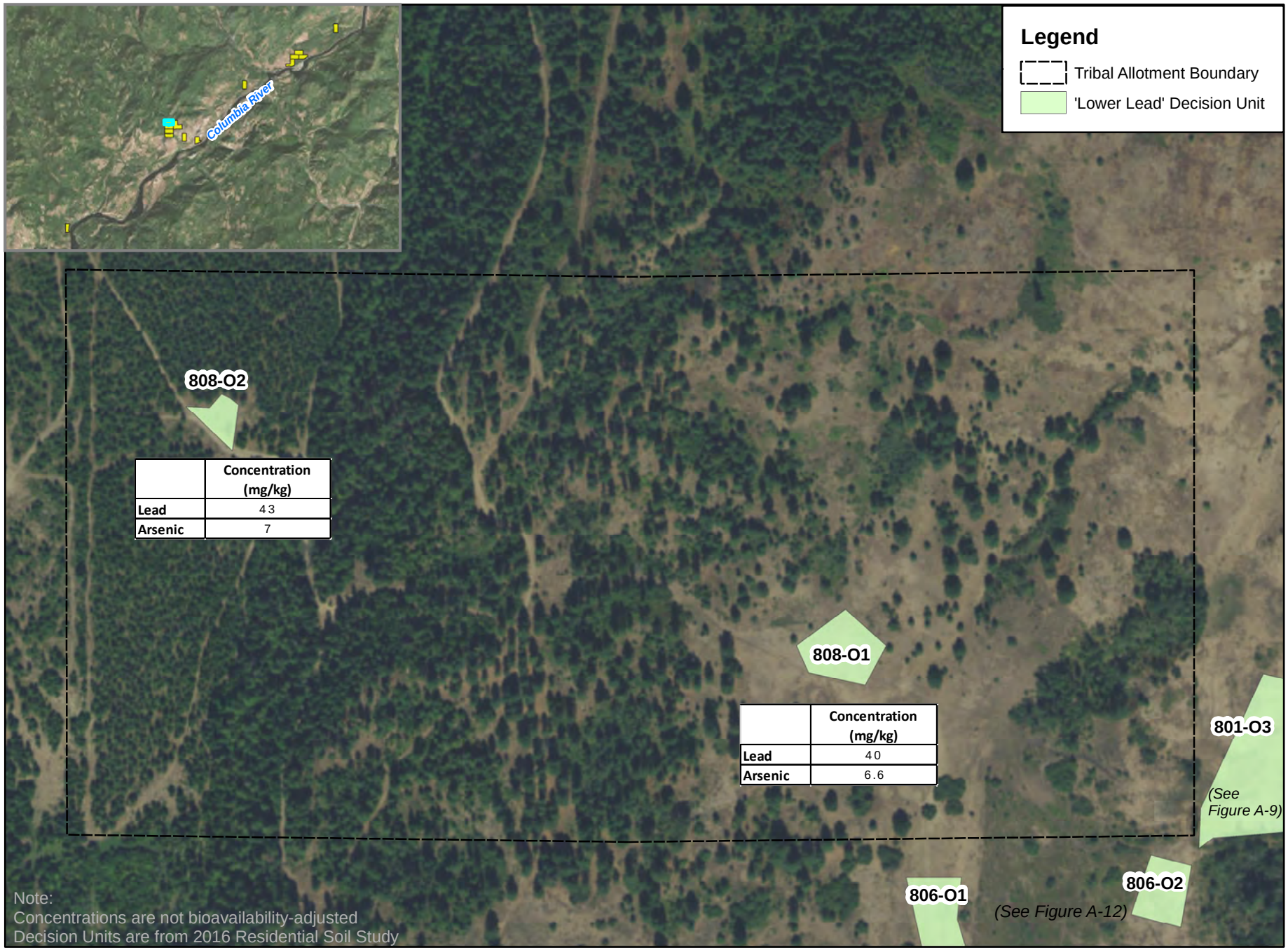
