

**ATTACHMENT 1**  
**MWH FIELD CLASSIFICATION GUIDES**



## FIELD GUIDE



**MWH**  
MONTGOMERY WATSON HARZA

### ORDER OF DESCRIPTION

1. Soil group name 2. USCS symbol 3. Color 4. Density/Consistency 5. Moisture  
6. Grain size (sands and gravels) 7. Cementation 8. Odor 9. Miscellaneous

### EXAMPLE DESCRIPTION

Poorly-graded sand with gravel (SP), light brown, loose, moist, predominantly fine sand, trace medium sand, 20% fine gravel, hydrocarbon odor and staining

### UNIFIED SOIL CLASSIFICATION SYSTEM

1	COARSE-GRAINED SOILS 50% coarse fraction passes #200 sieve	GRAVELS 50% coarse fraction passes #4 sieve	GRAVELS with little or no fines	Well-graded gravels, gravel-sand mixtures, little or no fines	GW	2
			GRAVELS with 15 fines	Poorly-graded gravels, gravel-sand mixtures, little or no fines	GP	
				Silty gravels, poorly-graded gravel-sand-silt mixtures	GM	
				Clayey gravels, poorly-graded gravel-sand-clay mixture	GC	
		SANDS 50% coarse fraction passes #4 sieve	SANDS with little or no fines	Well-graded sands, gravelly sands, little or no fines	SW	
				Poorly-graded sands, gravelly sands, little or no fines	SP	
				Silty sands, poorly-graded sand-gravel-silt mixtures	SM	
				Clayey sands, poorly-graded sand-gravel-clay mixtures	SC	
	FINE-GRAINED SOILS 50% fine fraction passes #200 sieve	SILTS AND CLAYS liquid limit <50		Inorganic silts and very fine sands, silty or clayey fine sands, silts with slight plasticity	ML	
				Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	CL	
			Organic silts and clays of low plasticity	OL		
SILTS AND CLAYS liquid limit >50			Inorganic silts, micaceous or diatomaceous fine sand or silt	MH		
			Inorganic clays of high plasticity, fat clays	CH		
			Organic silts and clays of medium-to-high plasticity	OH		
HIGHLY ORGANIC SOILS			Peat, humus, swamp soils with high organic content	PT		

NOTE: W = well-graded (wide range of grain size) = poorly sorted; poorly-graded (predominantly one grain size) = well sorted

3	COLOR	Assign color using Munsell Soil Color Chart (1992) if possible
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4

DENSITY (Sands and gravels)			
Term	Blo	w/ft*	
1.4"ID		2.0"ID	2.5"ID
very loose	0-4	0-5	0-7
loose	4-10	5-12	7-18
medium dense	10-29	12-37	18-51
dense	29-47	37-60	51-86
very dense	>47	>60	>86

SOIL TYPE MODIFIERS			
Sand/Gr	avel	Silt/Cla	y
Term	% fines	T	erm % fines
trace	<5	tr	ace <5
with 5-15		with	15-30
clayey/silty	15	sandy/g	ravelly 30

### CONSISTENCY (Sils and clays)

Term	Blo 1.4"ID	w/ft* 2.0"ID	Field 2.5"ID	Test (when b low counts not available)
very soft	0-2	0-2	0-2	Easily penetrated several inches by thumb; exudes between thumb and finger when squeezed
soft	2-4	2-4	2-4	Easily penetrated one inch by thumb; molded by light finger pressure
medium stiff	4-8	4-8	4-8	Penetrated over 1/2 inch by thumb with moderate effort; molded by strong finger pressure
stiff	8-15	9-17	9-18	Indented by 1/2 inch by thumb but penetrated only with great effort
very stiff	15-30	17-39	18-42	Readily indented by thumbnail
hard	30-60	39-78	42-85	Indented with difficulty by thumbnail
very hard	>60	>78	>85	

\* = 140 pound hammer dropped 30 inches

### MISCELLANEOUS

Plasticity (if applicable)	Degree of rounding/angularity	Loss of drilling fluid
Organics, carbon, vegetation Str	atigraphic unit (if known) Ca	ving/sloughing
Structure (e.g., layering) Dr	illing rate	Depth to first water (time and date)
Coloration (staining, oxidation, mottling) Rig beha	viour	Depth to water after drilling (time and date)
Lithology (e.g., quartz) Hea	ving sands	

GeoFMSd OA-QC 06-01



## 5 MOISTURE CONTENT

Term Field	Test
Dry Absence of moisture	, dusty, dry to the touch
Moist Damp b	ut no visible water
Wet Visib	le free water

## 6 GRAIN SIZE

Term Sie	ve size Gr	ain size Appro	ximate size
Boulders 12 inches	>12 inches	Larger than bask	etball-size
Cobbles 3-12 inches	3-12 inches	Fist-siz	e to basketball-size
Gravel - Coarse 3/4-3 inches	3/4-3 inches	Thumb-siz	e to fist-size
Fine #4-3/4 inches	0.19-0.75 inches	P	ea-size to thumb-size
Sand - Coarse #10-#4	0.079-0.19 inches	Roc	k salt-size to pea-size
Medium #40-#10	0.017-0.079 inches	Sugar-siz	e to rock salt-size
Fine #200-#40	0.0029-0.017 inches	Flour-siz	e to sugar-size
Fines P	assing #200 <0.0029 inches	Flour-siz	e and smaller

