DOE/RL-2013-53
Revision 1

Hanford Site Environmental Surveillance Master Sampling Schedule for Calendar Year 2015

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

P.O. Box 550
Richland, Washington 99352

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Summary

Mission Support Alliance (MSA) conducts environmental surveillance of the Hanford Site and surrounding areas for the U.S. Department of Energy, Richland Operations Office (DOE-RL). Sampling is conducted to evaluate levels of radioactive and nonradioactive pollutants in the Hanford Site environs, as required in DOE O 436.1, Supp Rev. 0, *Departmental Sustainability*, and DOE O 458.1, Chg. 2, *Radiation Protection of the Public and the Environment*.[1,2] The environmental surveillance sampling design is described in the *Hanford Site Environmental Monitoring Plan*, (DOE/RL-91-50).[3]

This document contains the calendar year (CY) 2015 schedule for routine radiological surveys and collection of samples for the Environmental Surveillance Project. Each section includes a general timeline for surveys and collection of samples, sampling locations, sampling frequencies, sample types, and analyses to be performed. In some cases, samples are scheduled on a rotating basis. If a sample will not be collected during the current year, the anticipated year for collection is provided.

Environmental Surveillance Project Sampling

The Environmental Surveillance project is a multimedia environmental surveillance effort to measure the concentrations of radionuclides and chemicals in environmental media and radiological external exposure levels. The data obtained from these efforts is used to demonstrate compliance with applicable environmental quality standards and public exposure limits, and assess environmental impacts. Project personnel collect selected samples of ambient air, surface water, agricultural products, fish, wildlife, soil, vegetation, sediments, and dosimeters as well as perform radiological surveys at or near known radioactive waste sites.

A radiological pathway analysis and exposure assessment is performed annually. The results of the pathway analysis and exposure assessment, as well as a biota dose screening evaluation, serve as the bases for the design of the ES program. The surveillance design is reviewed and evaluated annually based on the above considerations and an awareness of planned waste management and environmental restoration activities.

Quality Assurance

Quality Assurance (QA) duplicate samples are used to assess sample collection process variance. A sample collection process includes collection, handling, storage, and laboratory analyses. Similar sample collection methods for similar media are considered to be the same process. Air sample QA samples are collected through the employment of collocated sampling stations at two locations. Duplicate QA samples are obtained at a frequency range of 5-10% (duplicate to parent ratio). With the exception of routine air samples, equipment blanks are collected from each type of sampling equipment used to ensure that decontamination procedures are applicable to the specific equipment types. Equipment blanks are analyzed for the same analytes as are the samples being collected or as specified in the project-specific SOPs, SAP, or other work control documents (DOE/RL-96-68, HASQARD Volume 2, Sampling

[1] DOE O 436.1, Supp Rev. 0. 2011. *Departmental Sustainability*. U.S. Department of Energy, Washington, D.C.

[2] DOE Order 458.1, Chg. 2. 2011. *Radiation Protection of the Public and the Environment*. U.S. Department of Energy, Washington, D.C.

[3] DOE/RL-91-50, Rev. 6A. 2013. *Environmental Monitoring Plan, United States Department of Energy, Richland Operations Office*. U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Technical Requirements). The Environmental Surveillance project collects environmental samples that are either split or collocated with the Washington State Department of Health (DOH) and the results are compared by DOH to verify the quality of the Environmental Surveillance monitoring program.

Data Management

The Hanford Environmental Information System (HEIS) and the Automated Bar Coding of All Samples at Hanford (ABCASH) databases are used as repositories for data gathered during environmental surveillance activities at the Hanford Site. For ease in retrieving Environmental Surveillance data from the databases, the majority of the location names in this document are the location names used in these databases.

Schedule Changes

This schedule is subject to modification during the year in response to changes to Hanford Site operations, program requirements, project funding, and the nature of the observed results. Operational limitations such as weather, mechanical failures, sample availability, and other factors may also impact scheduled sampling. As a result, this document should not be considered an accurate record of samples collected during the year.

Acronyms and Symbols

^{129}I	iodine-129
^{137}Cs	cesium-137
^{14}C	carbon-14
^{241}Am	americium-241
^{241}Pu	plutonium-241
^{3}H	tritium
^{90}Sr	strontium-90
^{99}Tc	technetium-99
A	annually
ABCASH	Automated Bar Coding of All Samples at Hanford
ALE	Fitzner/Eberhardt Arid Lands Ecology Reserve
Alpha	gross alpha activity of a sample
Anions	major anions – generally chloride, fluoride, nitrate, nitrite, sulfate
BE	biennially (every two years)
Beta	gross beta activity of a sample
BW	biweekly (every two weeks)
Cr^{+6}	hexavalent chromium
CSB	Canister Storage Building
CSTL	Cross Site Transfer Line
DOE	U.S. Department of Energy
DOH	Washington State Department of Health
DR	Downriver
EDP	Environmental Data Point
ERDF	Environmental Restoration Disposal Facility
GEA	Gamma Energy Analysis
HEIS	Hanford Environmental Information System
Hg-CVAA	mercury by cold vapor atomic absorbance spectrometry
Hg-CVAF	total mercury in water by cold vapor atomic fluorescence
HGP	Hanford Generating Project
HRM	Hanford River Mile
HTO	tritiated water ($^{3}H^{1}H^{16}O$)
ICP-MS	major metals by inductively coupled plasma mass spectrometry – samples unfiltered unless otherwise noted
IDF	Integrated Disposal Facility
Lo ^{3}H	low-level method for the electrolytic enrichment of tritium
M	monthly
MSA	Mission Support Alliance
PFP	Plutonium Finishing Plant
PRD	Priest Rapids Dam
PSRP	Public Safety and Resource Protection

Pu	isotopic plutonium (^{238}Pu, $^{239/240}Pu$)
Q	quarterly
RPH	Richland Pumphouse
SA	semiannually (twice each year)
TA	tri annual (three times a year)
TBD	To Be Determined
TE	triennially (every three years)
TLD	Thermoluminescent Dosimeter
TOC	total organic carbon
TPH	total petroleum hydrocarbons
U	isotopic uranium (^{234}U, ^{235}U, ^{238}U)
VOA	volatile organic analysis
WCH	Washington Closure Hanford

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Schedule by Media

In this section of the schedule, the planned sampling events are shown per media. The locations, sampling frequency, and radiochemical and chemical analyses are also provided. Maps for each sample media are included within each section of the document.

1.0 Air Surveillance

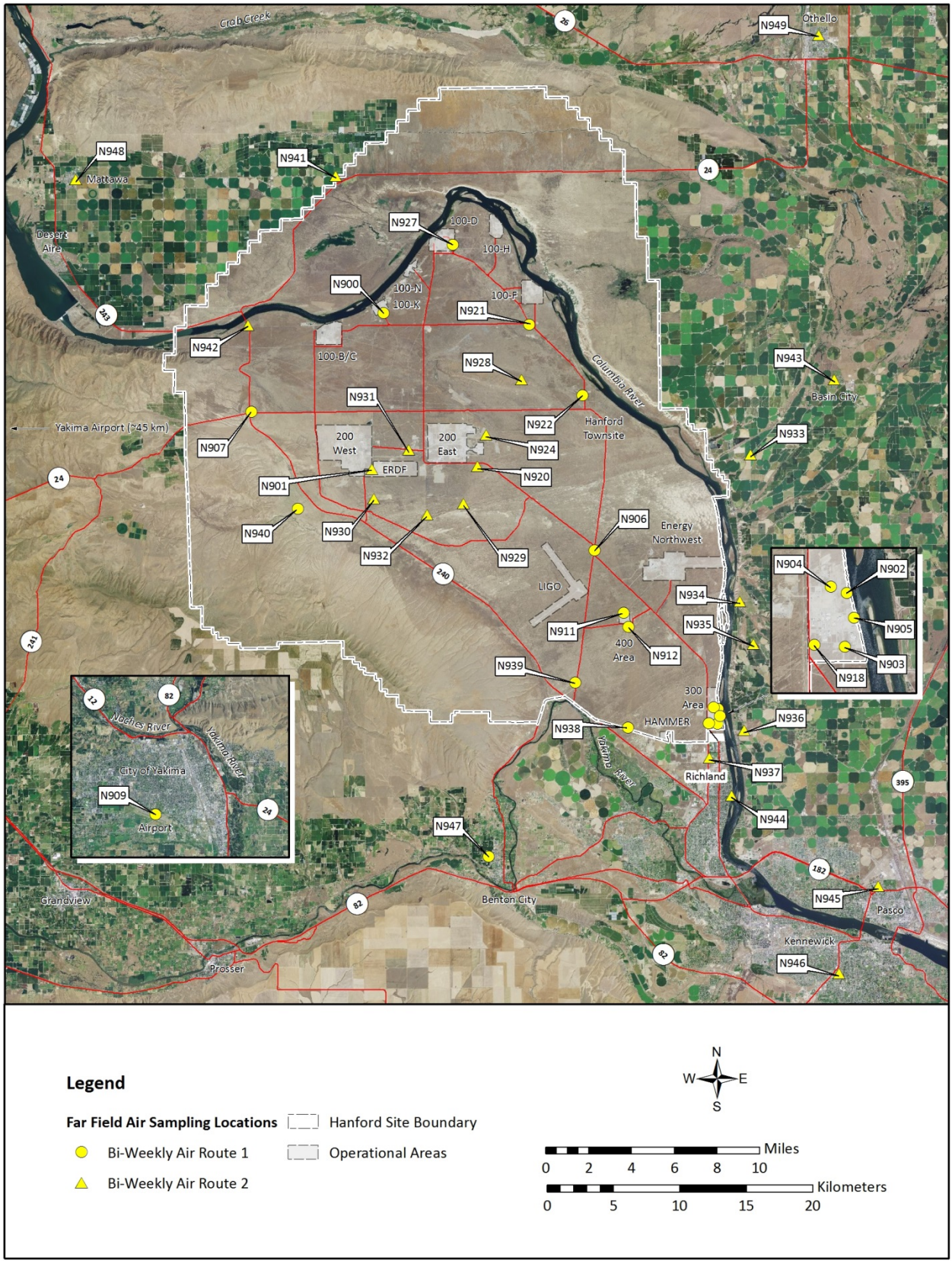
1.1 Far Field Air Monitoring

Far Field Air Monitoring		Analyses		
Air Monitoring Locations	**EDP Code**	**Bi-Weekly[a]**	**Monthly[b]**	**Semi-Annual Composite**
Onsite				
100 K Area	N900	Beta, Alpha	Tritium	^{90}Sr, Pu, GEA
100 D Area	N927	Beta, Alpha		^{90}Sr, Pu, GEA
100 F Met Tower	N921	Beta, Alpha		^{90}Sr, Pu, GEA
Hanford Townsite	N922	Beta, Alpha		^{90}Sr, Pu, GEA
Gable Mountain	N928	Beta, Alpha		Pu, U, GEA
200 ESE	N920	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
S of 200-E	N929	Beta, Alpha		^{90}Sr, Pu, U, GEA
B Pond	N924	Beta, Alpha		Pu, U, GEA
Army Loop Camp	N930	Beta, Alpha		^{90}Sr, Pu, U, GEA
200 Tel. Exchange	N931	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
SW of B/C Cribs	N932	Beta, Alpha		^{90}Sr, Pu, U, GEA
200 W SE	N901	Beta, Alpha		Pu, U, GEA
300 Water Intake[c, d]	N905	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
300 South Gate[e]	N903	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
300 South West	N918	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
300 Trench	N904	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
300 NE	N902	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
400 N	N911	Beta, Alpha		^{90}Sr, Pu, GEA
400 S	N912	Beta, Alpha	Tritium	^{90}Sr, Pu, GEA
Wye Barricade[c, f]	N906	Beta, Alpha		Pu, U, GEA
Perimeter				
Ringold Met Tower	N933	Beta, Alpha	Tritium	Pu, GEA
W End of Fir Road [c]	N934	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
Dogwood Met Tower	N935	Beta, Alpha	Tritium	^{90}Sr, U, GEA
Byers Landing	N936	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
Battelle Complex[c, d]	N937	Beta, Alpha	Tritium	U, GEA
Horn Rapids Substation	N938	Beta, Alpha		^{90}Sr, Pu, GEA
Prosser Barricade[c]	N939	Beta, Alpha	Tritium	^{90}Sr, Pu, GEA
Yakima Barricade[c]	N907	Beta, Alpha		^{90}Sr, Pu, GEA
Rattlesnake Springs	N940	Beta, Alpha		^{90}Sr, Pu, GEA
Wahluke Slope	N941	Beta, Alpha	Tritium	^{90}Sr, Pu, GEA
S End Vernita Bridge	N942	Beta, Alpha		^{90}Sr, Pu, GEA

Far Field Air Monitoring		Analyses		
Air Monitoring Locations	**EDP Code**	**Bi-Weekly[a]**	**Monthly[b]**	**Semi-Annual Composite**
Community				
Basin City School	N943	Beta, Alpha	Tritium	Pu, U, GEA
Leslie Groves-Richland	N944	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA
Pasco	N945	Beta, Alpha		^{90}Sr, Pu, U, GEA
Kennewick-Ely Street	N946	Beta, Alpha		^{90}Sr, Pu, U, GEA
Benton City	N947	Beta, Alpha		GEA
Mattawa	N948	Beta, Alpha		GEA
Othello	N949	Beta, Alpha		U, GEA
Distant				
Yakima	N909	Beta, Alpha	Tritium	^{90}Sr, Pu, U, GEA

(a) Particulate samples are collected every two weeks using 2-inch glass-fiber filters. These filters are analyzed then stored for the semi-annual composite.
(b) Four-week atmospheric water vapor samples for tritium analysis are collected using silica gel columns.
(c) DOH particulate air sampler also at this location.
(d) DOH tritium air sampler also at this location.
(e) Two tritium samples are collected from this location, one as QA duplicate sample.
(f) QA duplicate sample collected at this location.

Figure 1. Far Field Air Sampling Locations



1.2 Near Field Air Monitoring

Air Monitoring Locations	Number of Samplers	EDP Codes	Analyses	
			Bi-Weekly[a]	Semi-Annual Composite
100-K Area	6	N476, N534, N535, N575, N576[b], 578	Beta, Alpha	^{90}Sr, Pu, U, ^{241}Pu, ^{241}Am, GEA
200 East Area	17	N019, N158, N498, N499, N957, N967, N968, N969, N970, N972, N973, N976, N977, N978, N984[b], N985, N999	Beta, Alpha	^{90}Sr, Pu, U, GEA
CSB (200 E Area)	2	N480, N481	Beta, Alpha	^{90}Sr, Pu, U, ^{241}Pu, ^{241}Am, GEA
IDF (200 E Area)	2	N532, N559	Beta, Alpha	^{90}Sr, Pu, U, GEA
200 West Area	23	N155, N161, N165[b], N168, N200, N304[c], N433, N441, N442, N449, N456, N457, N554, N555, N956, N963, N964, N965, N966[c], N974, N975, N987, N994	Beta, Alpha	^{90}Sr, Pu, U, GEA
300 Area	2	N130	Beta, Alpha	^{90}Sr, Pu, U, GEA
		N557	Beta, Alpha	Pu, U, GEA
618-10 Burial Ground	4	N548[b], N549, N579, N580	Beta, Alpha	^{90}Sr, Pu, U, GEA
ERDF	3	N482[b], N517, N518	Beta, Alpha	^{90}Sr, Pu, U, GEA
WYE Barricade	1	N981[b, c]	Beta, Alpha	^{90}Sr, Pu, U, GEA

(a) Particulate samples are collected using 47-mm Versapor 3000 TN W/WA filters. These filters are analyzed then stored for the semi-annual composite.
(b) DOH particulate air sampler also at this location.
(c) QA duplicate sample collected at this location.