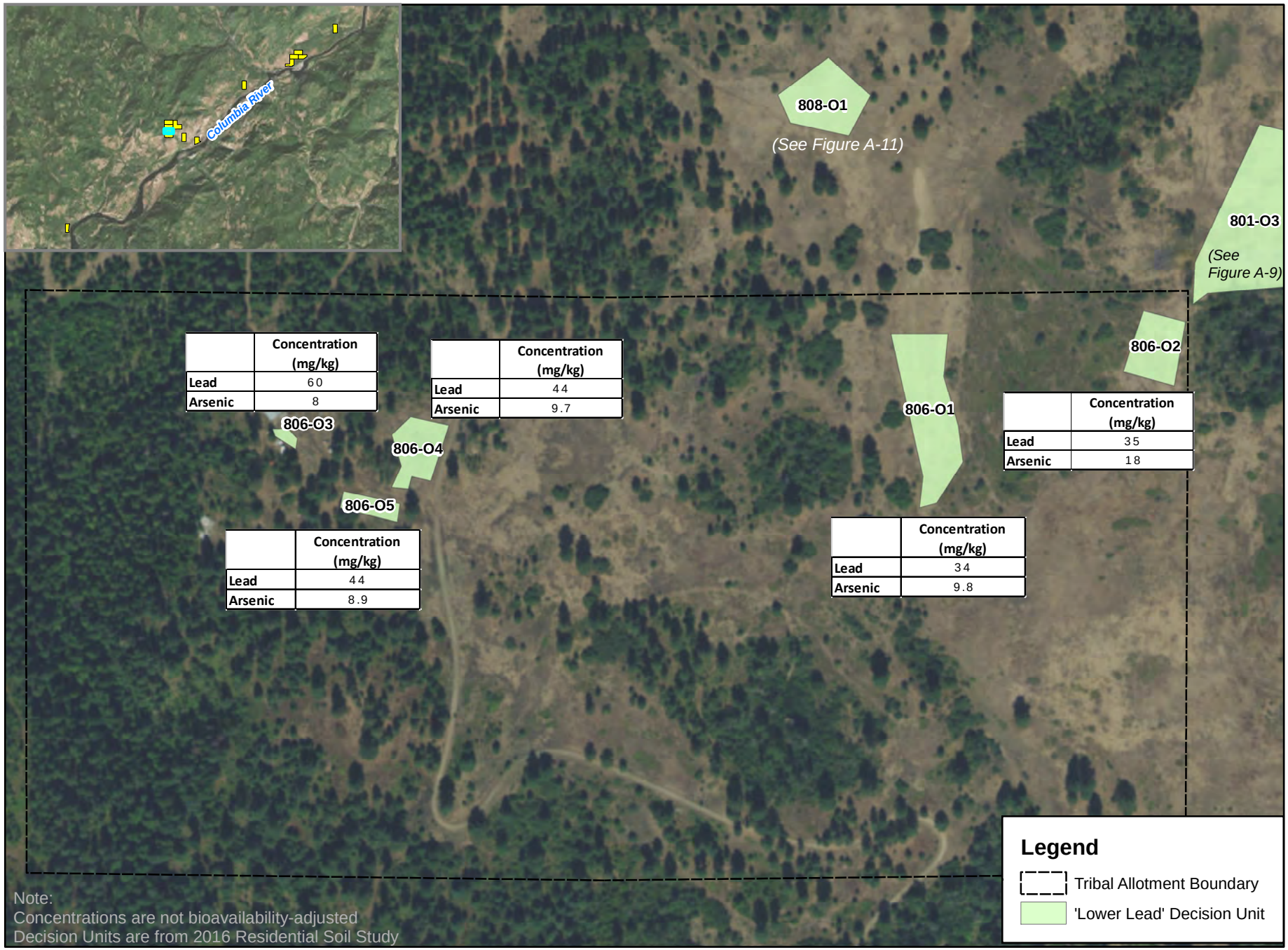


Figure A-11. 808 Tribal Allotment Overview
Upper Columbia River, WA



RAMBOLL ENVIRON

0 50 100 200 Meters

0 150 300 600 Feet

N

Figure A-12. 806 Tribal Allotment Overview
Upper Columbia River, WA

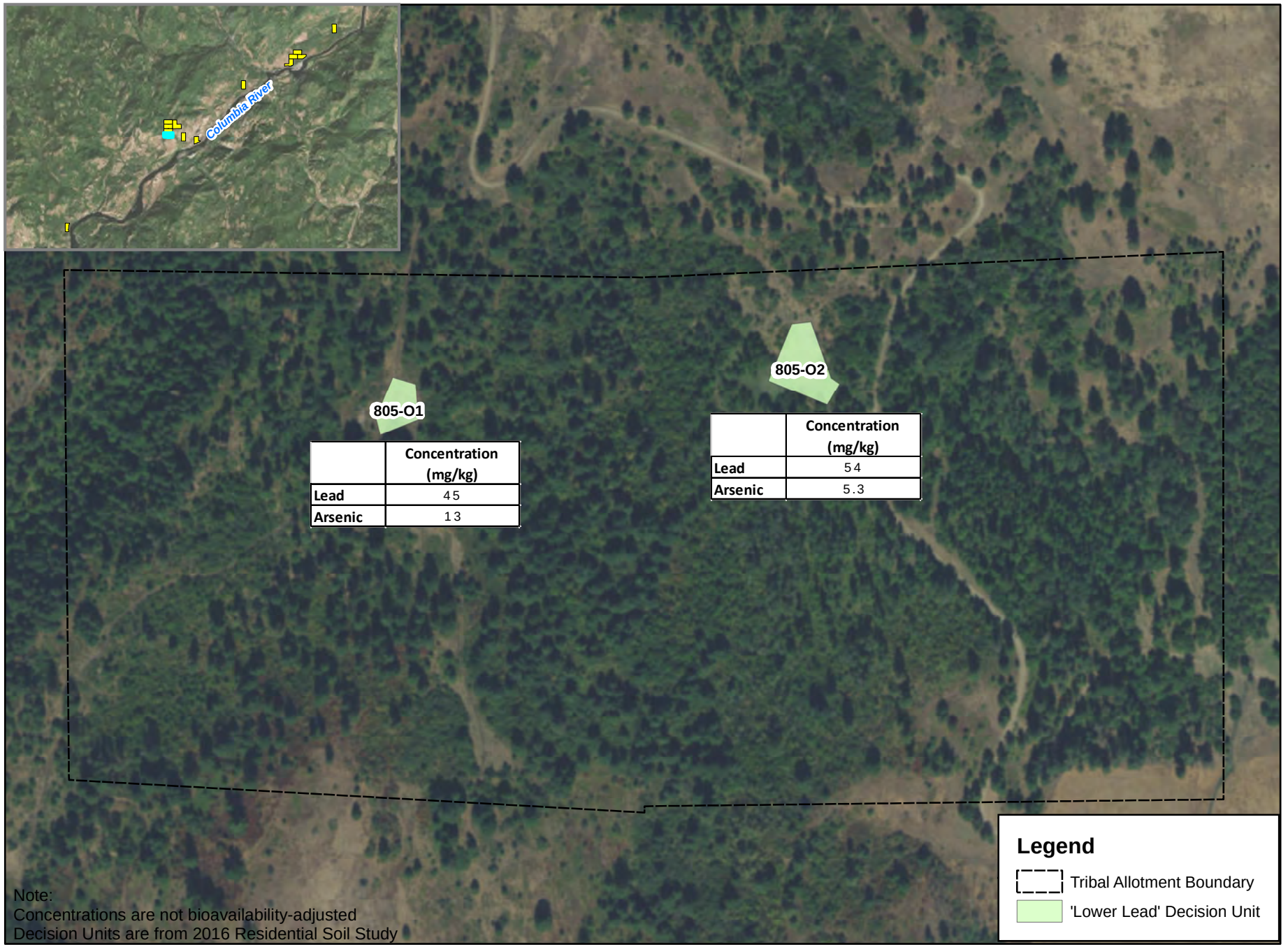


Figure A-13. 805 Tribal Allotment Overview
Upper Columbia River, WA

Figure A-14. 802 Tribal Allotment Overview
Upper Columbia River, WA

ATTACHMENT 3

FIELD DATA FORM

FIELD RECONAISSANCE FORM

Project Name: Plant Tissue Sampling ***Parcel Identifier:*** [one per form]

Field Crew Initials:

Date:

Time Begin/End:

EXPANDED DU BOUNDARY?
[Yes/No]