Figure 2. Near Field Air Sampling Locations in the 100 K Area

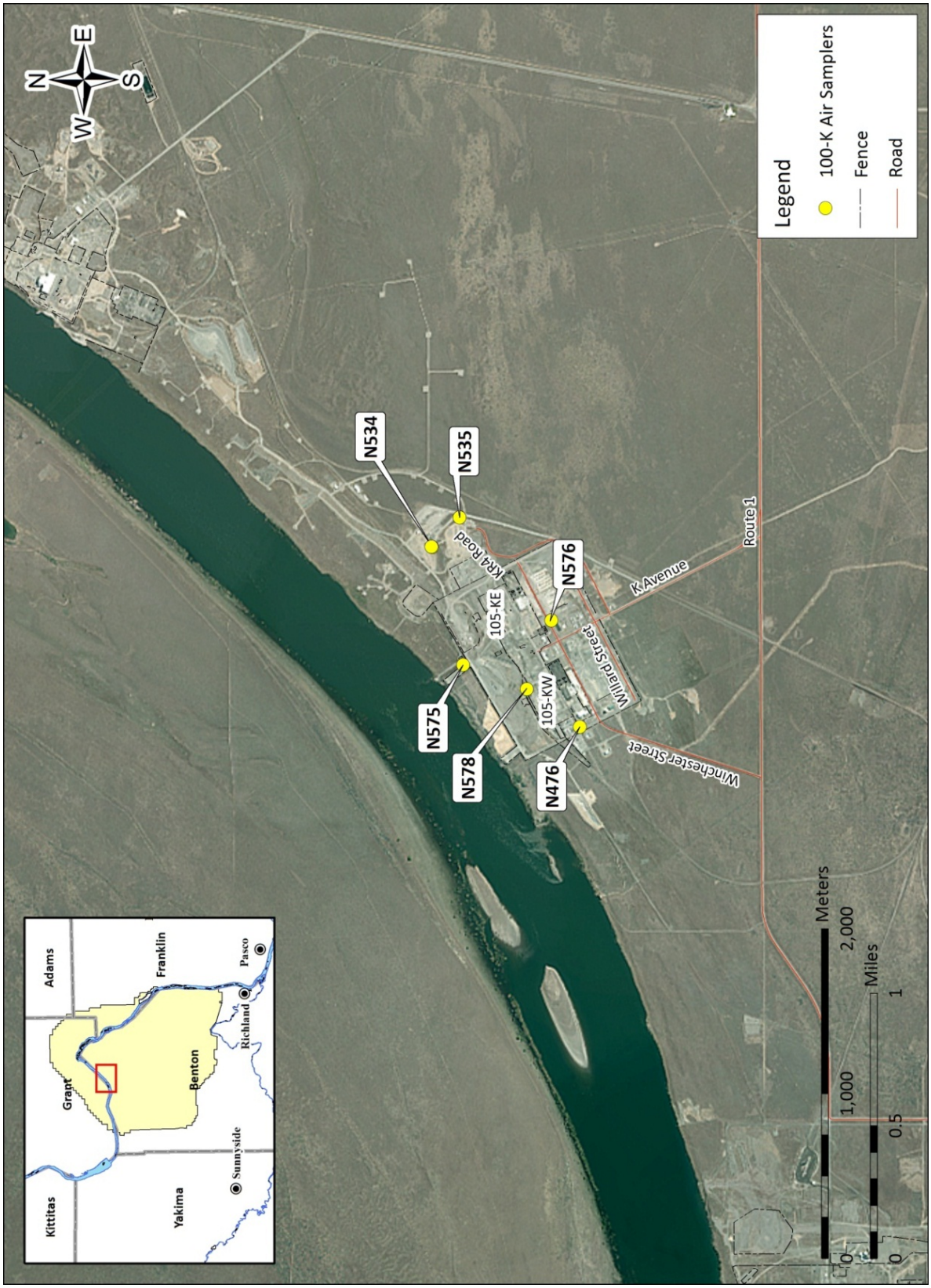


Figure 3. Near Field Air Sampling Locations in the 200 East Area

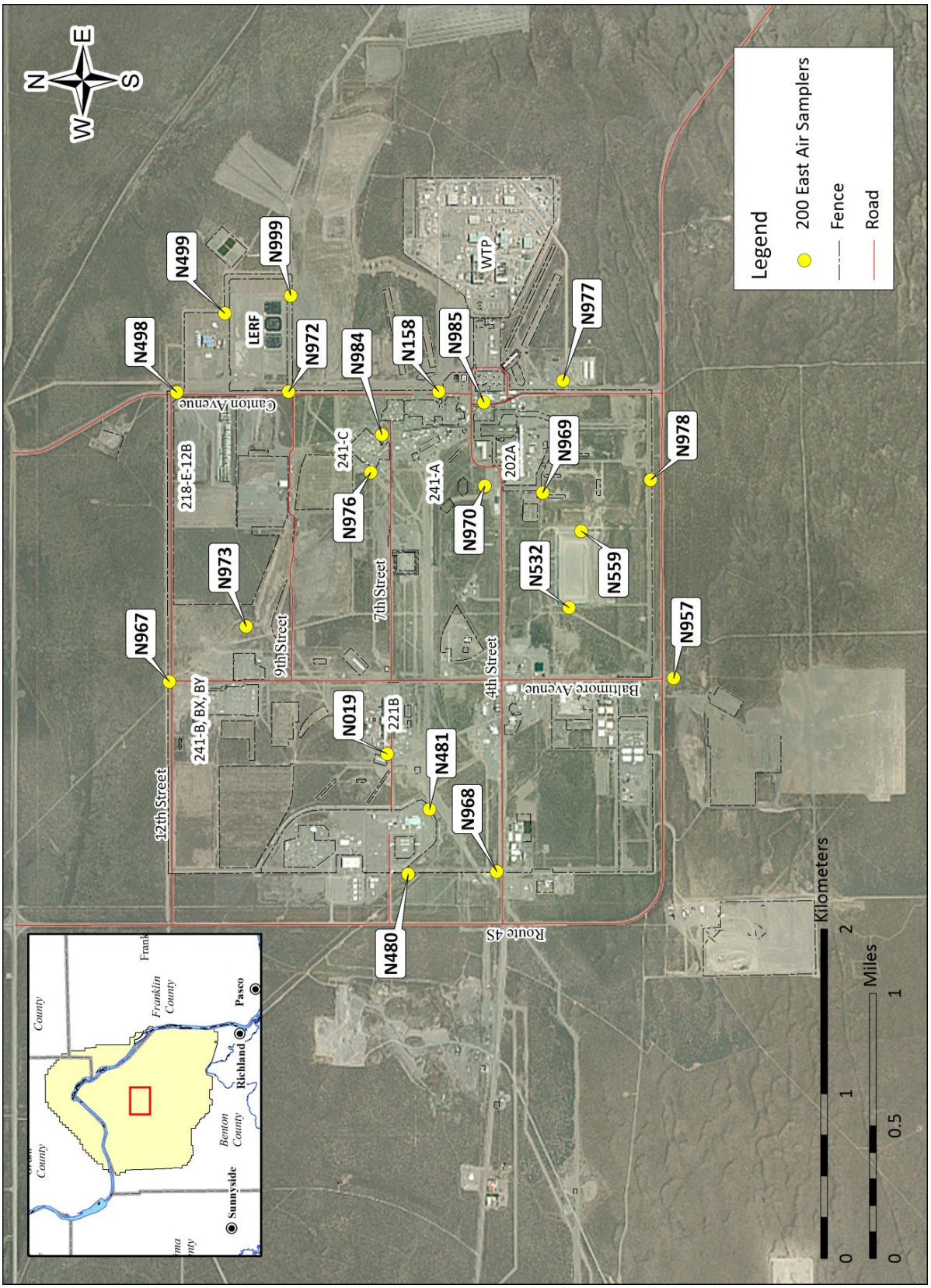


Figure 4. Near Field Air Sampling Locations in the 200 West Area

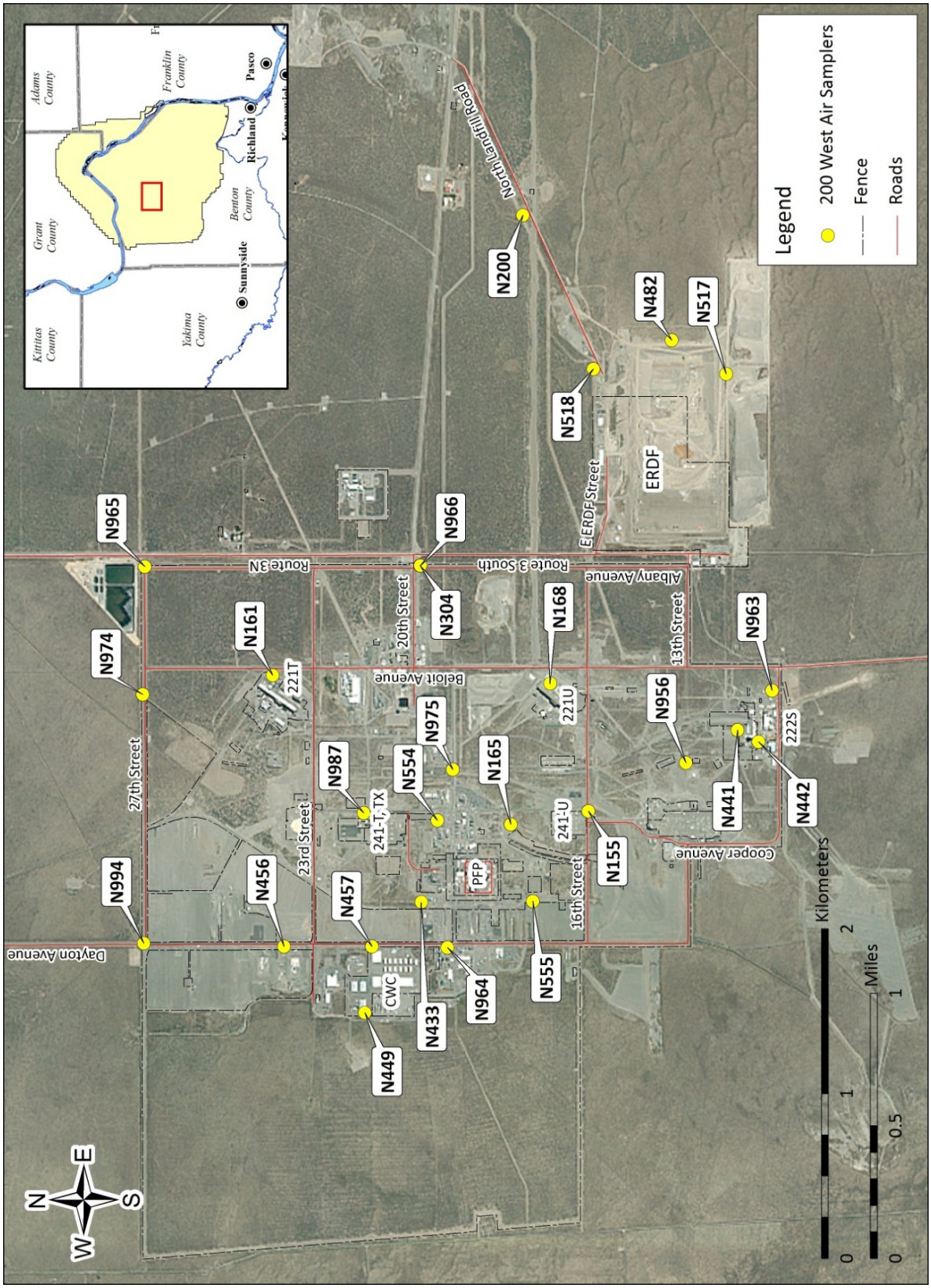


Figure 5. Near Field Air Sampling Locations in the 300 Area

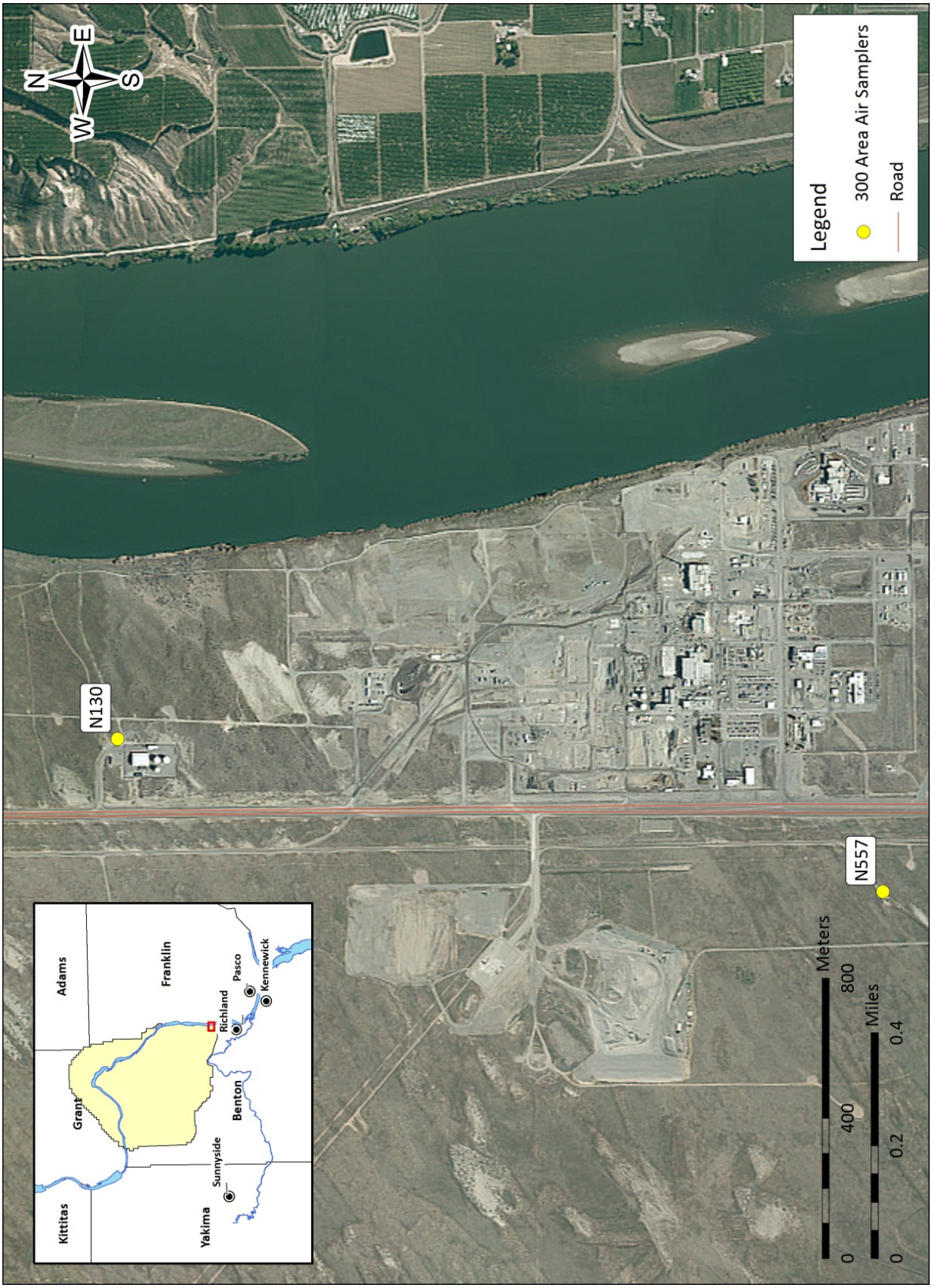
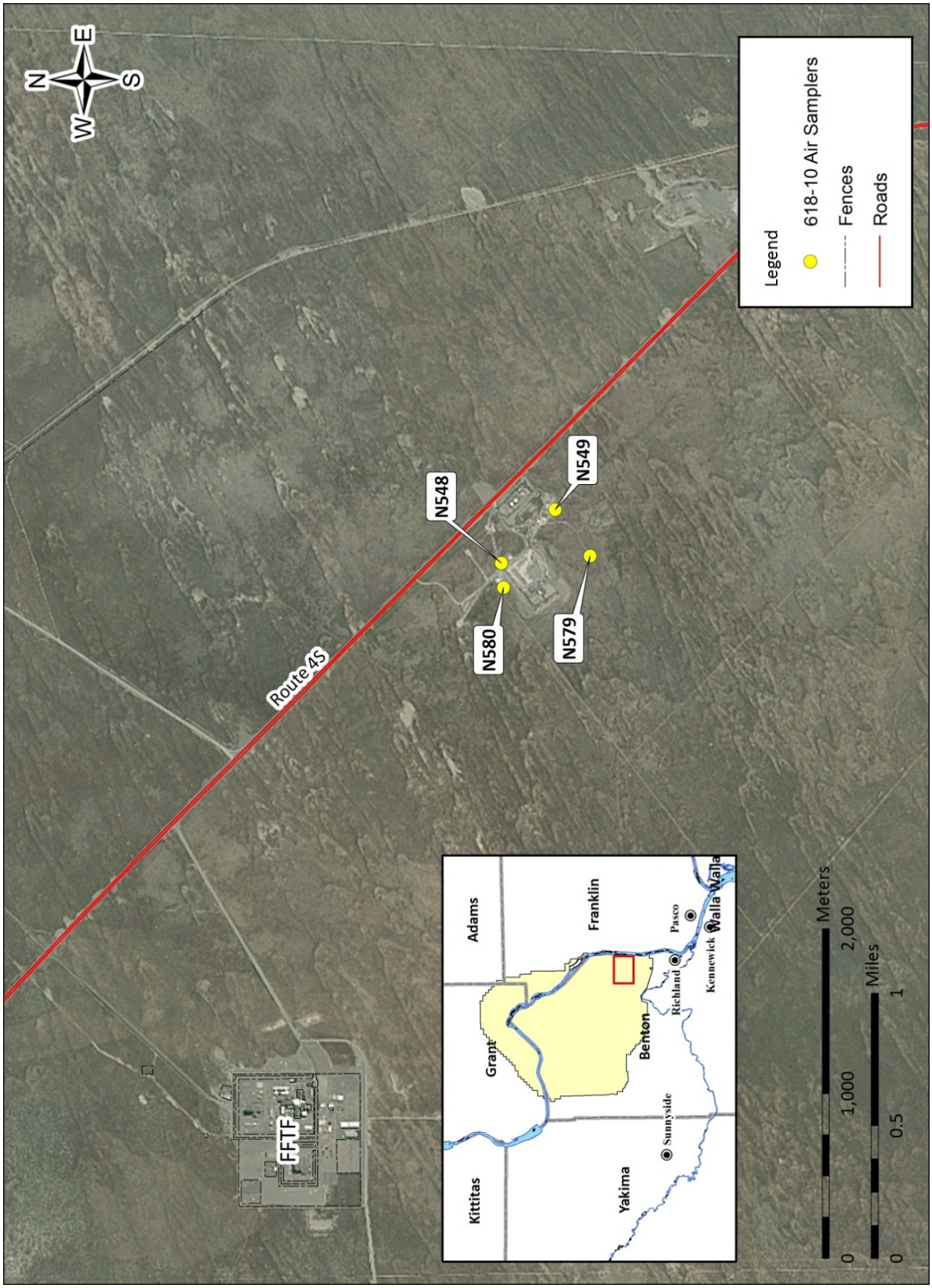


Figure 6. Near Field Air Sampling Locations at the 618-10 Burial Ground



2.0 Surface Water Surveillance

2.1 Columbia River – Continuous Sampling

Location	Sample Type	Sample Frequency	Analyses
Priest Rapids Dam	Cumulative (water)[a]	Monthly Composite[b, c]	Lo ^{3}H, ^{90}Sr, ^{99}Tc, U
	Particulate (filter)[d]	Monthly Composite[c]	GEA, Pu
	Soluble (resin)[d]	Monthly Composite	GEA, Pu
Richland Pump House	Cumulative (water)[a]	Monthly Composite[c]	Lo ^{3}H, ^{90}Sr, ^{99}Tc, U
	Particulate (filter)[d]	Monthly Composite	GEA, Pu
	Soluble (resin)[d]	Monthly Composite	GEA, Pu

(a) Sample is collected bi-weekly and composited monthly for analysis.
(b) Additional sample provided to DOH (January and June only).
(c) QA duplicate sample compiled during June. Analyses for the QA sample will be the same as for the parent sample.
(d) Sample is collected bi-weekly and composited monthly for GEA and Pu analyses.

2.2 Columbia River – Transects

Location	Sample Frequency	Collection Period	Analyses
Richland Pump House -1 HRM46.4[a, b] Richland Pump House -3 HRM46.4 Richland Pump House -5 HRM46.4 Richland Pump House -7 HRM46.4 Richland Pump House -9 HRM46.4	SA	March[b] and August	GEA, Lo ^{3}H, ^{90}Sr, U, Pu, ^{99}Tc, Anions, ICP-MS, ICP-MS Filtered, Hg-CVAF, VOA
Vernita-1 HRM 0.3[a, b] Vernita-2 HRM 0.3 Vernita-3 HRM 0.3 Vernita-4 HRM 0.3	SA	March[b] and August	GEA, Lo ^{3}H, ^{90}Sr, U, Pu, ^{99}Tc, Anions, ICP-MS, ICP-MS Filtered, Hg-CVAF, VOA
100 N -1 HRM 9.5 100 N -3 HRM 9.5 100 N -5 HRM 9.5 100 N -7 HRM 9.5 100 N -9 HRM 9.5	A	August	GEA, Lo ^{3}H, ^{90}Sr, U, Anions, ICP-MS, ICP-MS Filtered
Hanford Townsite -1 HRM 28.7 Hanford Townsite -3 HRM 28.7 Hanford Townsite -5 HRM 28.7 Hanford Townsite -7 HRM 28.7 Hanford Townsite -9 HRM 28.7	A	August	GEA, Lo ^{3}H, ^{90}Sr, U, Anions, ICP-MS, ICP-MS Filtered
300 Area -1 HRM 43.1[a] 300 Area -3 HRM 43.1 300 Area -5 HRM 43.1 300 Area -7 HRM 43.1 300 Area -9 HRM 43.1	A	August	GEA, Lo ^{3}H, ^{90}Sr, U, Anions, ICP-MS, ICP-MS Filtered

(a) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.
(b) Additional sample provided to DOH.

2.3 River Bank Seeps

Location[a]	HRM[b]	Collection Period	Analyses
100-B Spring 38-3[c]	3.8	September	^{3}H, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions
100-B Spring 39-2	3.9	September	^{3}H, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions
100-K Spring 63-1[c, d, e]	6.3	September	Alpha, Beta,^{3}H, ^{90}Sr, ^{99}Tc, ^{14}C, ICP-MS, ICP-MS Filtered, Anions, VOA
100-K Spring 68-1[c]	7.6	September	Alpha, Beta,^{3}H, ^{90}Sr, ^{99}Tc, ^{14}C, ICP-MS, ICP-MS Filtered, Anions, VOA
100-N Spring 89-1[c]	9.1	September	^{3}H, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions, TPH
100-N Spring 8-13[c, d]	9.3	September	Alpha, Beta,^{3}H, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions
100-D Spring 110-1[d]	11	September	Alpha, Beta,^{3}H, ^{99}Tc , U, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions
100-H Spring 145-1	14.4	September	^{3}H, ^{99}Tc, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions
100-H Spring 152-2[c]	15.2	September	Alpha, Beta,^{3}H, ^{99}Tc, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions
100-F Spring 207-1	20.7	September	^{3}H, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions
100-F Spring 211-1	21.1	September	^{3}H, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions
Hanford Townsite 25-4	25.4	September	Alpha, Beta,^{3}H, ^{99}Tc, ^{90}Sr, ICP-MS, ICP-MS Filtered, Anions, VOA
Hanford Spring 28-2[d]	28.1	September	Alpha, Beta,^{3}H, Anions, ^{129}I
300 Area Spring 42-2[d]	42.1	September	Alpha, Beta,^{3}H, U, Anions, VOA
300 Area Spring DR 42-2[a, d]	42.4	September	Alpha, Beta,^{3}H, U, Anions, VOA

(a) QA duplicate samples collected. Analyses for the QA sample will be the same as for the parent sample.
(b) HRMs are a series of signposts along the Hanford Site shoreline of the Columbia River that are roughly 1.6 km (1 mi) apart. The Vernita Bridge is HRM #0, and Ferry Street in Richland is HRM #46.
(c) Drive point sample collection available.
(d) Additional sample provided to DOH.
(e) Additional surface water and drive point samples collected in January, April, and July for ^{14}C analysis. Additional surface water sample collected in September for ^{14}C analysis.

2.4 Onsite Pond

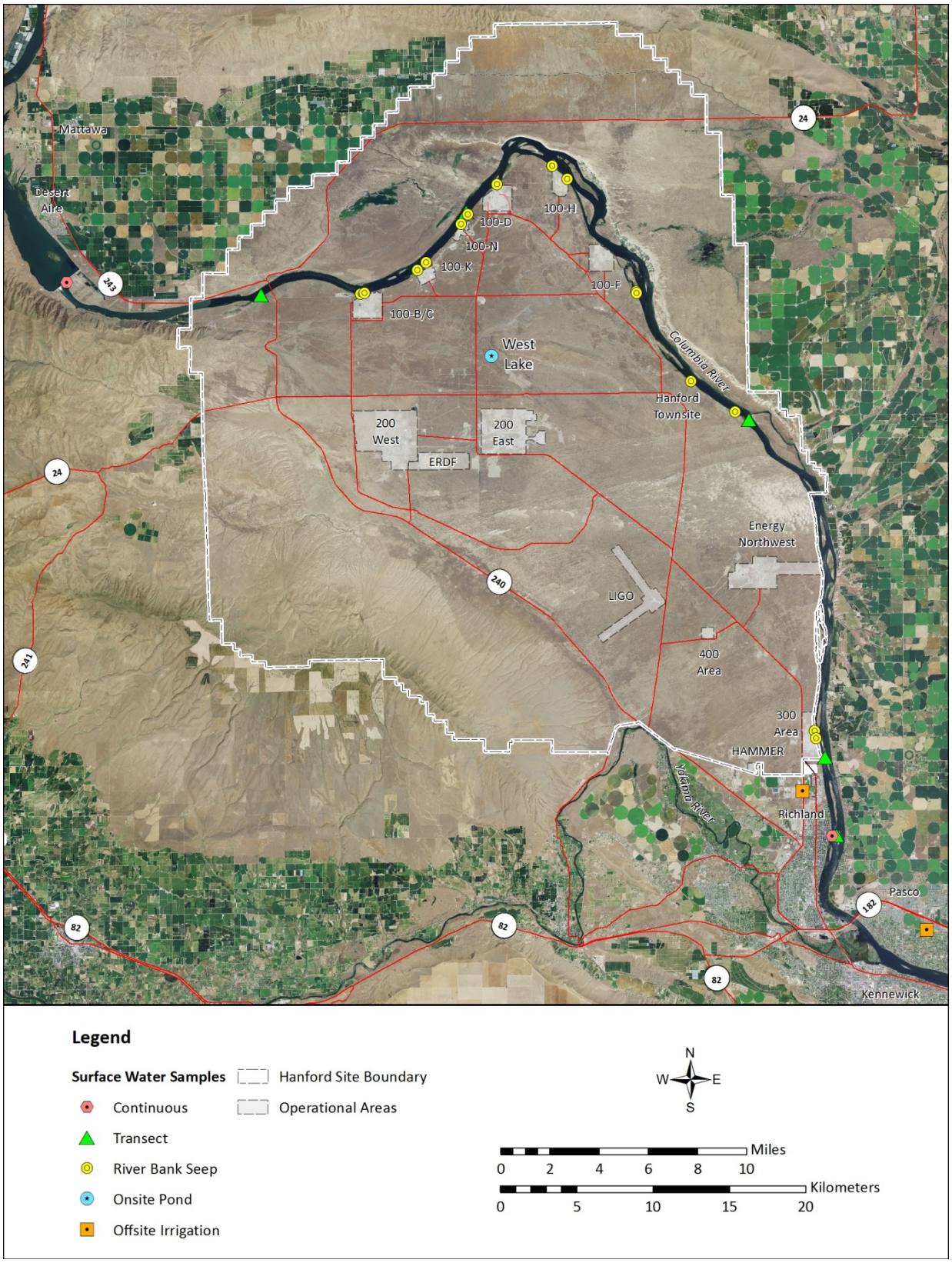
Location	Collection Period	Analyses
West Lake Seep	March	^{3}H, U
West Lake Water	May	^{3}H, U

2.5 Offsite Irrigation

Location	Collection Period	Analyses
Riverview Canal	May[a], June, and July	Alpha, Beta, Lo ^{3}H, ^{90}Sr, GEA
Horn Rapids Area	May[a], June[b], and July	Alpha, Beta, Lo ^{3}H, ^{90}Sr, GEA

(a) Additional sample provided to DOH.
(b) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.

Figure 7. Surface Water Sampling Locations



3.0 Biota

3.1 Food and Farm Products

3.1.1 Milk

Location	Frequency	Collection Period	Analyses
East Wahluke Area[a]	Q	Feb., May[b], Aug., and Nov.	Lo ^{3}H, ^{90}Sr, GEA
Sagemoor Composite[a]	Q	Feb., May, Aug., and Nov.	Lo ^{3}H, ^{90}Sr, GEA
Sunnyside Area	Q	Feb., May, Aug., and Nov.	Lo ^{3}H, ^{90}Sr, GEA

(a) Sample composited from multiple dairies in each area.
(b) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.

3.1.2 Vegetables

Location[a]	Frequency	Collection Period	Analyses
Leafy Vegetables			
Riverview Area[b]	A	June	^{90}Sr, GEA, ^{14}C
Sunnyside Area	A	June	^{90}Sr, GEA, ^{14}C
East Wahluke Area[b]	A	June	^{90}Sr, GEA, ^{14}C
Sagemoor Area[b]	A	June	^{90}Sr, GEA, ^{14}C
Potatoes			
Riverview Area[b]	A	August	^{90}Sr, GEA
Sunnyside Area	A	August	^{90}Sr, GEA
East Wahluke Area[b]	A	August	^{90}Sr, GEA
Sagemoor Area[b]	TE (2015)	August	^{90}Sr, GEA
Horn Rapids Area[b]	BE (2015)	August	^{90}Sr, GEA
Corn[c]			
Riverview Area[b]	A	July	^{90}Sr, GEA, ^{14}C
Sunnyside Area	A	July	^{90}Sr, GEA, ^{14}C
East Wahluke Area[b]	A	July	^{90}Sr, GEA, ^{14}C
Sagemoor Area[b]	A	July	^{90}Sr, GEA, ^{14}C
Alfalfa			
Sagemoor Area	BE (2015)	May	^{90}Sr, GEA
Riverview Area[b]	BE (2015)	May	^{90}Sr, GEA
Sunnyside Area	BE (2015)	May	^{90}Sr, GEA
Horn Rapids Area[b]	BE (2015)	May	^{90}Sr, GEA

(a) Two samples collected within each area; one is analyzed and one is archived.
(b) Additional sample provided to DOH.
(c) Four samples collected within each area (kernels and vegetation); Two are analyzed and two are archived.

3.1.3 Fruits

Location[a]	Frequency	Collection Period	Analyses
Tomatoes			
Riverview Area	A	August	^{90}Sr, ^{3}H, GEA
Sunnyside Area	A	August	^{90}Sr, ^{3}H, GEA
Cherries			
Riverview Area[b]	TE (2017)	June	^{90}Sr, GEA
Sagemoor Area[c]	2015 and 2017	June	^{90}Sr, GEA
Sunnyside Area[c]	TE (2017)	June	^{90}Sr, GEA
Ringold Area[c]	2015 and 2017	June	^{90}Sr, GEA
East Wahluke Area[c]	TE (2017)	June	^{90}Sr, GEA
Apples			
Mattawa Area[b, c]	TE (2015)	September	^{90}Sr, GEA
Riverview Area[c]	TE (2015)	September	^{90}Sr, GEA
Sagemoor Area[c]	TE (2015)	September	^{90}Sr, GEA
Sunnyside Area	TE (2015)	September	^{90}Sr, GEA
Grapes[d]			
Riverview Area[c]	TE (2016)	September	^{90}Sr, GEA
Sunnyside Area	TE (2016)	September	^{90}Sr, GEA
East Wahluke Area[b, c]	TE (2016)	September	^{90}Sr, GEA
Sagemoor Area[c]	TE (2016)	September	^{90}Sr, GEA
Melons			
Riverview Area[c]	A	July	^{90}Sr, GEA, ^{14}C
Sunnyside Area	A	July	^{90}Sr, GEA, ^{14}C
East Wahluke Area[c]	A	July	^{90}Sr, GEA, ^{14}C
Sagemoor Area[c]	A	July	^{90}Sr, GEA, ^{14}C

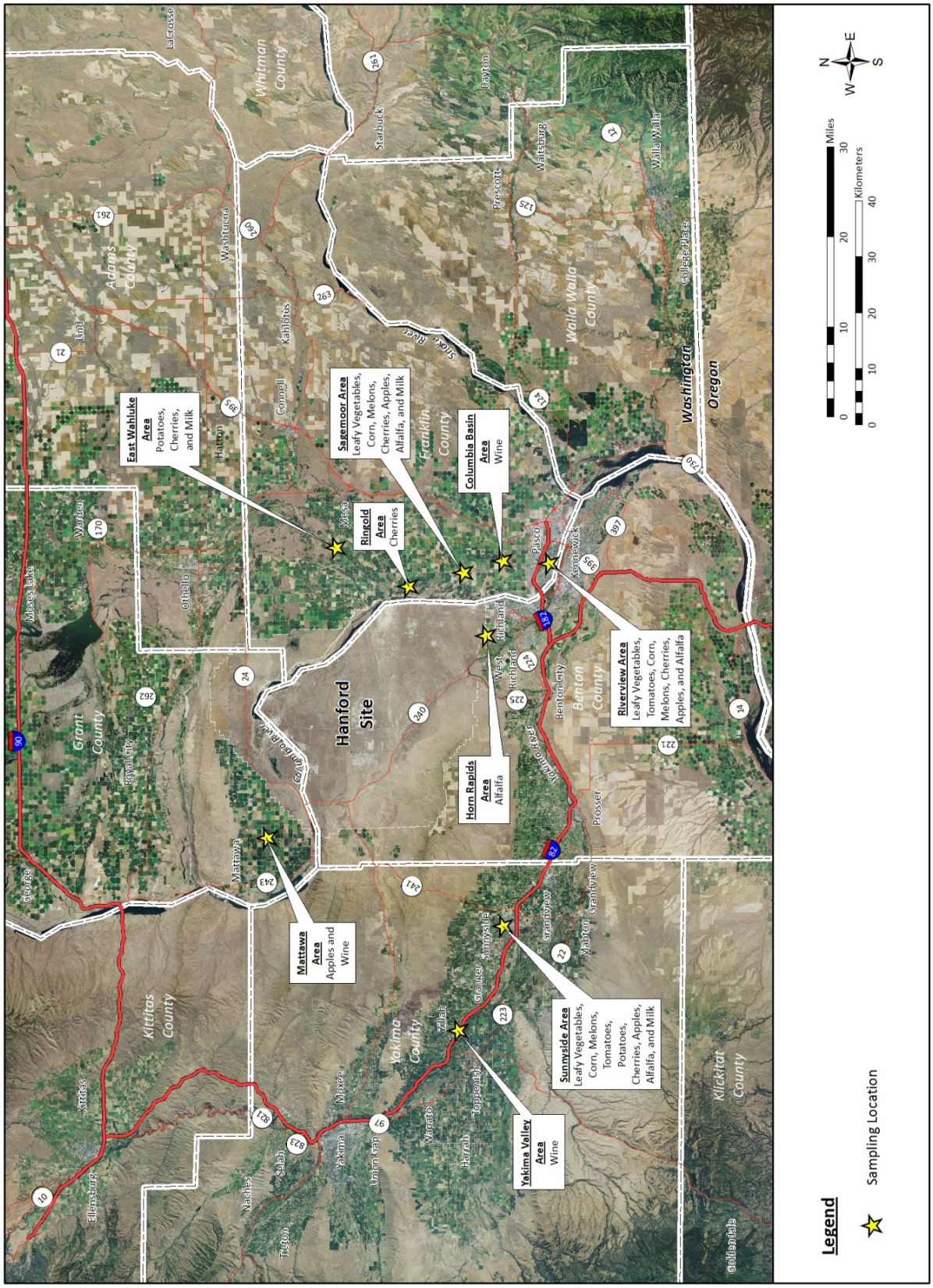
(a) Two samples collected within each area; one is analyzed and one is archived.
(b) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.
(c) Additional sample provided to DOH.
(d) Concord grapes are preferred, table grapes are acceptable.

3.1.4 Wine

Location[a]	Frequency	Collection Period	Analyses
Columbia Basin[b, c]	BE (2015)	December	Lo ^{3}H, GEA
Yakima Valley[b]	BE (2015)	December	Lo ^{3}H, GEA
Mattawa Area[b]	BE (2015)	December	Lo ^{3}H, GEA

(a) Two samples each of red and white wine collected within each area; one is analyzed and one is archived.
(b) Additional sample provided to DOH.
(c) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.

Figure 8. Food and Farm Products Sampling Locations



3.2 Wildlife

3.2.1 Fish

Location	Sample Item	Number of Samples	Frequency	Collection Period	Analyses
Bass[a]					
300 Area	Fillet	3	BE (2016)	July	GEA
	Fillet (Composite)	1	BE (2016)	July	GEA, U, Pu, ICP-MS, Hg-CVAA, ^{90}Sr, H^3
	Carcass	3	BE (2016)	July	^{90}Sr
100 Areas[b]	Fillet	3	BE (2016)	July	GEA
	Fillet (Composite)	1	BE (2016)	July	GEA, U, Pu, ICP-MS, Hg-CVAA, ^{90}Sr, H^3
	Carcass	3	BE (2016)	July	^{90}Sr
Hanford Slough/ Townsite[b]	Fillet	3	BE (2016)	July	GEA
	Fillet (Composite)	1	BE (2016)	July	GEA, U, Pu, ICP-MS, Hg-CVAA, ^{90}Sr, H^3
	Carcass	3	BE (2016)	July	^{90}Sr
Reference[c]	Fillet	3	BE (2016)	July	GEA
	Fillet (Composite)	1	BE (2016)	July	GEA, U, Pu, ICP-MS, Hg-CVAA, ^{90}Sr, H^3
	Carcass	3	BE (2016)	July	^{90}Sr
Carp[a]					
300 Area[b]	Fillet (composite)	3	TE (2017)	June	GEA, U, Pu, ICP-MS, Hg-CVAA, ^{90}Sr, H^3
	Carcass	3	TE (2017)	June	^{90}Sr
100 Areas[b]	Fillet (composite)	3	TE (2017)	June	GEA, U, Pu, ICP-MS, Hg-CVAA, ^{90}Sr, H^3
	Carcass	3	TE (2017)	June	^{90}Sr
Reference[c]	Fillet (composite)	3	TE (2017)	June	GEA, U, Pu, ICP-MS, Hg-CVAA, ^{90}Sr, H^3
	Carcass	3	TE (2017)	June	^{90}Sr
Whitefish[a]					
100 Areas[b]	Fillet	3	BE (2015)	October	GEA
	Fillet (Composite)	1	BE (2015)	October	GEA, U, Pu, ICP-MS, Hg-CVAA, ^{90}Sr, H^3
	Carcass	3	BE (2015)	October	^{90}Sr
Reference[d]	Fillet	3	BE (2015)	October	GEA
	Fillet (Composite)	1	BE (2015)	October	GEA, U, Pu, ICP-MS, Hg-CVAA, ^{90}Sr, H^3
	Carcass	3	BE (2015)	October	^{90}Sr

(a) Target to collect one QA duplicate fillet or carcass sample from any one of the listed locations. Analyses for the QA sample will be the same as for the parent sample.
(b) Additional whole fish sample provided to DOH.
(c) Reference location is Desert Aire/Vantage Area.
(d) Reference location is Priest Rapids/ Wanapum Pools.

3.2.2 Birds

Location	Sample Item	Number of Samples	Frequency	Collection Period	Analyses
Upland Game Birds[a, b]					
100-D to 100-H[c]	Muscle	3	BE (2016)	September	GEA
	Bone	3	BE (2016)	September	^{90}Sr
100-H to 100-F[c]	Muscle	3	BE (2016)	September	GEA
	Bone	3	BE (2016)	September	^{90}Sr
Reference	Muscle	3	BE (2016)	September	GEA
	Bone	3	BE (2016)	September	^{90}Sr
Waterfowl[b]					
100 Areas	Muscle	3	BE (2015)	July	GEA
	Bone	3	BE (2015)	July	^{90}Sr
Hanford Townsite to 300 Area	Muscle	3	BE (2015)	July	GEA
	Bone	3	BE (2015)	July	^{90}Sr
Reference	Muscle	3	BE (2015)	July	GEA
	Bone	3	BE (2015)	July	^{90}Sr

(a) Pheasants preferred; chukar or quail acceptable if pheasants are unavailable.
(b) Attempt to collect one QA duplicate muscle or bone sample from any one of the listed locations. Analyses for the QA sample will be the same as for the parent sample.
(c) Additional whole bird sample provided to DOH.

3.2.3 Mammals

Location	Sample Item	Number of Samples	Frequency	Collection Period	Analyses
Deer/Elk[a]					
Road Strike at Onsite Locations	Muscle[b]	≤10	BE (2016)	As Available	GEA
	Bone[b]	≤10	BE (2016)	As Available	^{90}Sr
	Liver[b]	≤10	BE (2016)	As Available	GEA, Pu, ICP-MS, Hg-CVAA
Reference[c]	Muscle	1	BE (2016)	As Available	GEA
	Bone	1	BE (2016)	As Available	^{90}Sr
	Liver	1	BE (2016)	As Available	GEA, Pu, ICP-MS, Hg-CVAA
Cottontail Rabbits[a]					
300 Area[d]	Muscle	3	BE (2015)	Feb. – March	GEA
	Bone	3	BE (2015)	Feb. – March	^{90}Sr
Reference	Muscle	3	BE (2015)	March – April	GEA
	Bone	3	BE (2015)	March – April	^{90}Sr

(a) Attempt to collect one QA duplicate muscle or bone sample from any one of the listed locations. Analyses for the QA sample will be the same as for the parent sample.
(b) Additional sample provided to DOH.
(c) The reference sample is obtained from DOH.
(d) Additional whole rabbit sample provided to DOH.