Common Name	Scientific Name	Plant Part	Species Present on Parcel	Specific Plant Part Observed/Collected	Species abundance across site	Comments, Including Health and Phenology	Spatial Data Collected
Sarvisberry	*Amelanchier* spp.	fruit					
Kinnikinnik	*Arctostaphylos uva-ursi*	leaves					
White/silver sage	*Artemisia ludoviciana*	leaves					
Big sage	*Artemisia tridentata*	leaves					
Arrowleaf balsamroot	*Balsamorhiza sagittata*	shoots, seeds root					
Black tree lichen	*Bryoria fremontii*	whole organism					
Puffball	*Calvatia gigantea*	fruiting body					
Camas	*Camassia quamash*	root					
Spring beauty/Indian potato	*Claytonia lanceolata*	root					
Shaggy mane	*Coprinus comatus*	fruiting body					
Red Willow	*Cornus sericea*	leaves, stem bark, inner cambium					
Hazelnut	*Corylus cornuta* var. *californica*	nut					

Common Name	Scientific Name	Plant Part	Species Present on Parcel	Specific Plant Part Observed/Collected	Species abundance across site	Comments, Including Health and Phenology	Spatial Data Collected
Wild Strawberry	*Fragaria virginiana, F. vesca*	fruit					
Bitterroot	*Lewisia rediviva*	root					
Lomatium	*Lomatium* spp.	root					
Wild mint	*Mentha arvensis*	Leaves					
Morel	*Morchella esculenta*	fruiting body					
Wild caraway/Indian carrot	*Perideridia gairdneri*	root					
Syringa (mock orange)	*Philadelphus lewisii*	branches					
Whitebark pine	*Pinus albicaulis*	nut					
Ponderosa pine	*Pinus ponderosa*	nut					
Chokecherry	*Prunus virginiana*	fruit					
Wild Rose	*Rosa* spp.	rose hip, stem, root					
Wild Blackberry	*Rubus* spp.	fruit					
Wild Thimbleberry	*Rubus parviflorus*	fruit					
Green willow (coyote willow)	*Salix exigua*	Leaves, stem, bark, inner cambium					
Elderberry	*Sambucus* spp.	fruit					

Common Name	Scientific Name	Plant Part	Species Present on Parcel	Specific Plant Part Observed/Collected	Species abundance across site	Comments, Including Health and Phenology	Spatial Data Collected
Tule	*Schoenoplectus acutus*	stalk					
Soapberry	*Shepherdia canadensis*	fruit					
Western Red Cedar	*Thuja plicata*	bark, root, outer root bark, boughs, needles, stems, cones					
Huckleberry	*Vaccinium* spp.	fruit					

ATTACHMENT 4

STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE SOP-1

Recording Plant Locations

Scope and Applicability

This standard operating procedure (SOP) describes procedures used for recording reconnaissance locations across the Upper Columbia River (UCR) Site (hereafter the Site). Accurate station positioning is required to help ensure quality and consistency in collecting samples and in data interpretation and analysis. Station positioning must be both absolutely accurate in that it correctly defines a position by latitude and longitude, and relatively accurate in that the position must be repeatable. The methods described in this SOP should be usable for any hand-held global positioning system (GPS) unit; however, the owner's manual for any GPS unit used should be consulted and used to support this SOP.

Equipment and Materials

The following is a list of equipment and materials needed by the field sampling team:

- Hand-held GPS unit (e.g., Trimble GeoXH) or dGPS antenna paired with device such as an iPhone, iPad or field tablet.
- Spare batteries, mobile charger
- Charging unit.

A GPS hardware system, such as a Trimble GeoXH GPS (or equivalent device), should be used for recording reconnaissance locations and re-visiting these locations as needed. The standard projection method to be used during field activities is the horizontal datum of the World Geodetic System of 1984 (WGS84).

Positioning System Verification

GPS requires no calibration because all signal propagation is controlled by the U.S. government (the Department of Defense for satellite signals, and the U.S. Coast Guard and U.S. Forest Service for differential corrections). Verification of the accuracy of the GPS requires that coordinates be known for one (or more) horizontal control points within the study area. The GPS position reading at any given station can then be compared to the known control point. If possible, GPS accuracy should be verified at the beginning and at the end of each sampling day. Known control points that are recognized by the National Geodetic Survey can be found on their website (https://www.ngs.noaa.gov/INFO/ gnss-gps-data.shtml). Control point locations should be included on the GPS before going into the field. At least 3 control points should be visited by the field staff during the reconnaissance period, and a point be taken at each location. This will be used during post-processing of data to confirm the accuracy of spatial data.