Figure 9. Whitefish Sampling Locations

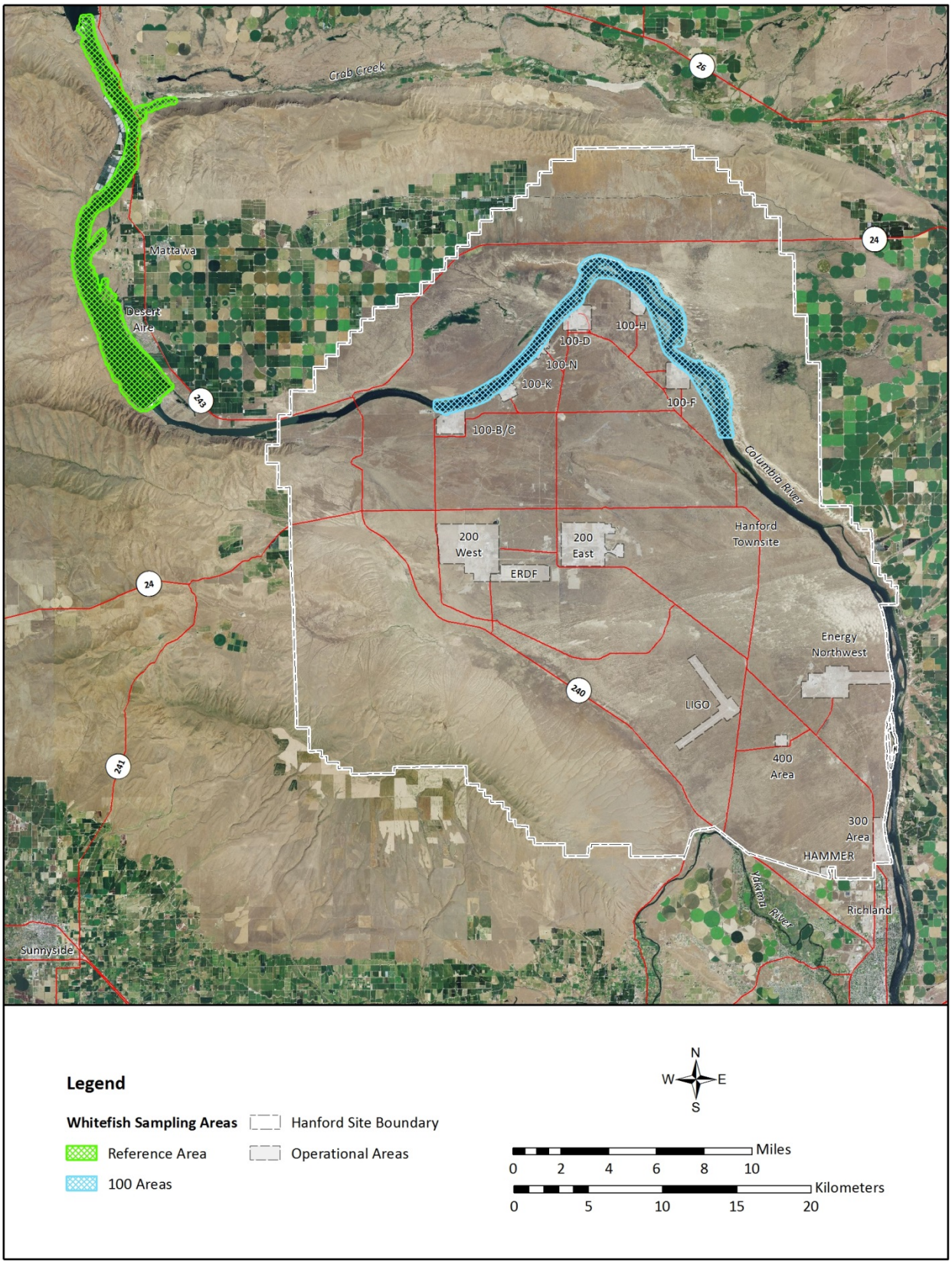


Figure 10. Waterfowl Sampling Locations

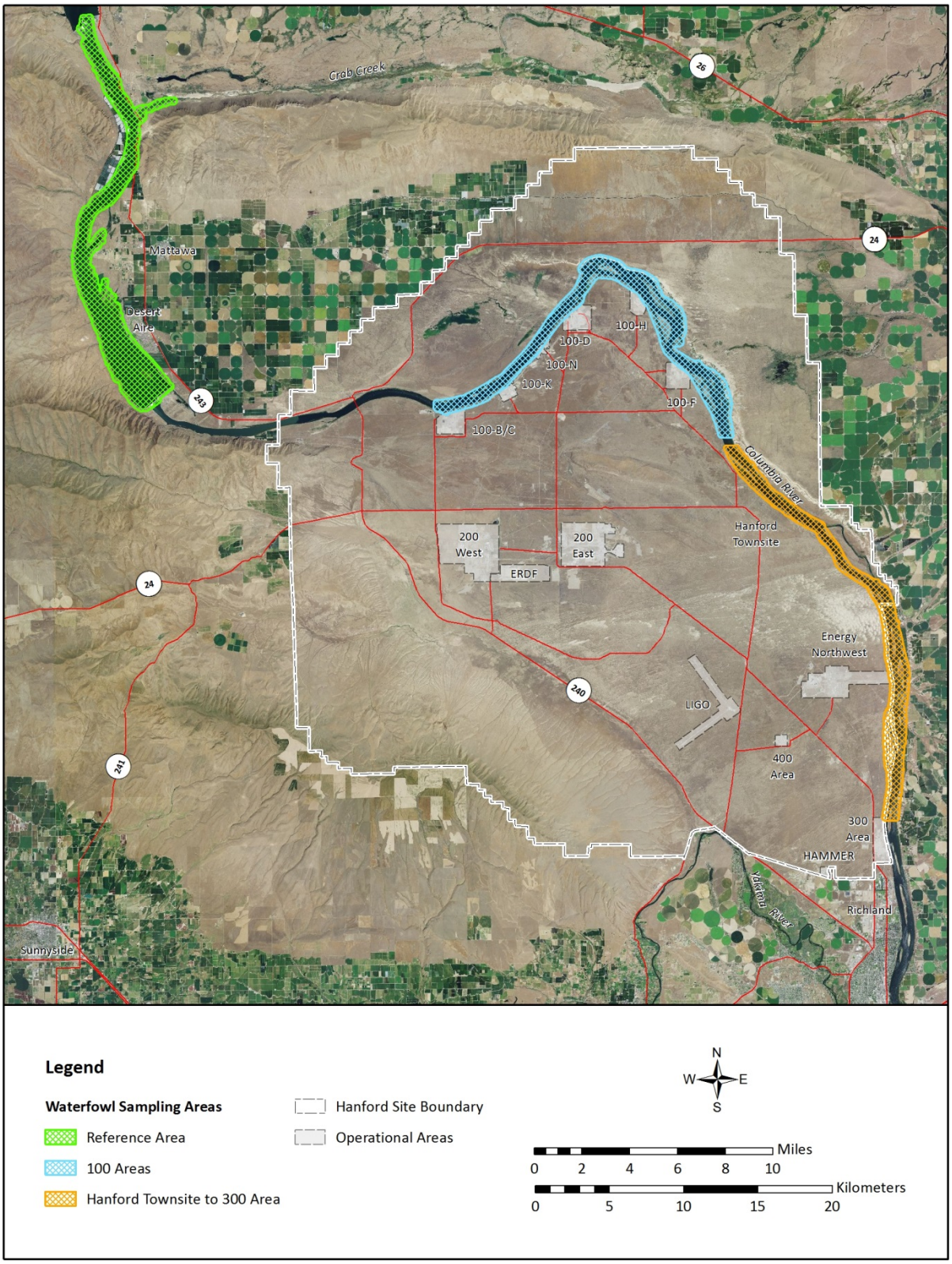
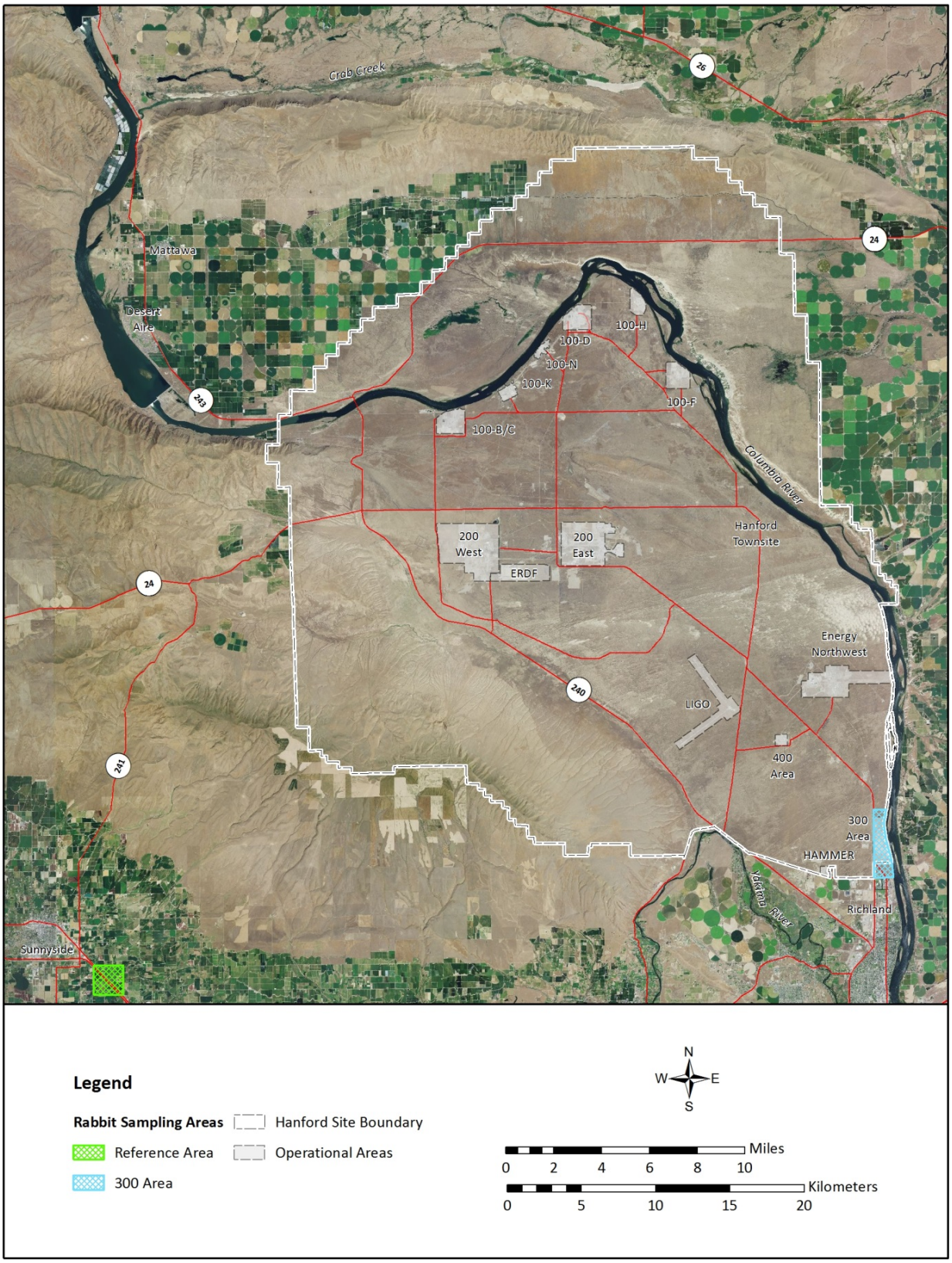


Figure 11. Cottontail Rabbit Sampling Locations



4.0 Soil and Vegetation

4.1 Near Field Soil Monitoring

Discrete EDP Codes	Area	Sample Location/Name	Collection Period	Analyses
D120[(a)]	300	316-2 South	June	GEA, ^{90}Sr, U, Pu
D121	300	316-1 Northeast	June	GEA, ^{90}Sr, U, Pu
D123[(a)]	300	316-3 South	June	GEA, ^{90}Sr, U, Pu
D125	300	618-3 Southwest	June	GEA, ^{90}Sr, U, Pu
D126	300	618-2 Northwest	June	GEA, ^{90}Sr, U, Pu
D207	300	South of 300 Area	June	GEA, ^{90}Sr, U, Pu
D130	400	400 Process Pond	June	GEA, ^{90}Sr, U, Pu
D003 , D027 , D029 , D037	200-W	S-Farm	June	GEA, ^{90}Sr, U, Pu
D005 , D007 , D009 , D011	200-W	PFP	June	GEA, ^{90}Sr, U, Pu
D013, D015 , D017 , D035	200-W	T-West	June	GEA, ^{90}Sr, U, Pu
D019 , D021 , D023 ,D025	200-W	T-North	June	GEA, ^{90}Sr, U, Pu
D031 , D041 ,D043 , D045 , D047	200-W	U-Plant	June	GEA, ^{90}Sr, U, Pu
D039 , D051 , D103 , D105 , D107 , D109	600	S-Plant	June	GEA, ^{90}Sr, U, Pu
D049 , D101	600	CSTL	June	GEA, ^{90}Sr, U, Pu
D053 , D061	200-E	Baseline	June	GEA, ^{90}Sr, U, Pu
D055 , D057	200-E	B-Farm	June	GEA, ^{90}Sr, U, Pu
D067, D069, D071 , D073	200-E	A-Farm	June	GEA, ^{90}Sr, U, Pu
D091 , D093 , D095	600	Purex East	June	GEA, ^{90}Sr, U, Pu
D075 , D077 , D079	200-E	Purex South	June	GEA, ^{90}Sr, U, Pu
D087, D089	600	B-Pond	June	GEA, ^{90}Sr, U, Pu
D097, D099	600	BC Controlled	June	GEA, ^{90}Sr, U, Pu
D001	200-W	216-U-10 Pond, South	June	GEA, ^{90}Sr, U, Pu
D033	200-W	U Tank Farm, East	June	GEA, ^{90}Sr, U, Pu
D059	200-E	B-63 Ditch	June	GEA, ^{90}Sr, U, Pu
D063	200-E	218-C-9 Trench, East	June	GEA, ^{90}Sr, U, Pu
D065	200-E	C Tank Farm, East	June	GEA, ^{90}Sr, U, Pu
D081	600	Gable Pond, North	June	GEA, ^{90}Sr, U, Pu
D083	600	216-N-1 Pond	June	GEA, ^{90}Sr, U, Pu
D085	600	UN-216-E-31, North	June	GEA, ^{90}Sr, U, Pu
D146[(b)]	200-W	ERDF at N482	June	GEA, ^{90}Sr, U, Pu
D147, D171, D172, D173	100-D[(c)]	At N467,N468, N514, N515	TBD	GEA, ^{90}Sr, U, Pu
D176, D152, D178, D177	100-H[(c)]	At N508, N509, N510, N574	TBD	GEA, ^{90}Sr, U, Pu
D156, D158, D183	100-N[(c)]	At N102, N106, N103	TBD	GEA, ^{90}Sr, U, Pu

(a) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.
(b) ERDF soil sample is collected every year
(c) Sample locations at WCH sites. TBD = To be scheduled by WCH.

Figure 12. Near Field Soil Sampling Locations in the 200 East/600 Areas

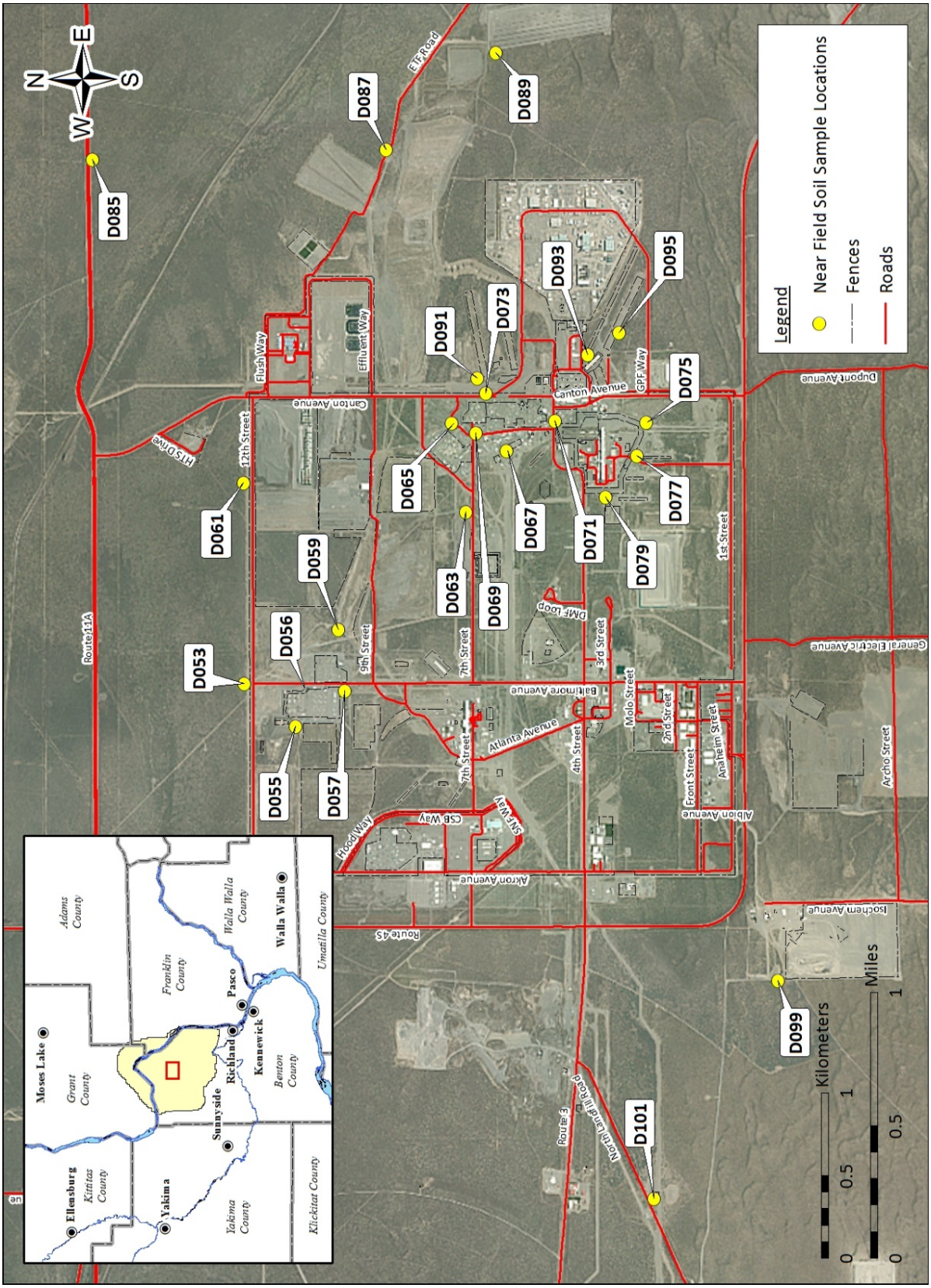


Figure 13. Near Field Soil Sampling Location in the BC Controlled Area

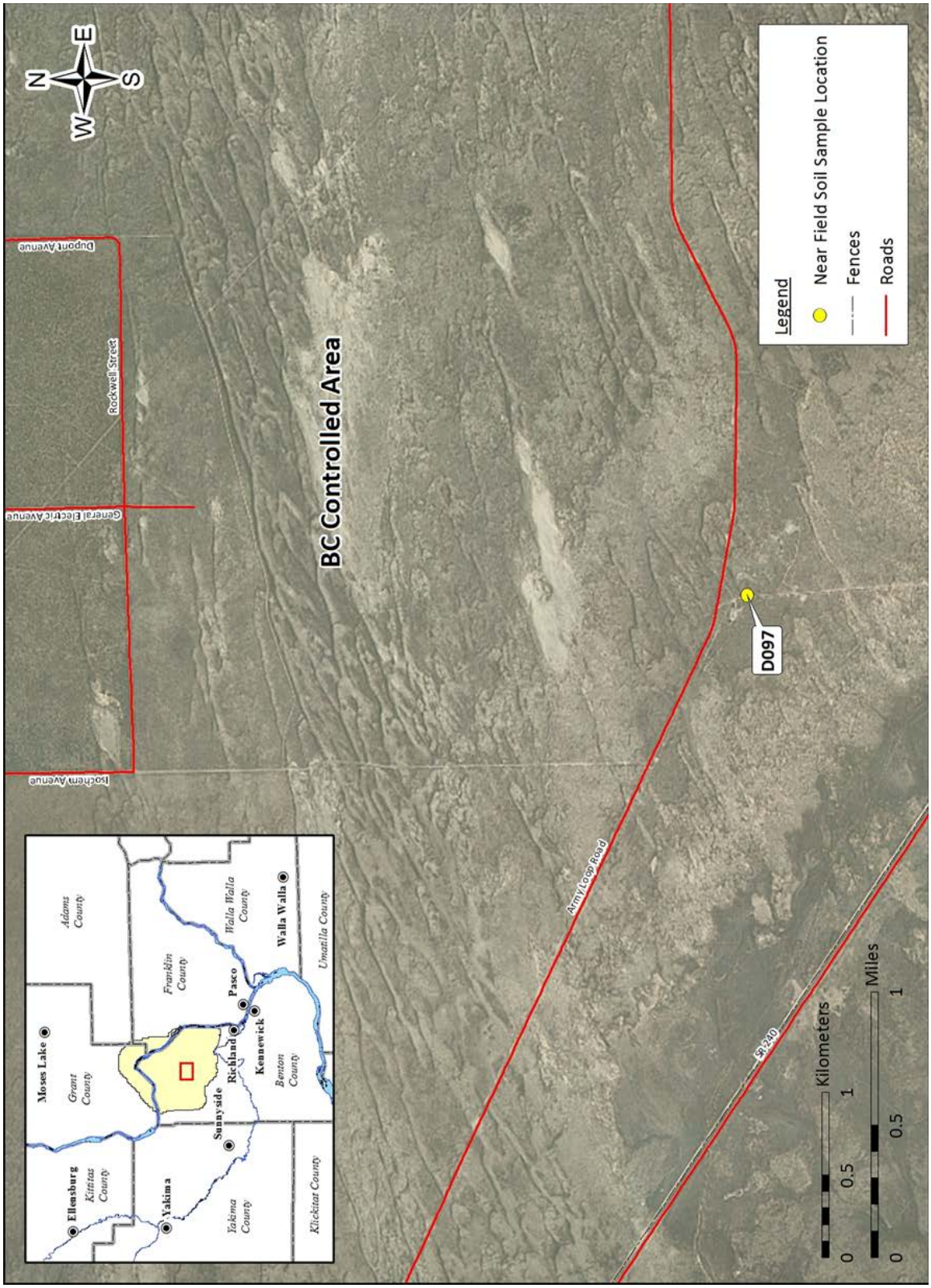


Figure 14. Near Field Soil Sampling Locations in the 200 West Area

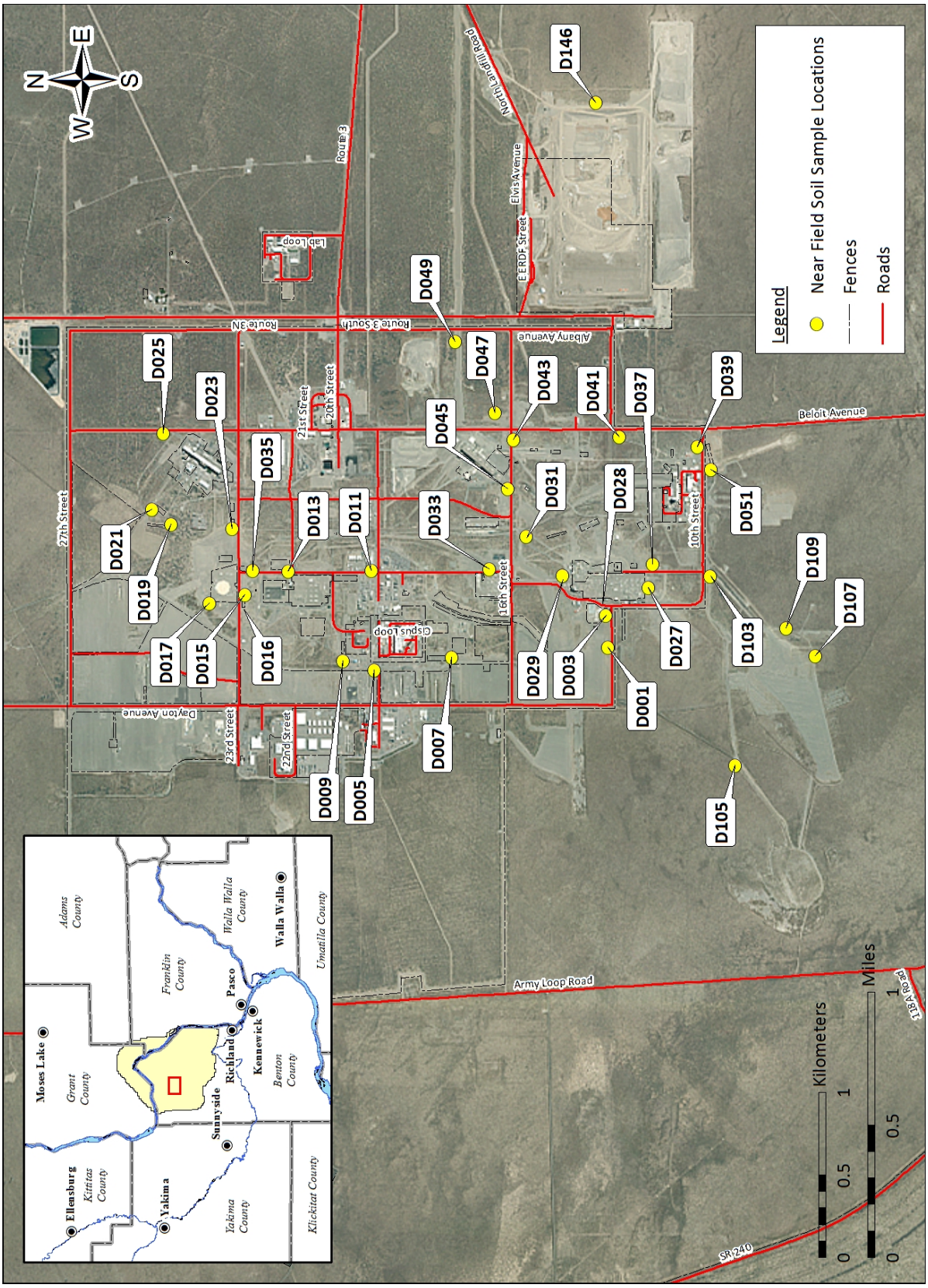


Figure 15. Near Field Soil Sampling Locations in the 300 Area

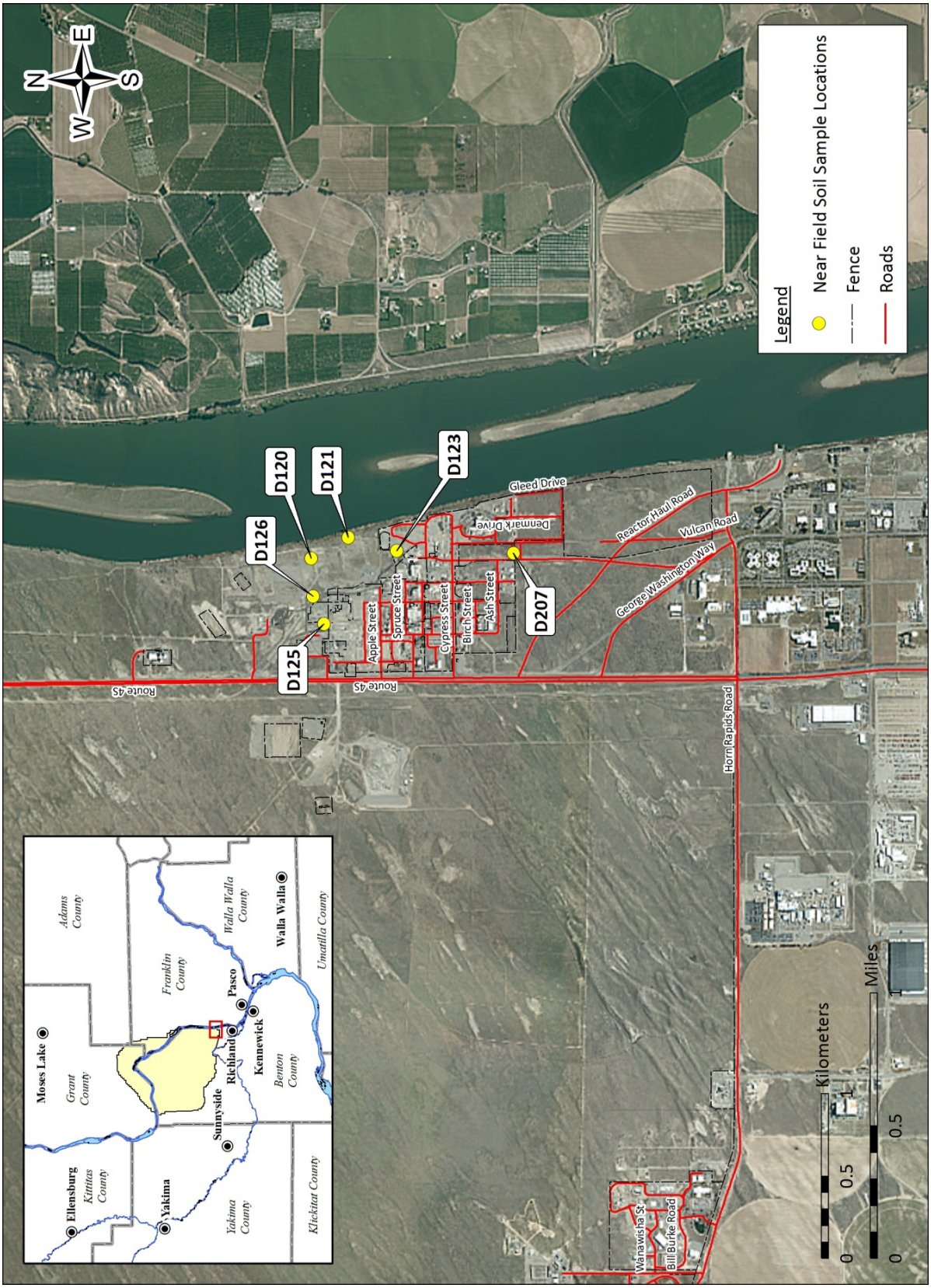


Figure 16. Near Field Soil Sampling Locations in the 400 Area

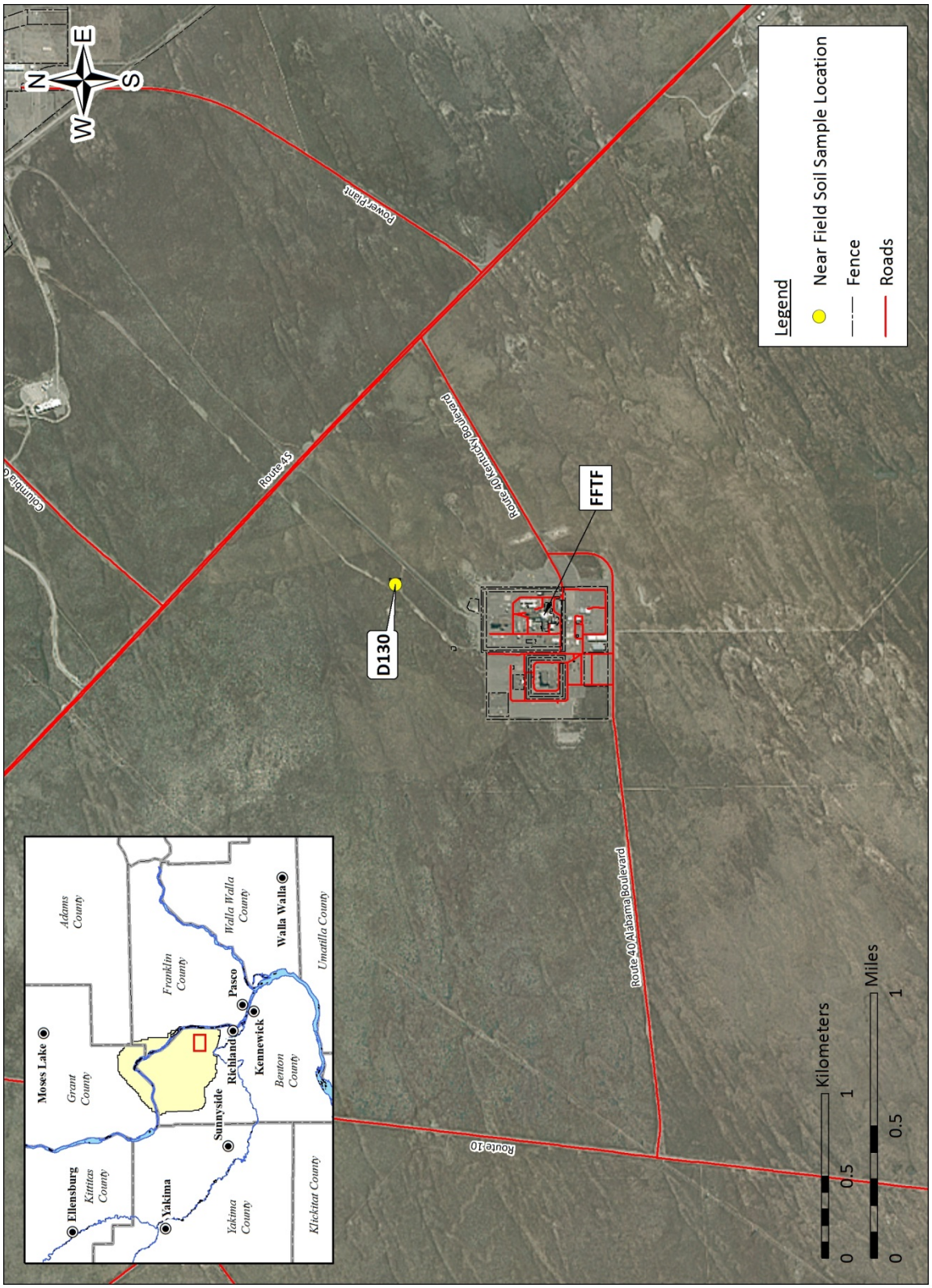


Figure 17. Near Field Soil Locations in 100-D Area

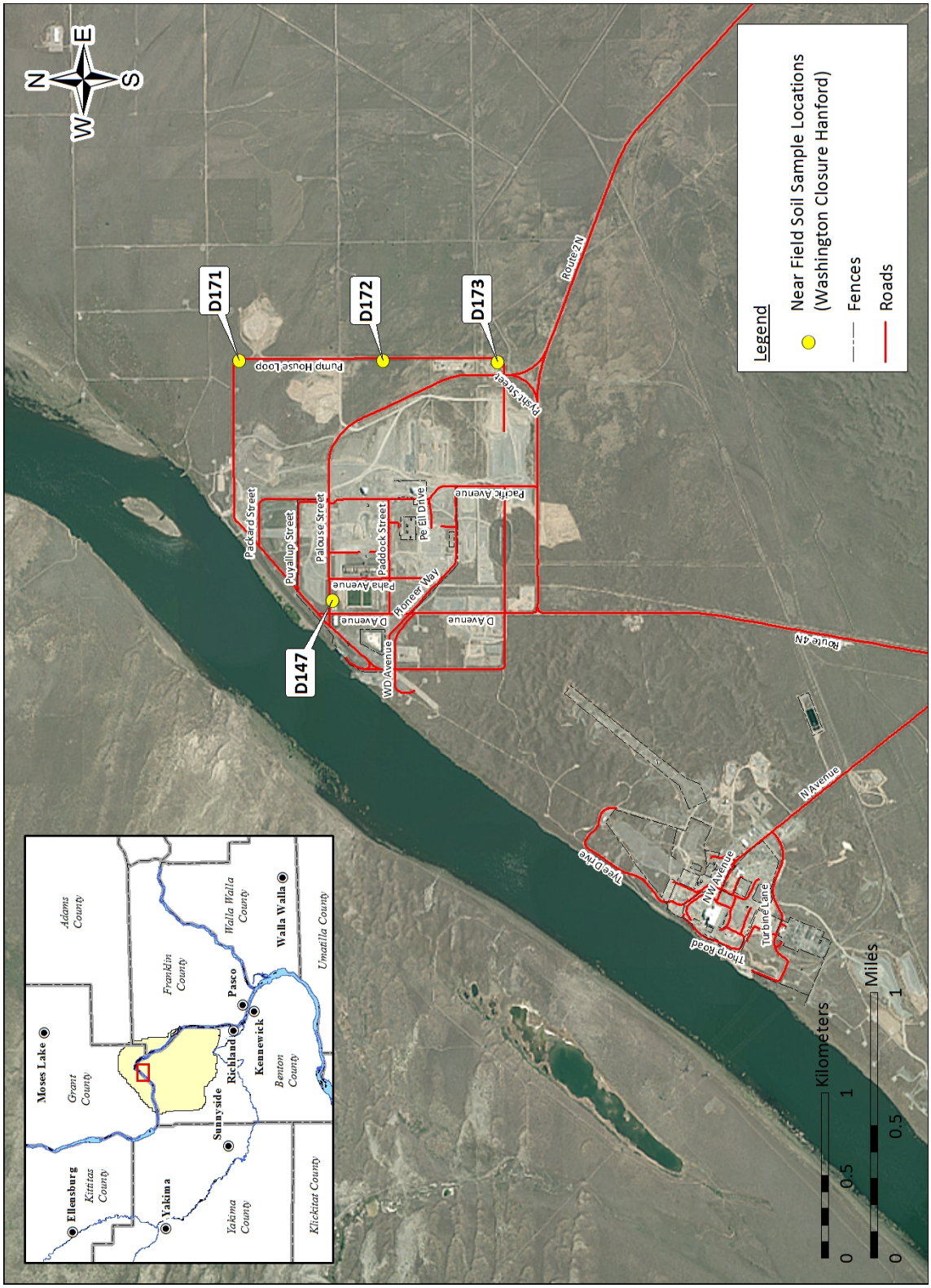


Figure 18. Near Field Soil Locations in 100-H Area

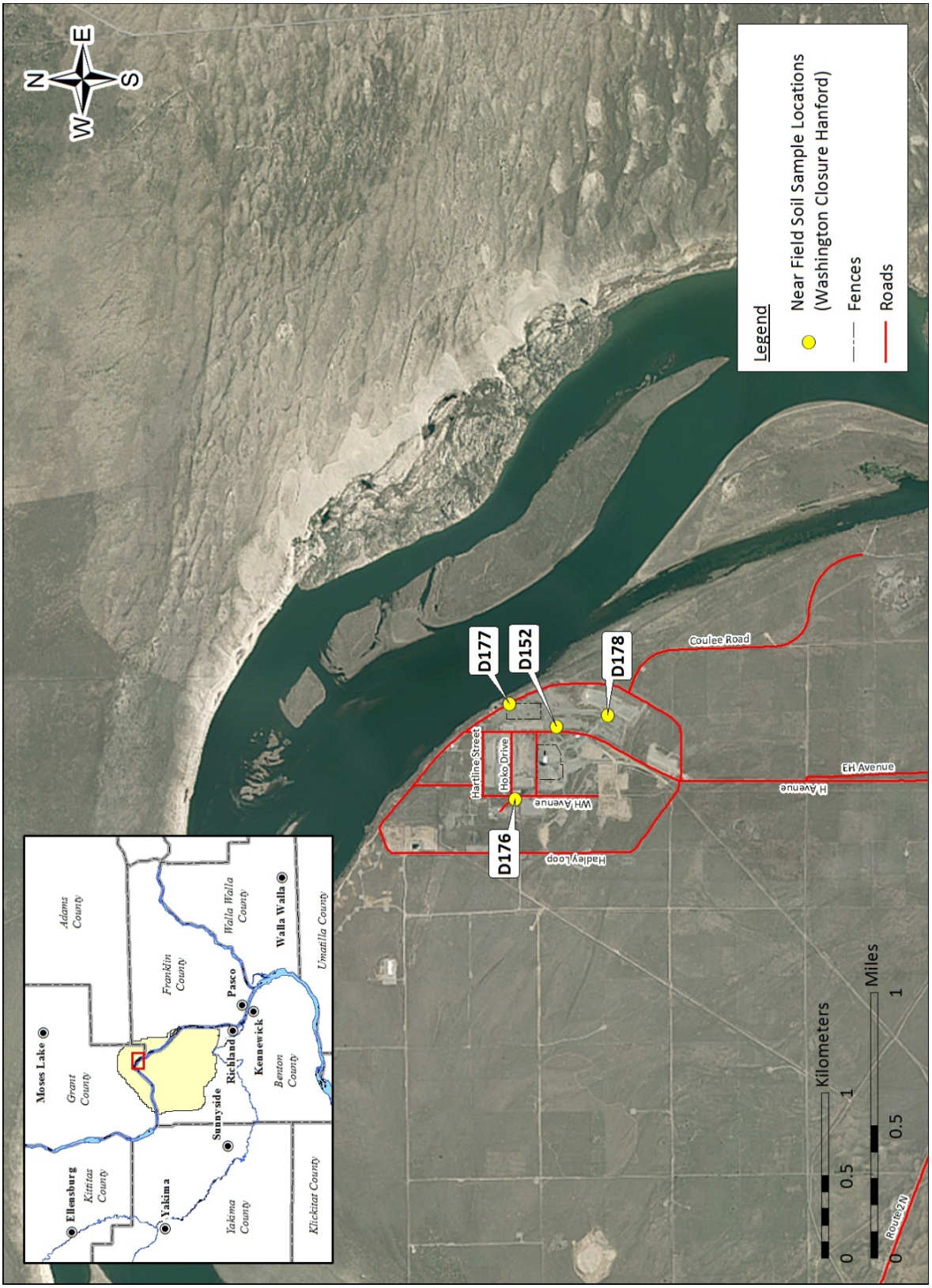
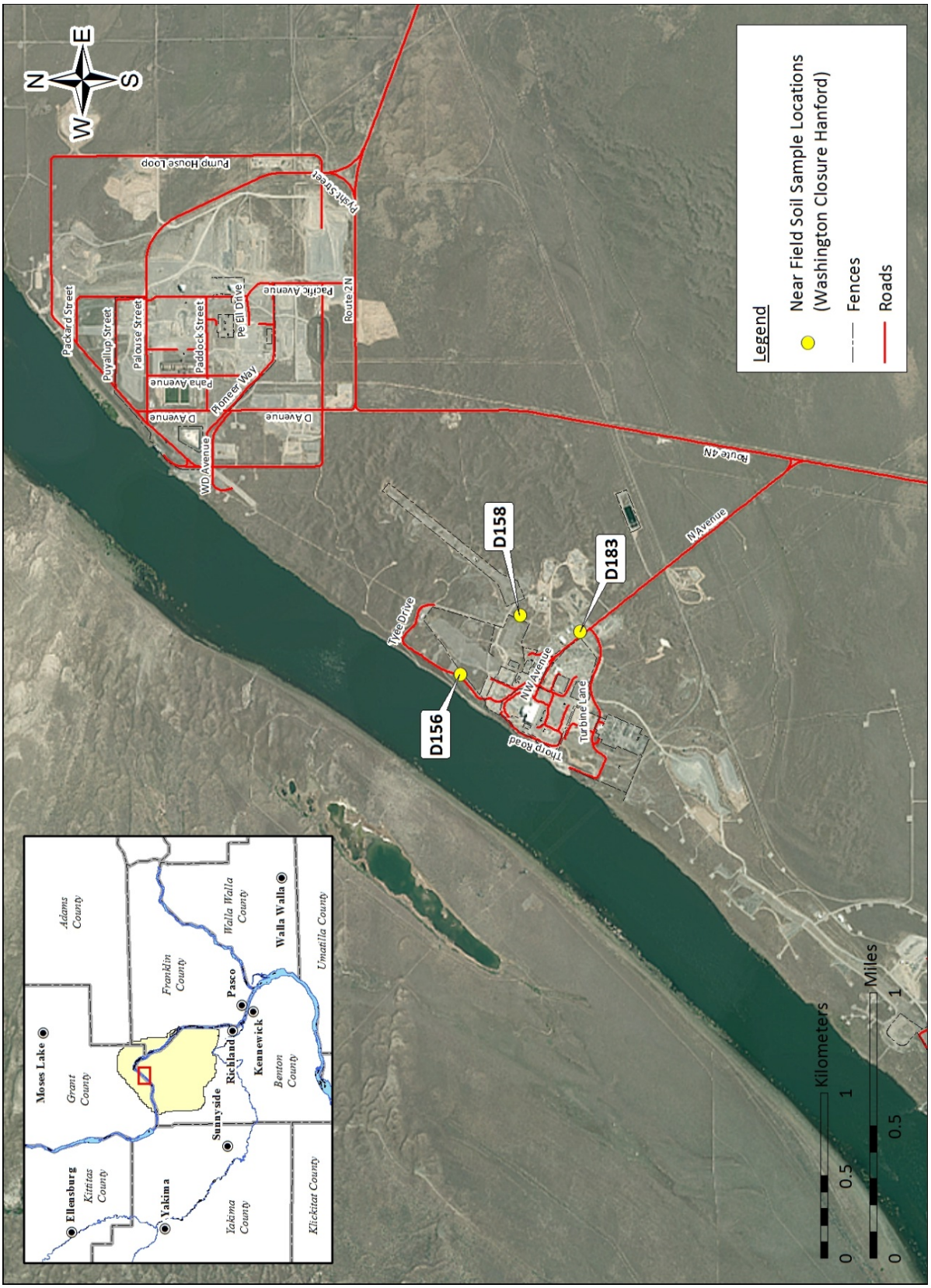


Figure 19. Near Field Soil Locations in 100-N Area



4.2 Near Field Vegetation Monitoring

Discrete EDP Codes	Area	Sample Location/Name	Collection Period	Analyses
Y719	100-N	100N Veg Y719	June	GEA, ^{90}Sr, U, Pu
Y724	100-N	100N Veg Y724	June	GEA, ^{90}Sr, U, Pu
V123	300	316-3 South	June	GEA, ^{90}Sr, U, Pu
V130	400	400 Process Pond	June	GEA, ^{90}Sr, U, Pu
V003 , V027 , V029 , V037	200-W	S-Farm	June	GEA, ^{90}Sr, U, Pu
V007 , V009 , V011	200-W	PFP	June	GEA, ^{90}Sr, U, Pu
V015 , V017 , V035	200-W	T-West	June	GEA, ^{90}Sr, U, Pu
V019 , V021, V023, V025	200-W	T-North	June	GEA, ^{90}Sr, U, Pu
V031, V041, V043, V045, V047	200-W	U-Plant	June	GEA, ^{90}Sr, U, Pu
V039, V051, V103, V105, V107, V109	600	S-Plant	June	GEA, ^{90}Sr, U, Pu
V049, V101	600	CSTL	June	GEA, ^{90}Sr, U, Pu
V053, V061	200-E	Baseline	June	GEA, ^{90}Sr, U, Pu
V055 , V057	200-E	B-Farm	June	GEA, ^{90}Sr, U, Pu
V091, V093, V095	600	Purex East	June	GEA, ^{90}Sr, U, Pu
V075, V077, V079	200-E	Purex South	June	GEA, ^{90}Sr, U, Pu
V087, V089	600	B-Pond	June	GEA, ^{90}Sr, U, Pu
V097, V099	600	BC Controlled	June	GEA, ^{90}Sr, U, Pu
V001	200-W	216-U-10 Pond, South	June	GEA, ^{90}Sr, U, Pu
V059	200-E	216-B-63 Ditch	June	GEA, ^{90}Sr, U, Pu
V063	200-E	218-C-9 Trench, East	June	GEA, ^{90}Sr, U, Pu
V065	200-E	C Tank Farm, East	June	GEA, ^{90}Sr, U, Pu
V067	200-E	244-A Lift Station	June	GEA, ^{90}Sr, U, Pu
V081	600	Gable Pond, North	June	GEA, ^{90}Sr, U, Pu
V083	600	216-N-1 Pond	June	GEA, ^{90}Sr, U, Pu
V085	600	UN-216-E-31, North	June	GEA, ^{90}Sr, U, Pu