Station Location Procedures

Sampling area boundaries and other applicable geographic information systems (GIS) data layers (e.g., aerial photographs, topography, parcel data) will be uploaded into the hand-held GPS unit(s) prior to the sampling effort. A position will be recorded electronically at each location where plant locations are collected. Ancillary information will be recorded in the field logbook, and may include the personnel operating the GPS system, water depth of sample, and the time samples were collected.

A brief summary of procedures to record a specific reconnaissance location using a hand-held GPS unit are as follows:

- Turn on the unit, start up the GPS program(s), enable the GPS.
- Wait for it to acquire satellite lock.
- If recording a solitary point location, position the antenna over the sampling location and hold it steady and make sure not to block the satellites. Start recording the GPS location. If the data collection form is on the GPS unit save the geometry after it acquires the recommended number of satellite observations and edit the form filling out the required attributes, or save the location and edit the attribute information later. (site coordinates may also be noted on field forms [Attachment A2 of this FSP] or in the field logbook. Note that these coordinates may change slightly after the GPS data is processed.
- Charge unit and batteries when not in use.

Upon completion of the sampling effort, all data points will be downloaded from the GPS unit and displayed on a GIS map. Any sampling locations outside of the originally defined sampling areas will be mapped and described with supporting documentation in the field sampling report.

STANDARD OPERATING PROCEDURE SOP-2

Field Documentation

Scope and Applicability

This standard operating procedure (SOP) presents the general information that will be documented for all plant tissue reconnaissance activities conducted by Teck American Incorporated (TAI) field personnel. Proper record keeping will be implemented in the field to ensure transparency and reproducibility of methods and procedures. Several types of field documents will be used for this purpose by field personnel.

Equipment and Materials

Equipment and materials used for this SOP are:

- Field logbook
- Field forms
- Black-ink pen
- Digital camera.

Field Logbooks

During field reconnaissance events, field logbooks and field forms (Attachment A2 of this field reconnaissance plan [FRP]) are used to record all daily field activities. The purpose of the field logbook is to thoroughly document the reconnaissance event to ensure transparency and reproducibility. The field logbook will contain reconnaissance-related information supplemental to the field forms. Any deviations from this FRP that occur during reconnaissance (e.g., personnel, responsibilities, planned reconnaissance locations) and the reasons for these changes will be documented in the field logbook. Other types of information that may be included in the field logbook include the following:

- Project study name
- Name of person making entries and other field staff
- Onsite visitors, if any
- Observations made during reconnaissance and other details not entered onto the field form
- A record of site health and safety meetings, updates, and related monitoring

The field supervisor will maintain the field logbook and is responsible for ensuring that the field logbook and all field data forms are correct. Requirements for logbook entries will include the following:

- Entries will be made legibly with black (or dark) waterproof ink.
- Unbiased, accurate language will be used.
- Entries will be made while activities are in progress or as soon afterward as possible (the date and time that the notation is made should be documented, as well as the time of the observation itself).
- Each consecutive day's first entry will be made on a new, blank page.
- The field supervisor must sign and date the last page of each daily entry in the field logbook.
- When field activity is complete, the logbook will be entered into the TAI project file.

All logbook entries must be completed at the time any observations are made. Logbook corrections will be made by drawing a single line through the original entry, allowing the original entry to be read. The corrected entry will be written alongside the original. Corrections will be initialed and dated and may require a footnote for explanation.

Upon completion of the field reconnaissance event, the field supervisor will be responsible for submitting all field logbooks to be copied. A discussion of copy distribution is provided below.

Field Forms

Field data forms will be used to record the relevant reconnaissance information collected during a reconnaissance event. These forms will be filled out completely by the field team during reconnaissance and will include the following information:

- Project name and date
- Names of all members of the reconnaissance team
- A brief description of the weather
- The time each location was visited
- Presence and abundance of target species
- Phenology of target plants
- General health of plants
- Decision unit location details from the hand-held global positioning system (GPS) unit: latitude, longitude, positional accuracy, and elevation (unless recorded electronically)
- A list of numbered photographs of the site
- Any additional reconnaissance comments.