Figure 20. Near Field Vegetation Sampling Locations in the 100 N Area

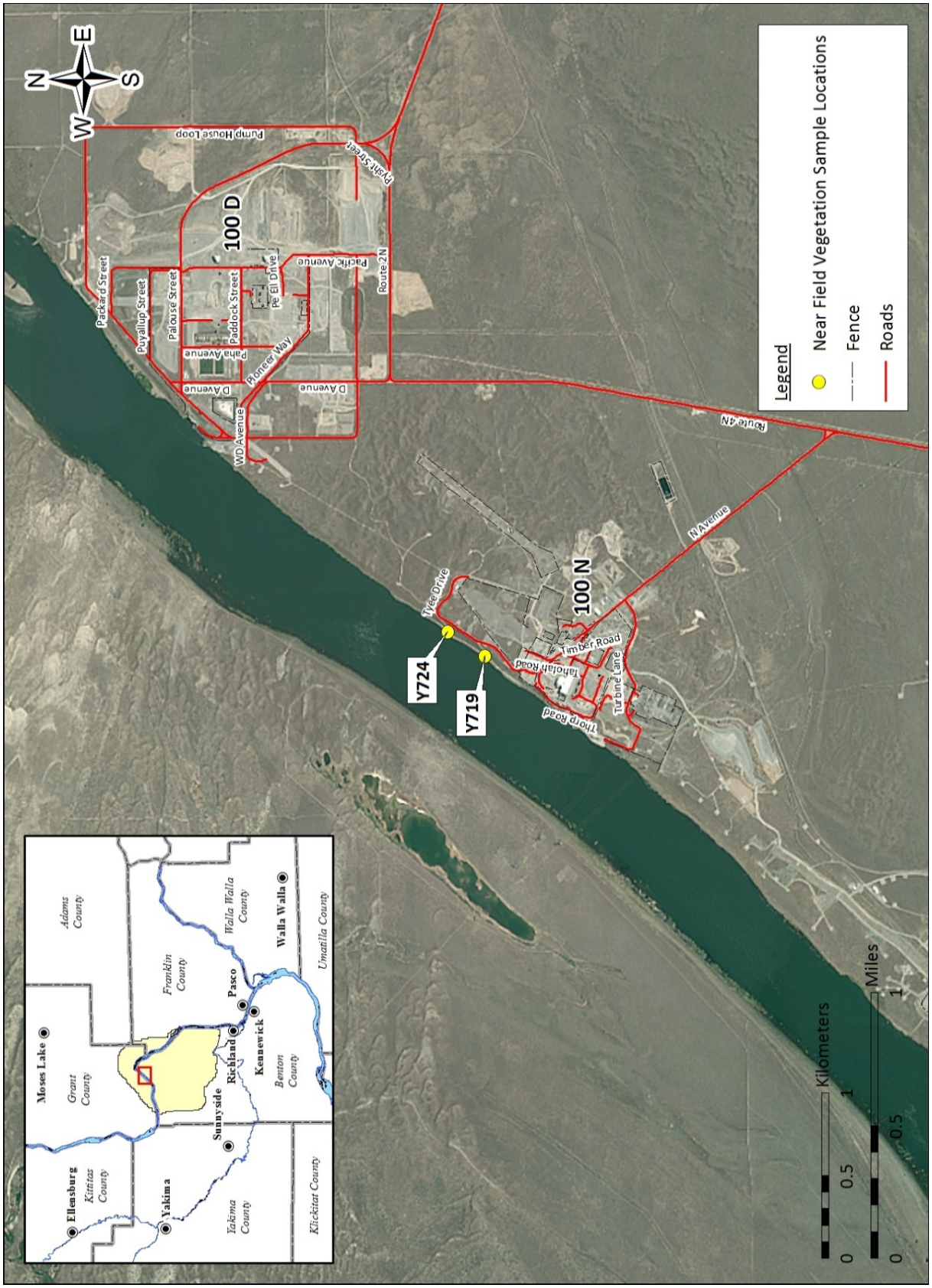


Figure 21. Near Field Vegetation Sampling Locations in the 200 East Area

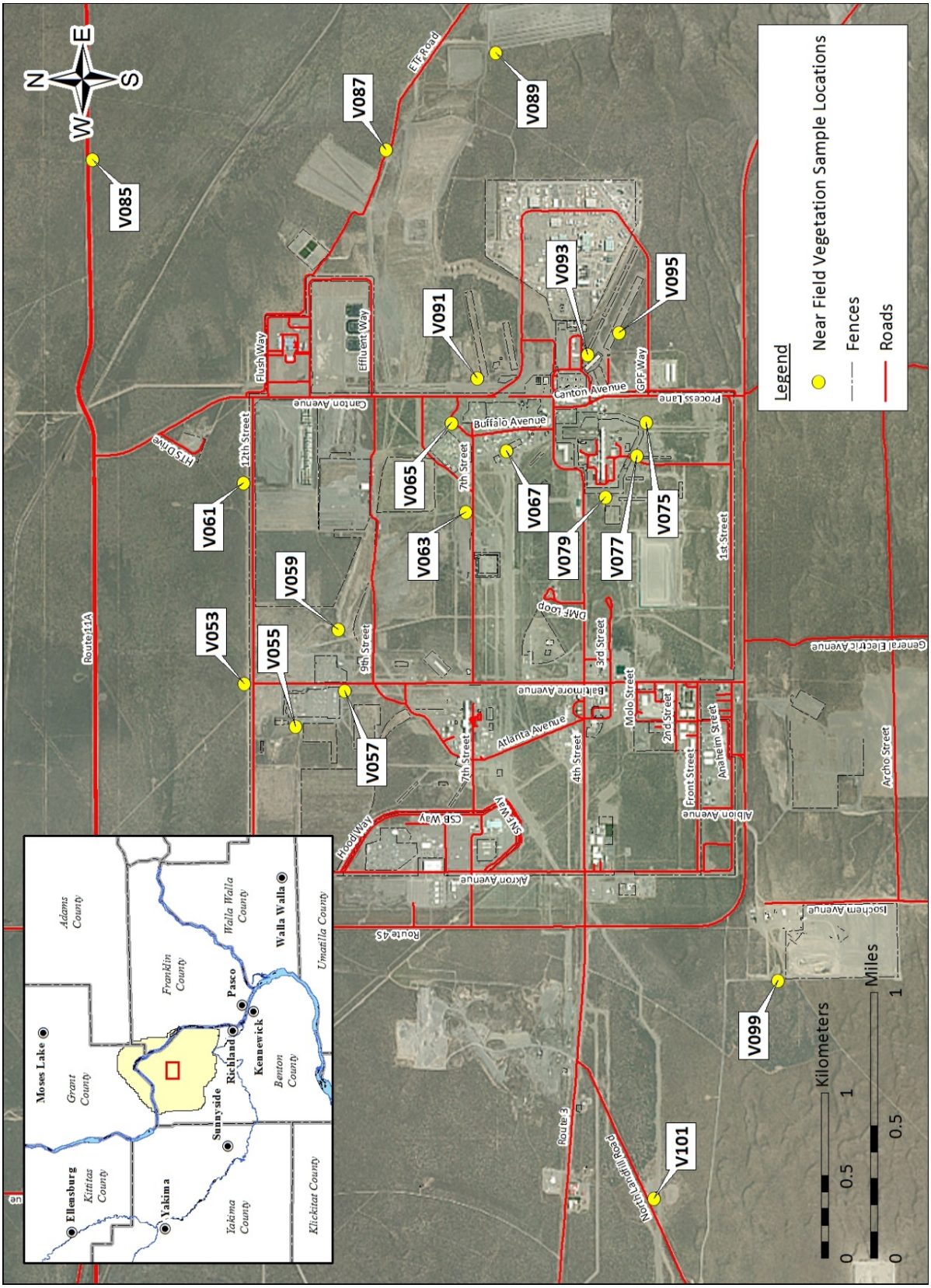


Figure 22. Near Field Vegetation Sampling Locations in the BC Controlled Area

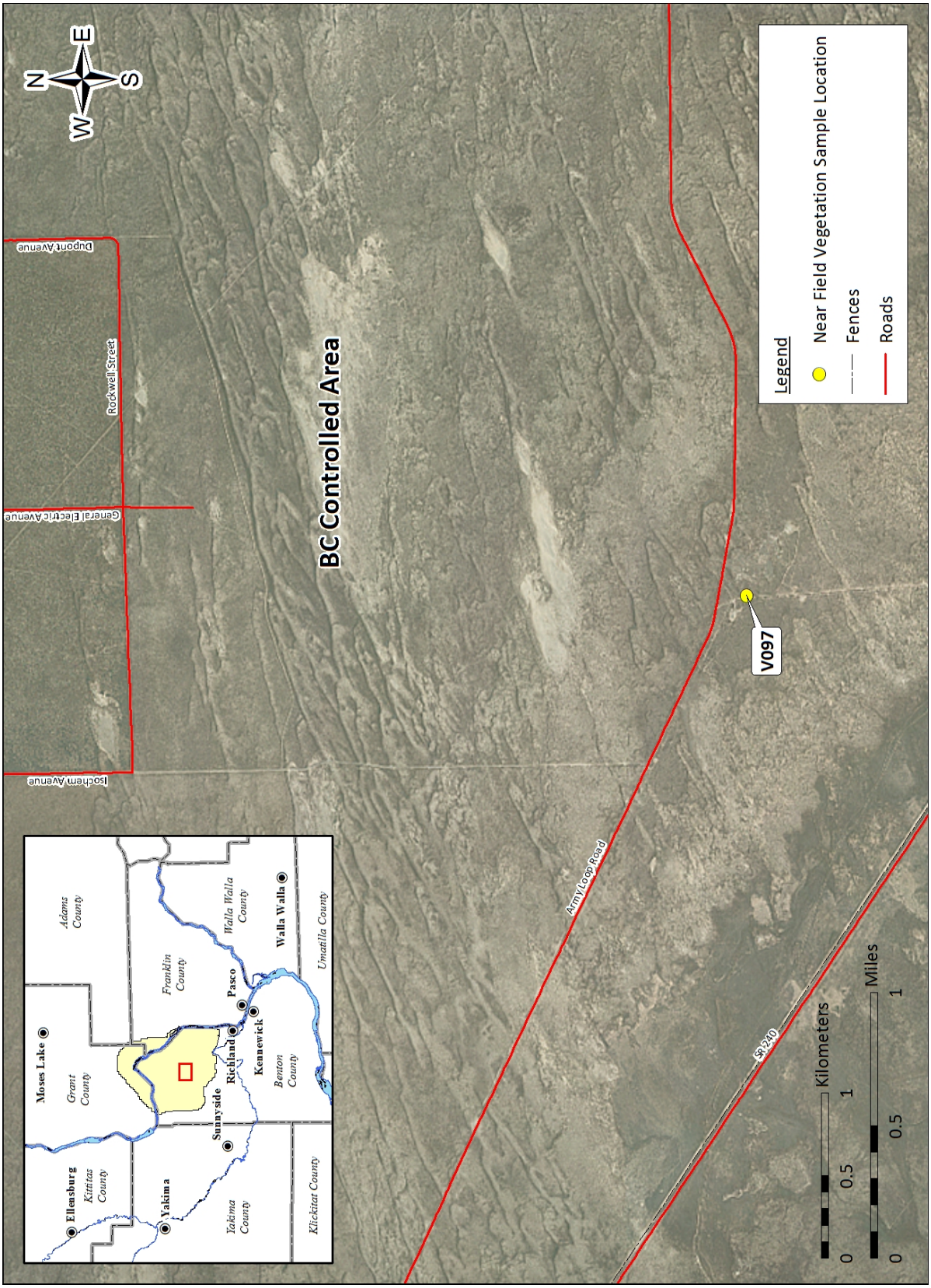


Figure 23. Near Field Vegetation Sampling Locations in the 200 West Area

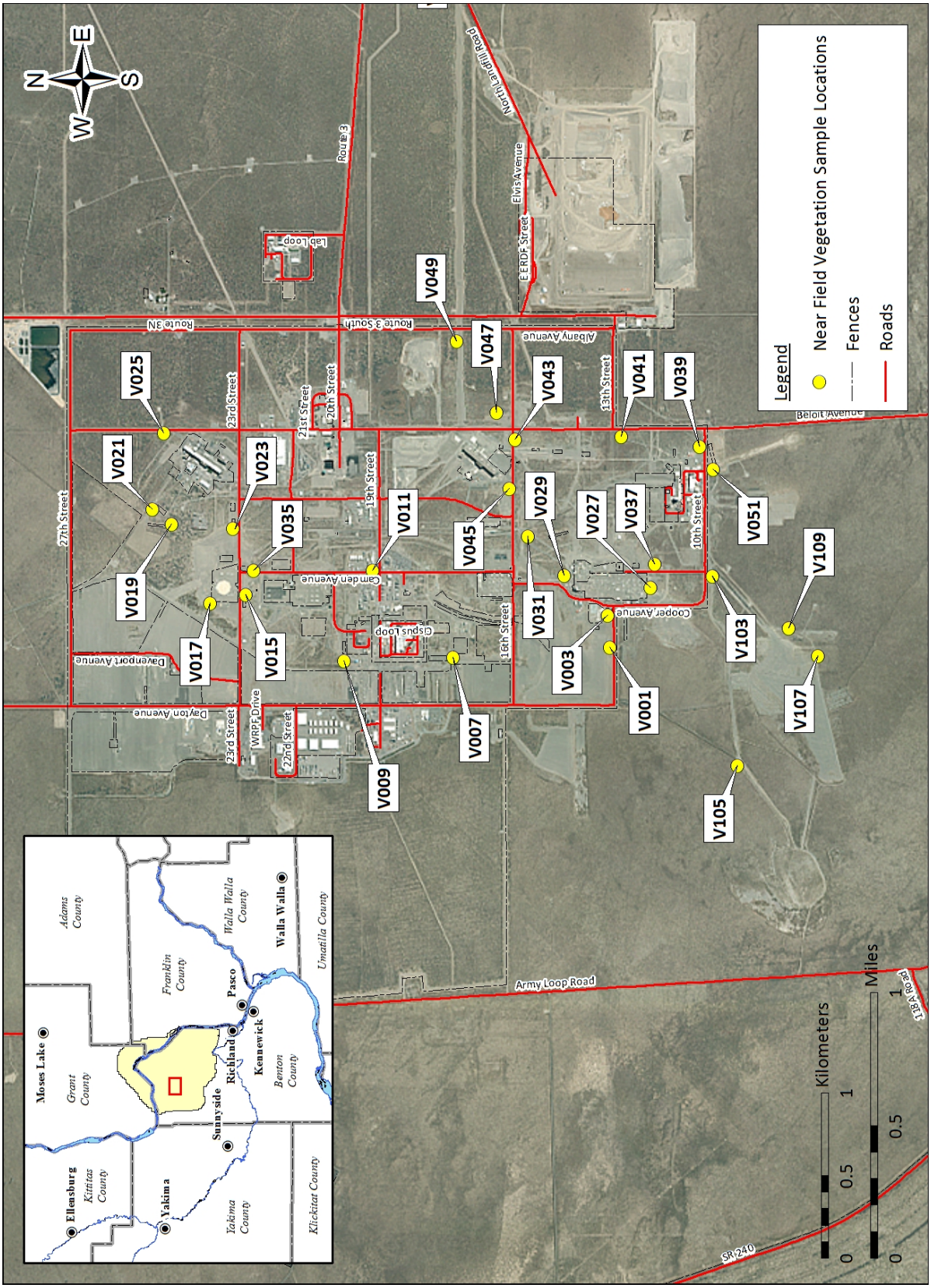


Figure 24. Near Field Vegetation Sampling Locations in the 300 Area

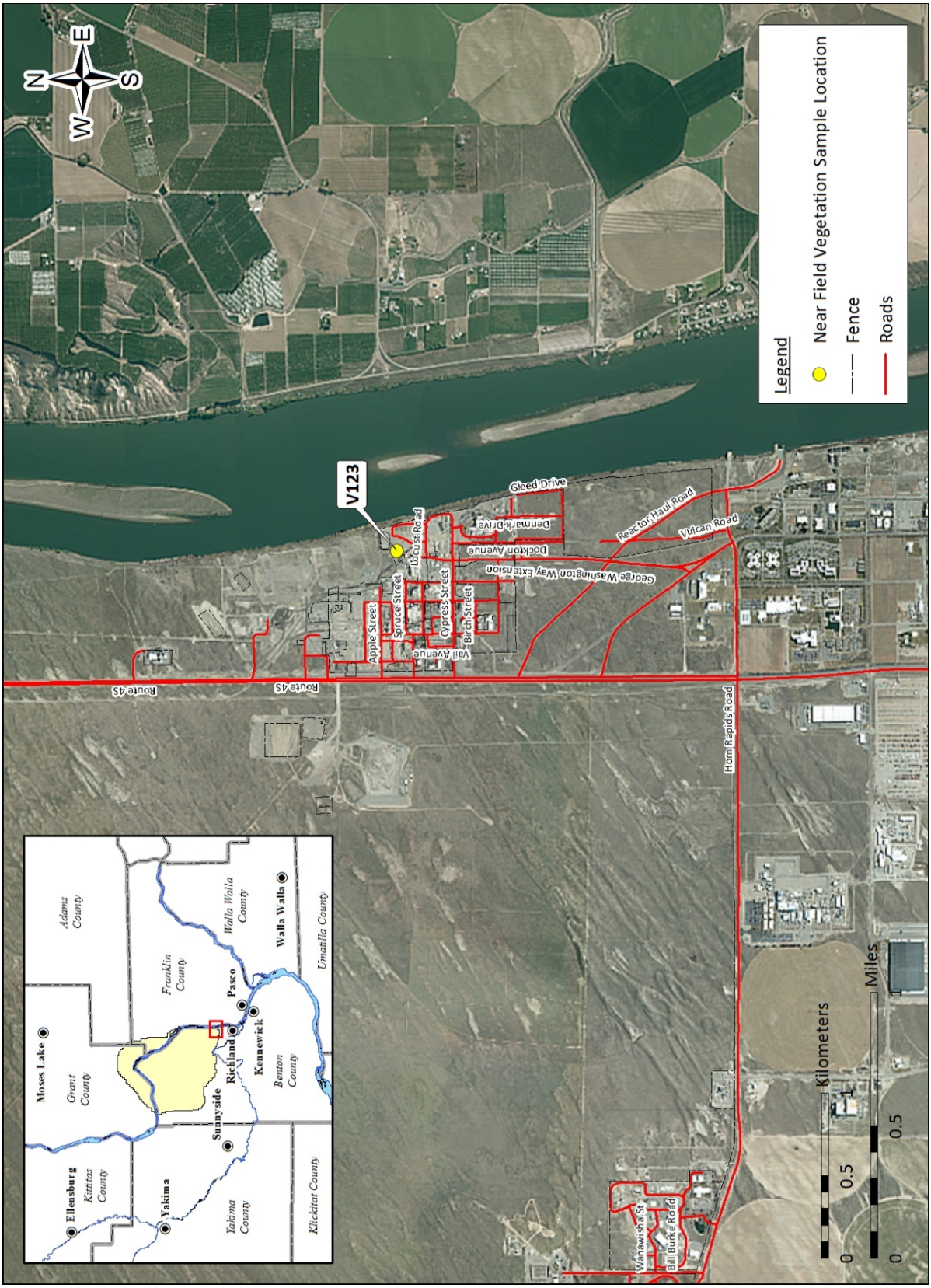
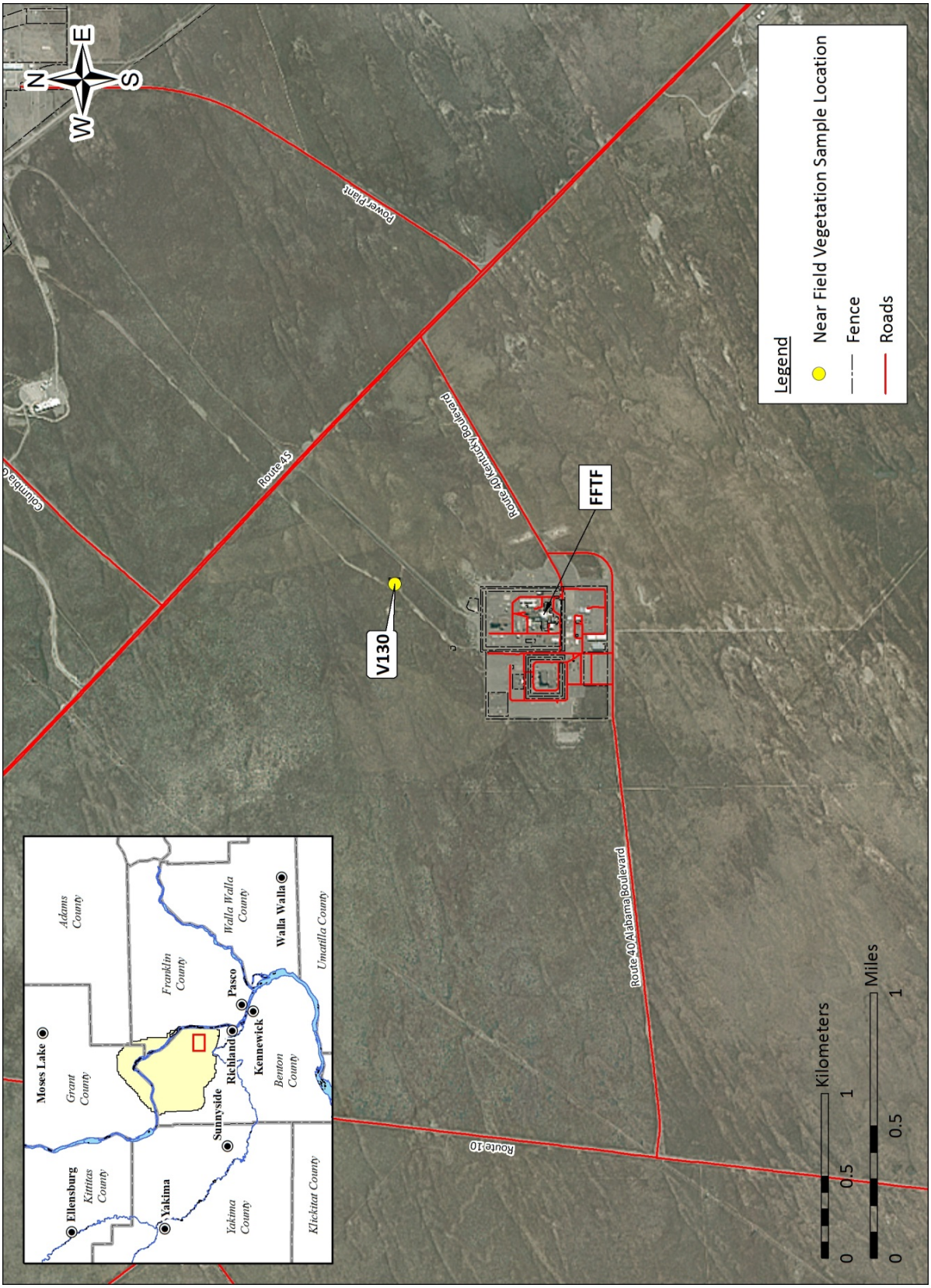


Figure 25. Near Field Vegetation Sampling Locations in the 400 Area



4.3 Far Field Soil Monitoring

EDP Code	Sample Location	2015 Collection Period[a]	Analyses
D424	N end Vernita Bridge	June	GEA, ^{90}Sr, U, Pu
D425	Wahluke Slope	June	GEA, ^{90}Sr, U, Pu
D426	Berg Ranch	June	GEA, ^{90}Sr, U, Pu
D427	Ringold	June	GEA, ^{90}Sr, U, Pu
D428	W end Fir Road	June	GEA, ^{90}Sr, U, Pu
D429	Taylor Flats No. 2	June	GEA, ^{90}Sr, U, Pu
D430	Sagemoor Farms[b]	June	GEA, ^{90}Sr, U, Pu, ^{241}Am
D431	Byers Landing	June	GEA, ^{90}Sr, U, Pu
D433	Benton City	June	GEA, ^{90}Sr, U, Pu
D434	Sunnyside	June	GEA, ^{90}Sr, U, Pu, ^{241}Am
D435	McNary Dam	June	GEA, ^{90}Sr, U, Pu
D436	Walla Walla	June	GEA, ^{90}Sr, U, Pu
D437	Washtucna	June	GEA, ^{90}Sr, U, Pu
D438	Toppenish	June	GEA, ^{90}Sr, U, Pu
D439	George[c]	June	GEA, ^{90}Sr, U, Pu
D440	Othello[c]	June	GEA, ^{90}Sr, U, Pu
D441	Wanapum[c]	June	GEA, ^{90}Sr, U, Pu

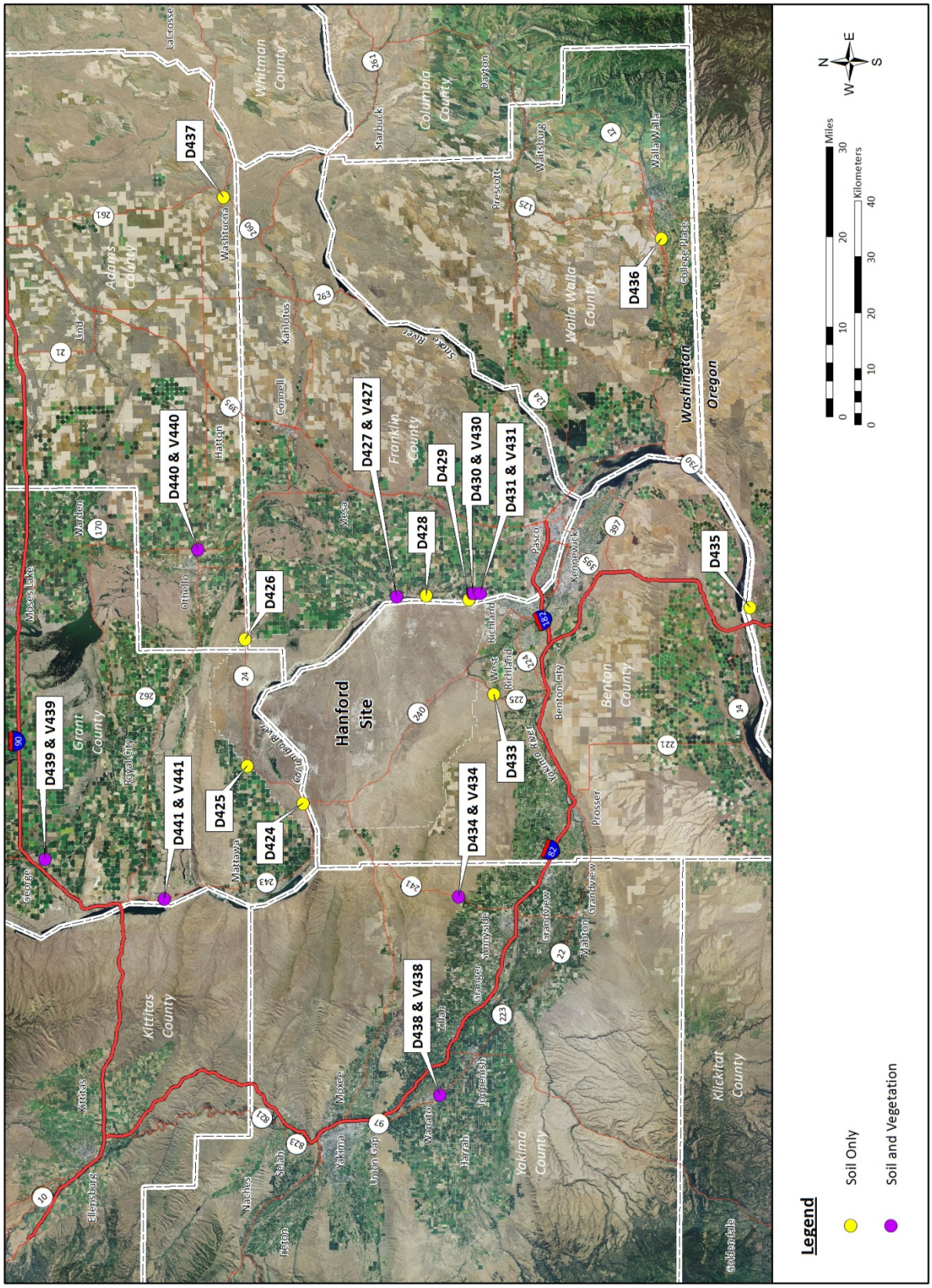
a) Samples are collected approximately every 5 years.
b) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.
c) Additional sample provided to the DOH.

4.4 Far Field Vegetation Monitoring

EDP Code	Sample Location	2015 Collection Period[a]	Analyses
V427	Ringold	June	GEA, ^{90}Sr, U, Pu
V430	Sagemoor Farms	June	GEA, ^{90}Sr, U, Pu
V431	Byers Landing	June	GEA, ^{90}Sr, U, Pu
V434	Sunnyside	June	GEA, ^{90}Sr, U, Pu
V438	Toppenish[c]	June	GEA, ^{90}Sr, U, Pu
V439	George[b]	June	GEA, ^{90}Sr, U, Pu
V440	Othello[b]	June	GEA, ^{90}Sr, U, Pu
V441	Wanapum[b]	June	GEA, ^{90}Sr, U, Pu

a) Samples are collected approximately every 5 years.
b) Additional sample provided to the DOH.
c) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.

Figure 26. Far Field Soil and Vegetation Sampling Locations



5.0 Sediment

5.1 Columbia River

Location	Collection Period	Analyses
McNary Dam - Oregon Side[(a)]	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA, TOC
McNary Dam - Washington Side[(a)]	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA, TOC
Priest Rapids Dam - Grant Side[(a)]	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA, TOC
Priest Rapids Dam - Yakima Side[(a)]	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA, TOC
100-D Spring 102-1	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA, TOC
100-K Spring 63-1	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA, TOC, ^{14}C
Adjacent to Locke Island	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA
White Bluffs Slough[(a)]	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA, TOC
100-F Slough[(b)]	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA, TOC
Hanford Slough	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA, TOC
Adjacent to Savage Island	October	GEA, ^{90}Sr, U, Pu, Anions, Cr^{+6}, ICP-MS, Hg-CVAA

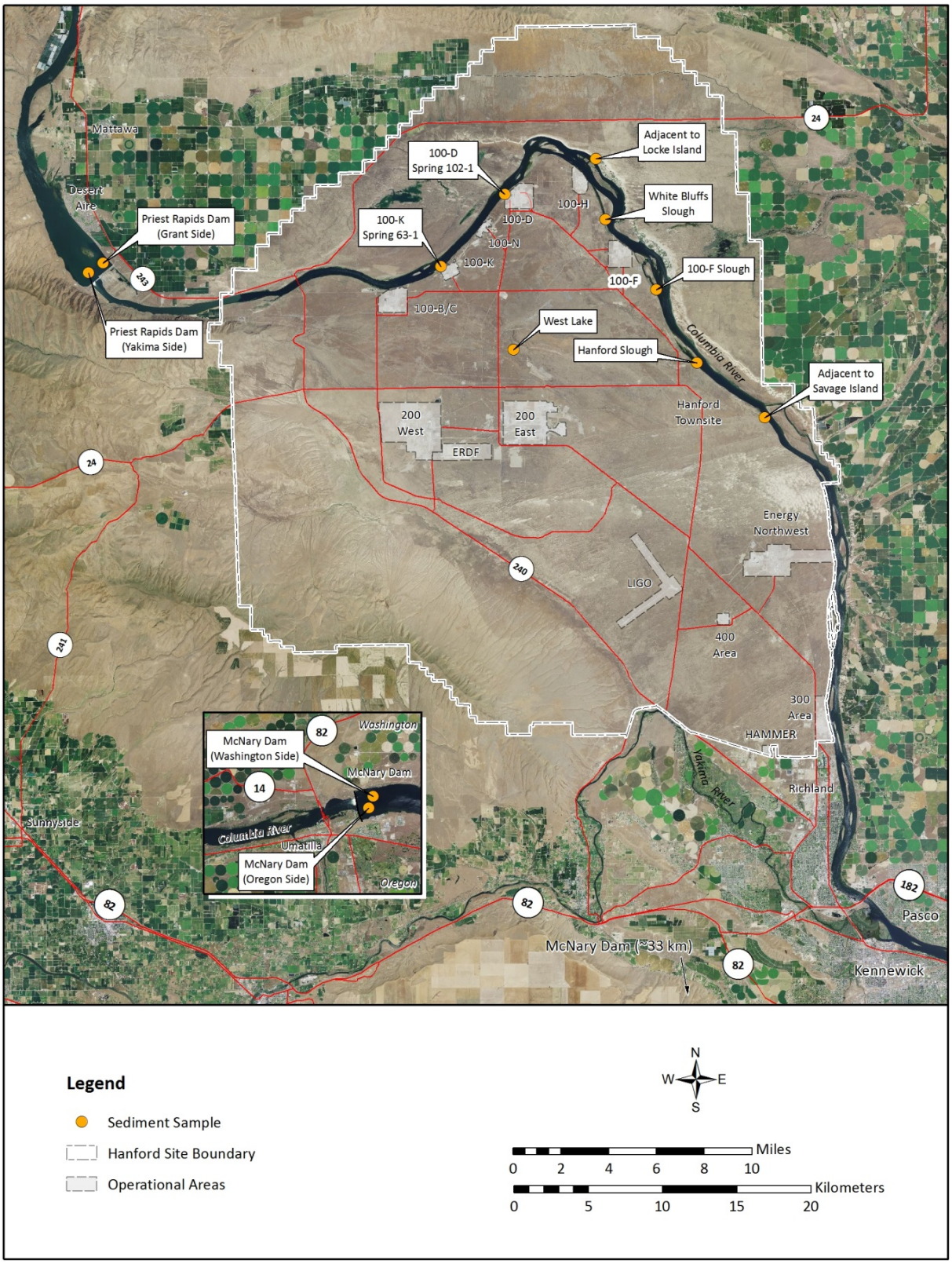
(a) Additional sample provided to DOH.
(b) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.

5.2 Onsite Pond

Location	Collection Period	Analyses
West Lake[(a)]	May	GEA, ^{90}Sr, U, ^{99}Tc, Alpha, Beta

(a) QA duplicate sample collected. Analyses for the QA sample will be the same as for the parent sample.

Figure 27. Sediment Sampling Locations



6.0 Thermoluminescent Dosimeter

Area	Number of Locations	EDP Codes
100 K	18	T219, T220, T221, T222, T223, T224, T225, T226, T227, T228, T347, T348, T349, T350, T377, T378, T218, T376
100 N	1	T246
200 E	43	T259, T260, T261, T262, T263, T264, T266, T267, T268, T269, T270, T271, T272, T273, T274, T275, T276, T277, T278, T279, T280, T281, T282, T283, T284, T285, T286, T287, T288, T289, T290, T291, T292, T293, T294, T295, T296, T297, T298, T299, T300, T375, T265
200 W	28	T301, T302, T303, T304, T305, T306, T307, T308, T309, T310, T311, T312, T313, T314, T315, T316, T317, T318, T319, T320, T322, T324, T351, T352, T353, T321, T325, T323
300 Area	14	T326, T327, T328, T329, T330, T331, T332, T333, T334, T335, T337, T338, T339, T336
400 Area	7	T340, T341, T342, T343, T344, T345, T346
618-10	4	T379, T380, T381, T374

TLDs are exchanged quarterly in March, June, September and December.