Upon completion of the field reconnaissance event, the field supervisor will be responsible for submitting all field data forms to be copied. A discussion of copy distribution is provided below.

Photographs

Reference SOP-3 of the FRP for procedures regarding digital photographs.

Distribution of Copies

Electronic scans of the field logbooks and field data forms will be made after completion of the field reconnaissance event and stored electronically in the project files for use by project staff. The original field logbooks and forms will be placed in a locked file cabinet at the task manager's location.

Set-up of Locking File Cabinet

Each field event will have its own dedicated section in a locking file cabinet. The section label will include the project name and work order number. The following documents may be included in this cabinet for each field event:

- Original field logbook(s)
- Original field data forms
- Photograph CDs (see SOP-3

STANDARD OPERATING PROCEDURE SOP-3

Digital Camera Use and Documentation Procedures

Purpose

The purpose of this standard operating procedure (SOP) is to describe the use of digital cameras and procedures for digital camera data management.

Scope and Applicability

This SOP is applicable to taking digital photographs and placing the digital data in a database. Digital photographs may be taken to document field activities, site conditions and features, and sampling locations.

Equipment and Materials

Equipment and materials for taking digital photographs are:

- Digital camera
- Spare batteries
- 12-volt charger
- Digital camera-carrying case and manual
- Field form
- Permanent marker
- Compass
- Personal computer.

Typical Camera Features

- Save photographs (in standard mode) directly to a memory stick or comparable device
- Auto focus; manual focus available if required
- Zoom
- Brightness control
- Playback of photographs on camera screen
- Display of photograph number, date, and time
- Flash
- Timer

- Display showing time remaining on battery and remaining disk capacity
- Ability to protect and delete images that have been taken.

Camera Use

Digital cameras will be used by the field team to document field activities. Each field team will be directly responsible for the camera and ensure that it is not exposed to excessive heat, cold, or moisture. The field team leader will be responsible for digital photograph documentation or for assigning documentation duties to a team member.

Digital photographs will be taken to document field activities and locations. Examples of field activities for which photo documentation will be useful include 1) location of target plant species; and 2) station vicinity with associated reference points and compass directions noted.

Digital photographs will be collected at a high-pixel setting such that enlargements can be made with minimal degradation in picture quality.

Photograph Documentation

Field Team Responsibilities

Each field team will keep a daily hard copy log of all photographs. The following digital photograph data will be collected:

- Camera identifier (type, model, equipment number).
- Project and event identification (ID) number—this information is obtained from the field team leader.
- Photograph number—record the number of the photograph and the photograph file name (as coded below).
- Date and time—as provided by the camera display.
- Description—the target of the photograph.
- Station—identify a station ID (such as parcel or DU location ID), if applicable.

Notes: Record any other pertinent information (including coordinates of location where the photograph was taken [see above]).

Digital Photograph File Name

At the end of each field day, the member of the field team who is responsible for the camera will transfer the electronic data from the camera to the field operations computer. The folder structure will be as follows:

\\DATA\PHOTOS\YYYYMMDD\RECON AREA\file\[1, 2, 3, ...N]

The notation YYYYMMDD represents the year, month, and day. The recon area is the previously sampled decision unit name (e.g., DU-441). The individual files for the day (e.g., file 1, file 2, file N) will be placed within this folder using the default file identifier provided by the camera.

Transfer of Information and Archive

After the photograph disks have been uploaded, the original hard copy of the photograph log will be initialed and dated by the team member who downloaded the photographs, then archived by the field team leader.

Field Coordinator Responsibilities

The field team leader will be responsible for 1) reviewing electronic photographs and the logs as they are made available to ensure consistency and completeness of annotations; 2) collecting and archiving the hard copies of the photograph logs; 3) reviewing electronic photographs and the logs as they are made available to ensure consistency and completeness of annotations; and 4) notifying the field team leader of apparent inconsistencies and making recommendations for corrective action.

Key Checks and Items

Important checks for digital camera management are:

- Make sure the camera's battery is fully charged on a daily basis
- Keep extra memory sticks available
- To save battery life, use flash only when necessary
- Make sure the camera quality level is set at "best" or equivalent (high pixel)
- Review photograph records periodically to ensure that the electronic photographs and the data log agree
- Leave enough time at the end of the field day to transfer the data.