Figure 28. Thermoluminescent Dosimeter Locations in the 100 K Area

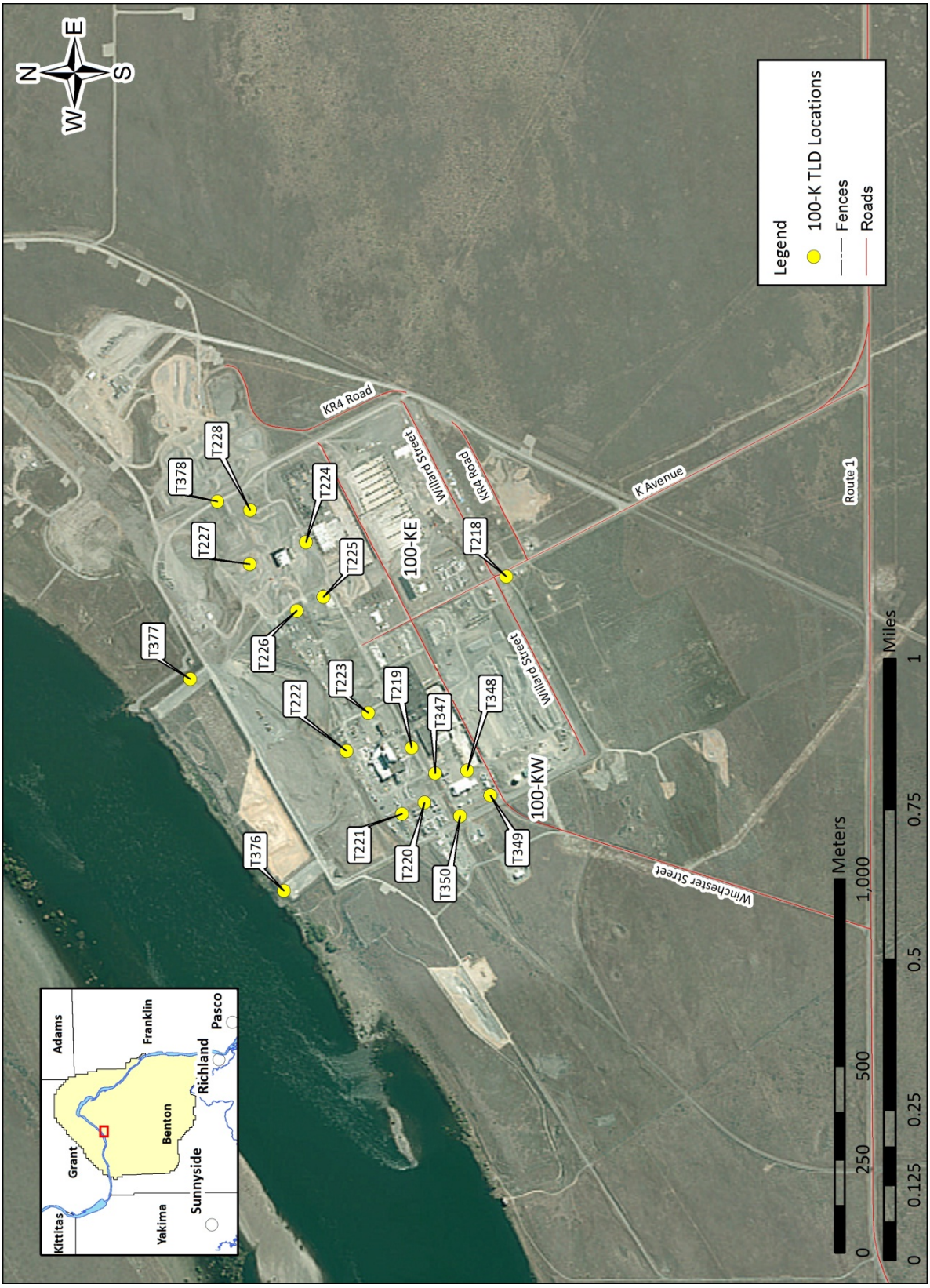


Figure 29. Thermoluminescent Dosimeter Location in the 100 N Area

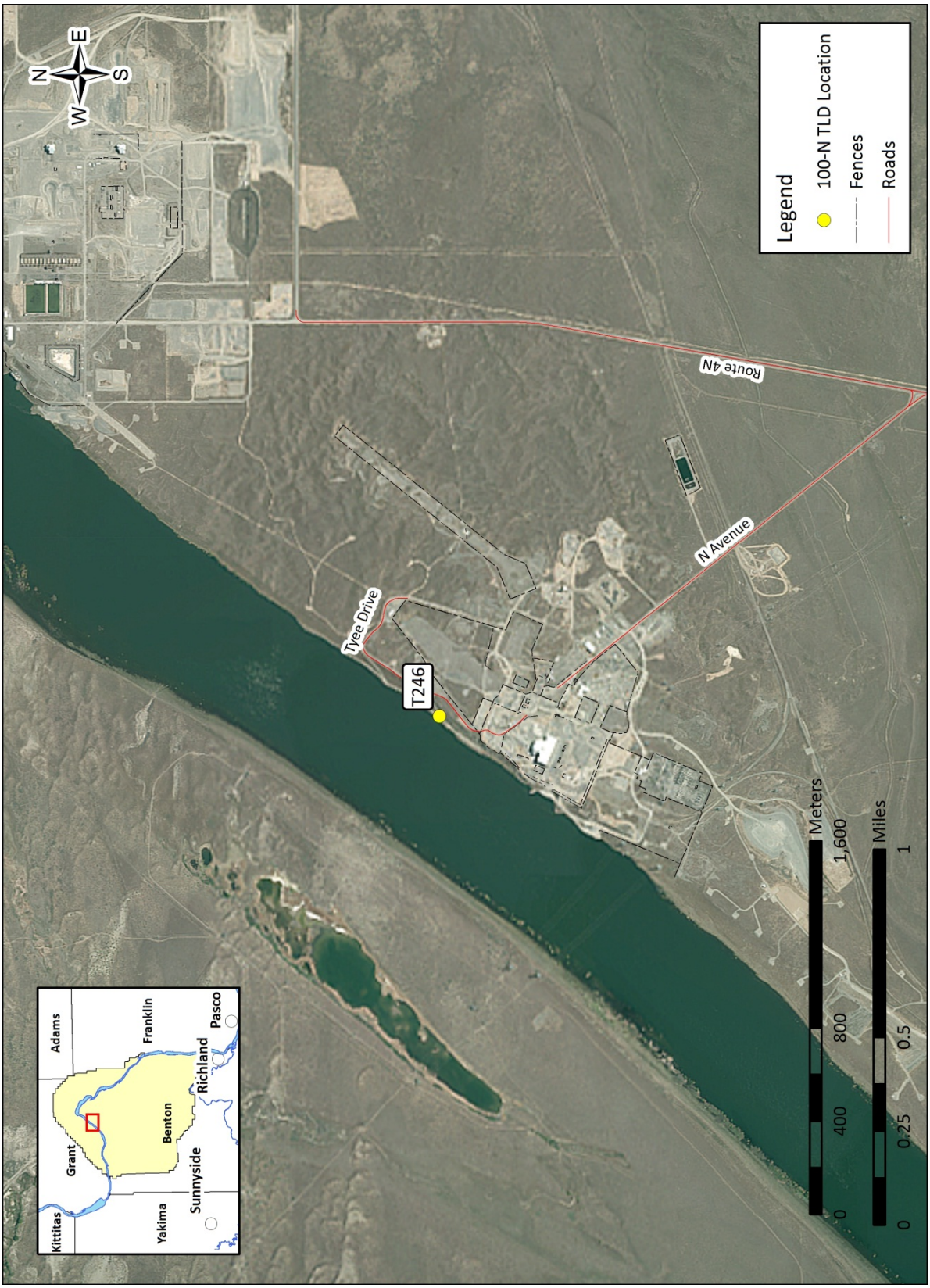


Figure 30. Thermoluminescent Dosimeter Locations in the 200 East Area

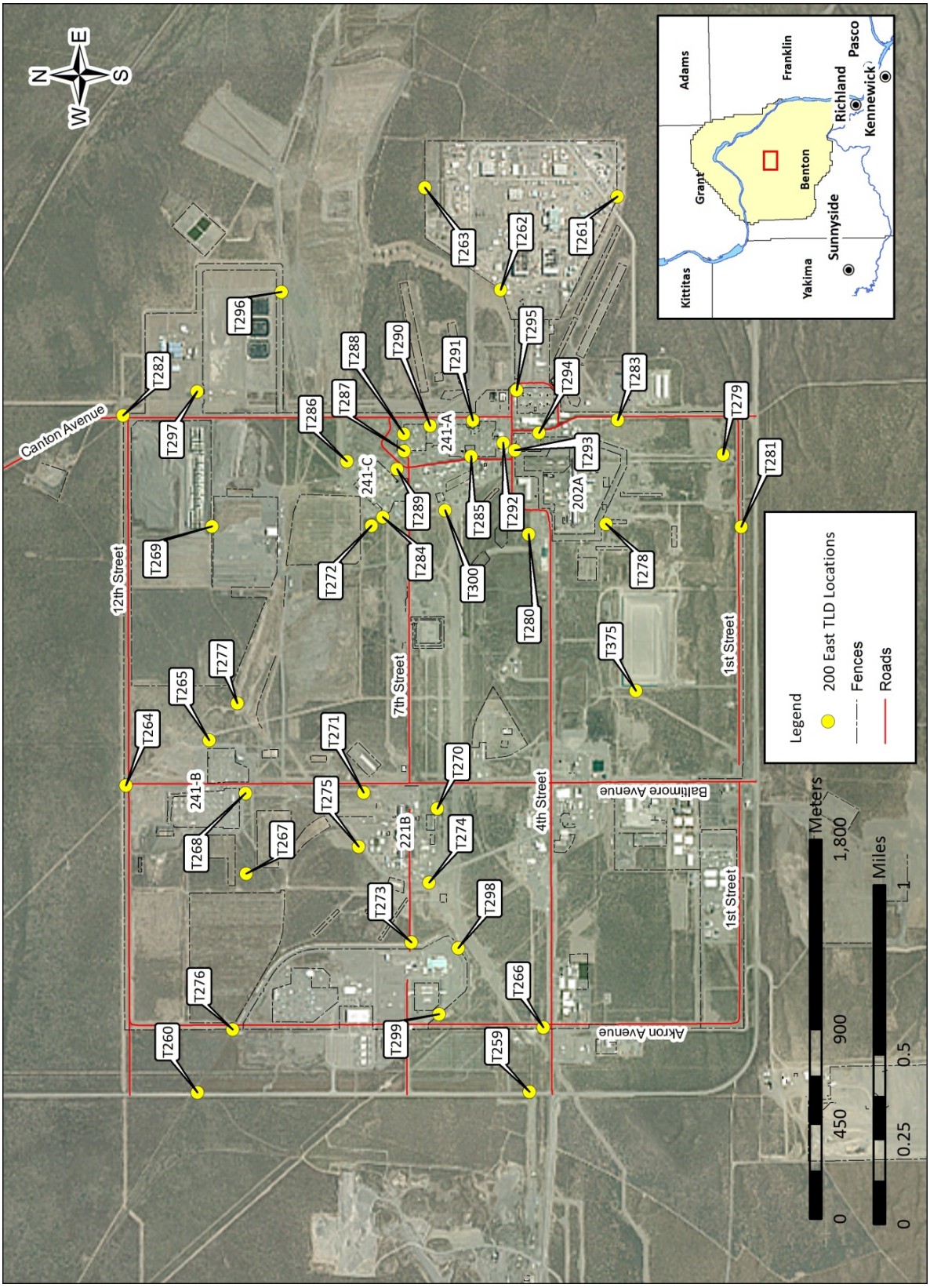


Figure 31. Thermoluminescent Dosimeter Location in the 200 North Area

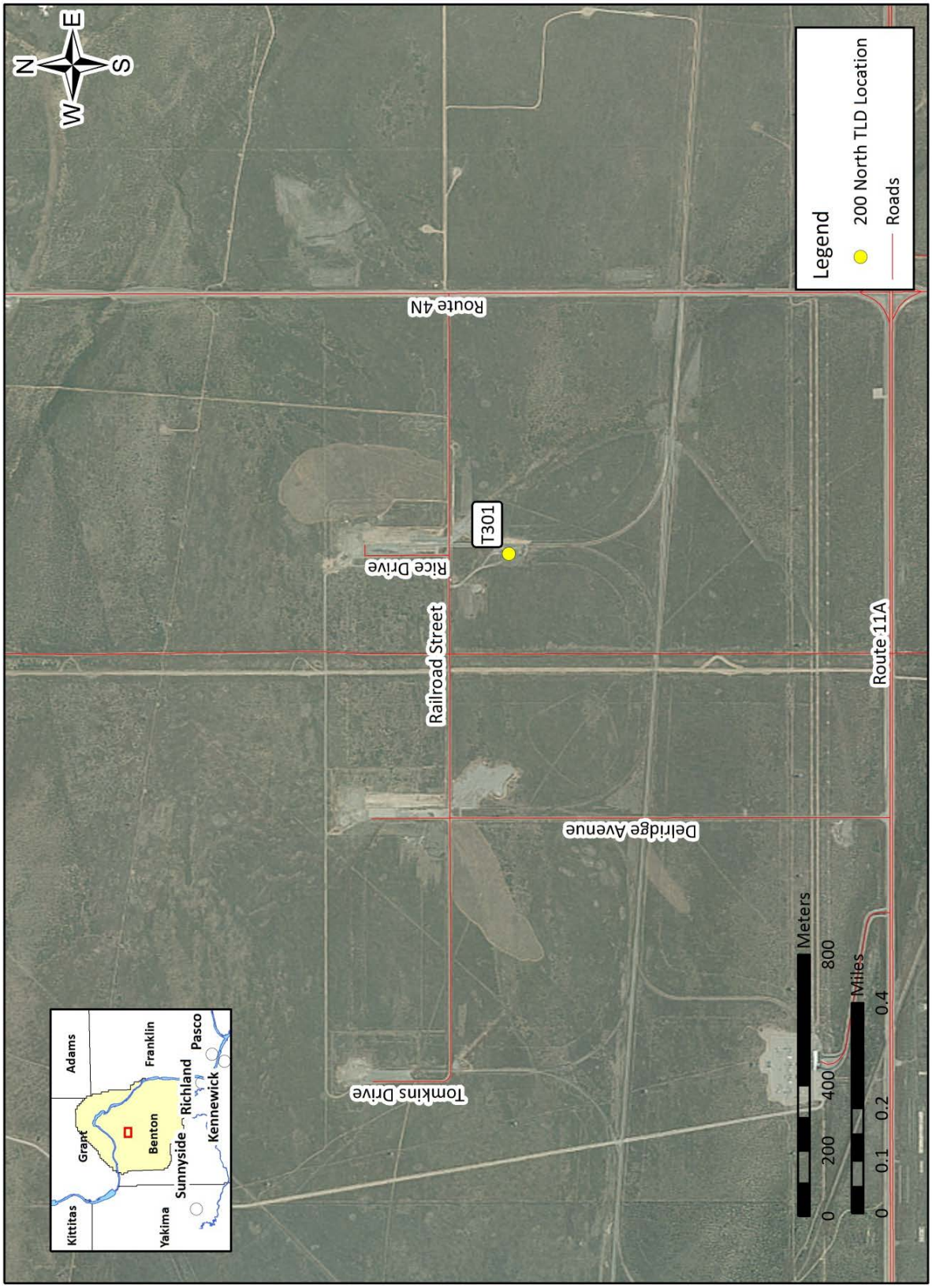


Figure 32. Thermoluminescent Dosimeter Locations in the 200 West Area

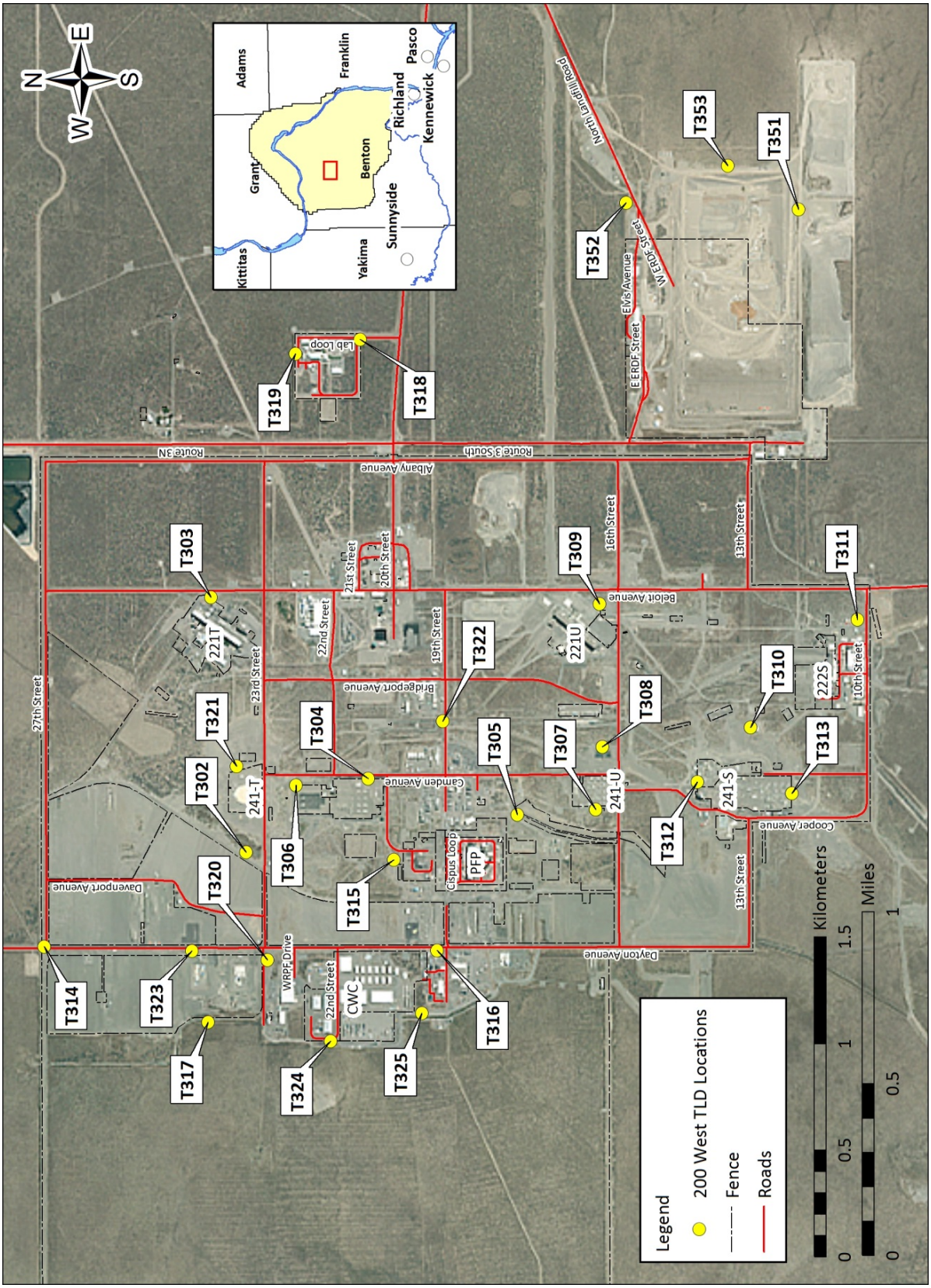


Figure 33. Thermoluminescent Dosimeter Locations in the 300 Area

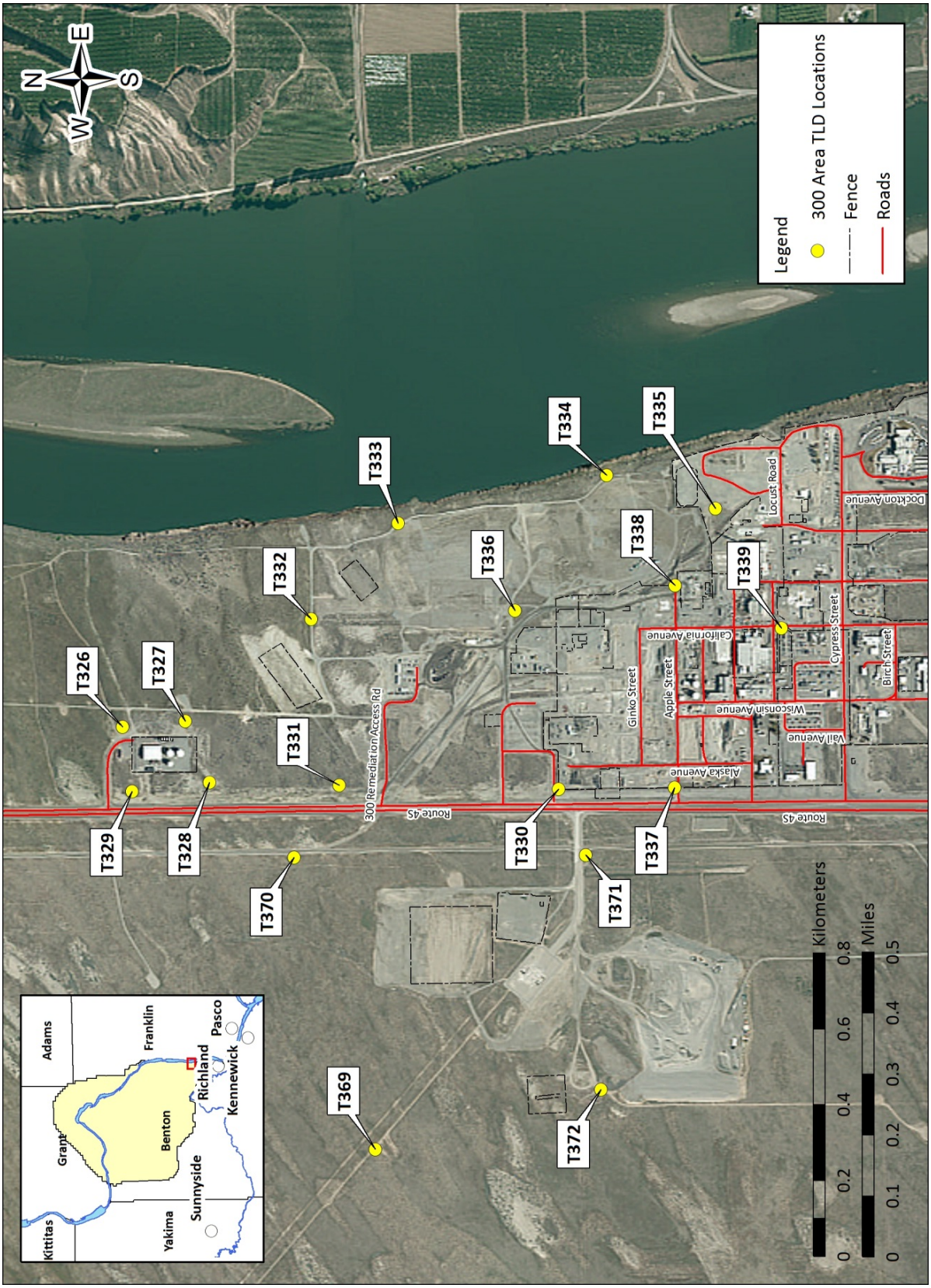


Figure 34. Thermoluminescent Dosimeter Locations in the 400 Area

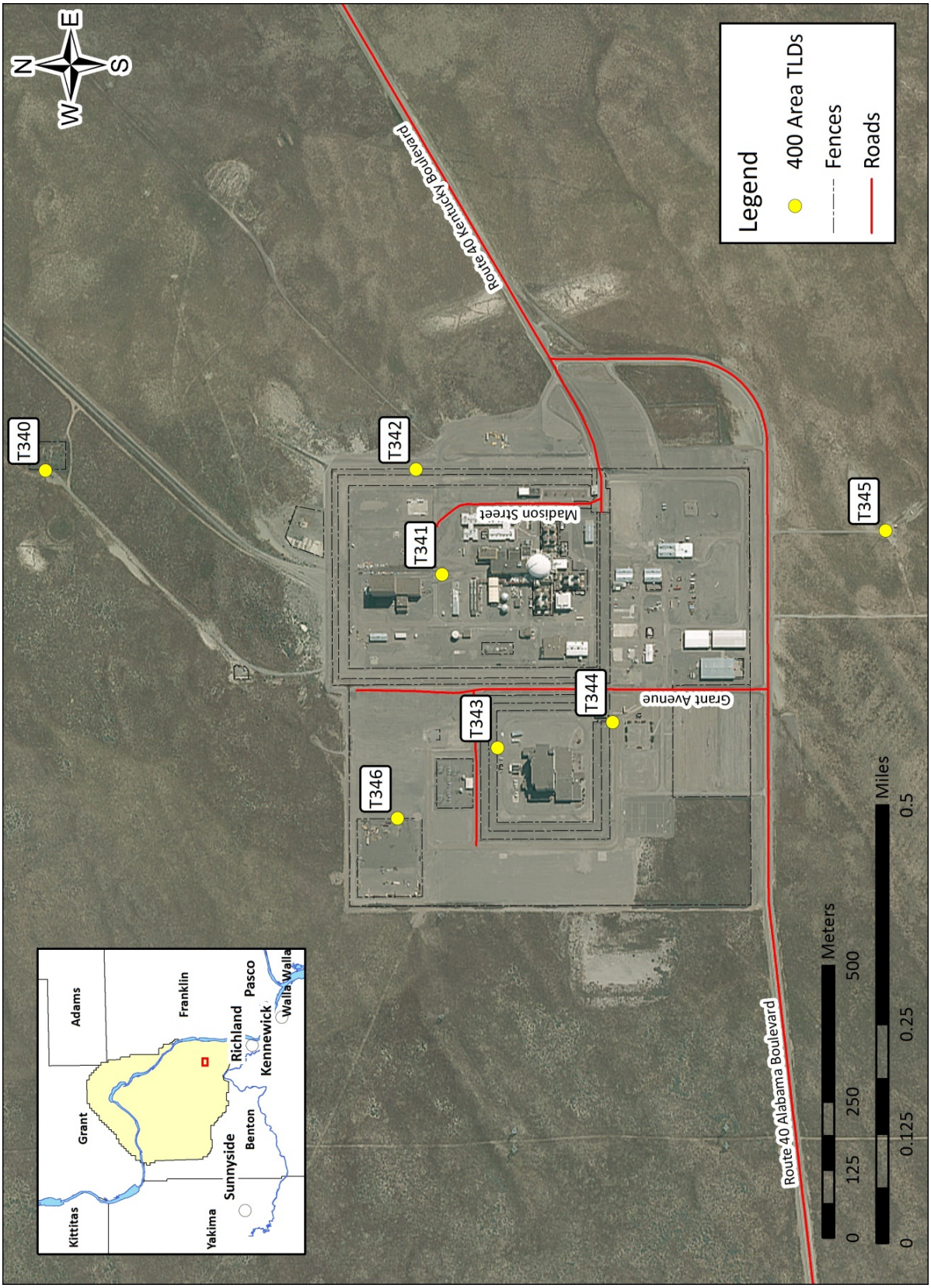
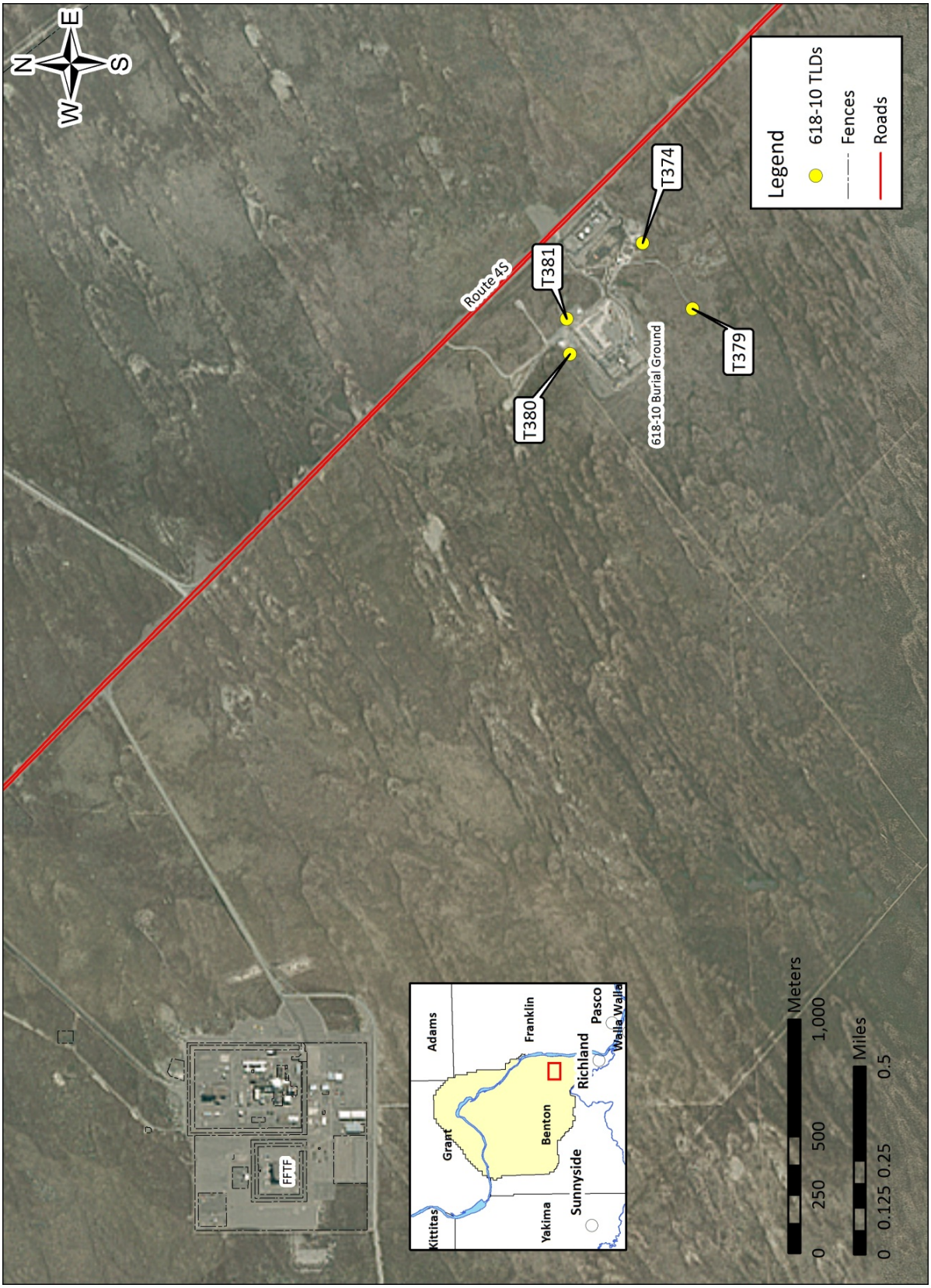


Figure 35. Thermoluminescent Dosimeter Locations at the 618-10 Burial Ground



7.0 Radiological Surveys

7.1 Weekly Inspections

Location
2724-WB RMA

7.2 Annual Radiological Surveys

Location	Survey Period
241-S/SX/SY tank farm perimeters (including 200-W-54 and 216-SX-2)	January
218-E-12B outside perimeter	January
241-B tank farm perimeter	January
241-C tank farm perimeter (including posted CA South of 7th street)	February
241-A, AN, AX, AY, & AZ tank farm perimeters	February
241-BX/BY tank farm perimeters (including 216-BY-201 tank)	February
218-E-12A outside perimeter	February
241-U (including 200-W-91 and 200-W-95) tank farm perimeters	February
241-TX/TY tank farm perimeters	March
218-W-4A perimeter	March
200-E-109 perimeter	March
241-ER-151 diversion box perimeter	March
218-E-10 outside perimeter	March
241-T tank farm perimeter	April
2025E and 200-E-17 perimeter	April
600-214 Perimeter	April
Tumbleweed surveys inside and outside of the Northeast corners of 200-E and 200-W perimeter fences	April
200/600 Areas Emergency Plots	November
Haul routes (As identified by PSRP)	TBD