## 7 CEMENTATION

Term Field	Test
Weak Cr	umbles or breaks with handling or slight finger pressure
Moderate Cr	umbles or breaks with considerable finger pressure
Strong Will not cr	umble or break with finger pressure

### PLASTICITY

Nonplastic A1/8 inch (3mm) thread cannot be rolled at an	y water content
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit
Medium	The thread is easy to roll and not m uch time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit
High It tak rerolled se cr	es considerable time rolling and kneading to reach the plastic limit. The thread can be veral times after reaching the plastic limit. The lump can be formed without umbling when drier than the plastic limit

### ROCK CLASSIFICATION

Rock name Color	W	eathing F	racturing Competency	Miner	alogy	Miscellaneous
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### CONVERSIONS

Multiply b	y to Obtain
in 2.54	cm
ft 0.3048	m
mi 1760	yd
mi 5280	ft
mi 1.6093	km
cm 0.3937	in
cm 3.2808 E-2	ft
m 3.2808	ft
km 0.6214	mi
cu ft 2.8317 E-2	cu m
gal 3.7850 E-3	cu m
cu ft 7.4813	gal
quart 0.9464	liter
gal 3.7854	liter
liter 0.2642	gal

Sch 40 PVC	VOLUMES
CASING	Diameter (in) V olume (gal/ft)
2	0.17
4	0.66
6	1.50

BORING VOLUMES	Hole dia. (in) V olume (gal/ft)
7.25	2.14
7.75	2.45
8.25	2.78
10.25	4.29
12.25	6.1

### WELL VOLUME CALCULATION EXAMPLE

Well volume = Annular volume + Casing volume  
Annular volume = (Boring volume - Casing volume  
x Sand pack porosity

### EXAMPLE

Assume 10.25 in dia hole 4 in dia casing  
30% sand pack porosity, 8 ft water column  
Annular volume = (4.29 gal/ft - 0.66 gal/ft) x .30 x 8  
8.71 gal/ft  
Casing volume = 0.66 gal/ft x 8 ft = 5.28 gal/ft<sup>2</sup>  
One well volume = 8.71 gal = 5.28 gal = 13.99 gal



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MONTGOMERY WATSON HARZA

INCHES (tenths) 1	2	3	4	5	6	7
(Add 1 inch)						



**ATTACHMENT 2**

**EXAMPLE MWH BORING LOG FORMS**



BORING LOG NUMBER: _____						LOCATION SKETCH				
LOC. ID: _____				ELEVATION: _____				SHEET _____ OF _____		
PROJECT NAME: _____				DATUM: _____				DRILL DATE: _____		
INCLINATION: _____		AZIMUTH: _____		HAMMER WEIGHT: _____				DATE FINISHED: _____		
DEPTH (UNITS)	BORING METHOD	SOIL PROFILE		GRAPHIC LOG	SAMPLES					ADDITIONAL COMMENTS
		SOIL DESCRIPTION			USCS	NUMBER	TYPE	BLOW COUNT/6"	RECOVERY	
<div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">0</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">5</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">10</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">15</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">20</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">25</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">30</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">35</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">40</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 20px; text-align: center;">45</div> <div style="width: 10px; border-bottom: 1px solid black;"></div> </div>										
DEPTH UNITS: _____ DRILLING CONTRACTOR: _____ DRILLER: _____				LOGGED BY: _____ CHECKED BY: _____						
<b>SOIL BORING LOG FORM</b>										
REV. No.	REVISIONS	REV. DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY					
		PROJECT No. _____								
		AutoCAD FILE: _____								
		SCALE: _____	FIGURE No: _____							



Boring #:		MW#:		Project:		Sheet		of						
PID/OVA	Sample Interval	Recovered (in.)	Blow Counts / 6 in.	Retained for Analysis.	Casing Type & Size	Annulus Filler	Depth (Feet)	USCS Soil Type	Soil Description	Estimated % Of				
										Gravel	Coarse Sand	Med. Sand	Fine Sand	Silt/Clay
							2							
							3							
							4							
							5							
							6							
							7							
							8							
							9							
							0							
							1							
							2							
							3							
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							9							
							0							
							1							
							2							



**STANDARD OPERATING PROCEDURES  
PRE-DESIGN STUDIES  
CHURCH ROCK MINE AND MILL SITE**

**SOP-31  
Revision: 0**

**EQUIPMENT  
DECONTAMINATION**

**Date: July 2013**



**STANDARD OPERATING PROCEDURE 31  
EQUIPMENT DECONTAMINATION**

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2.1	DECONTAMINATION OF GEOTECHNICAL SAMPLING EQUIPMENT ...	2
2.2	DECONTAMINATION OF CHEMICAL SAMPLING EQUIPMENT .....	2
2.3	DECONTAMINATION PRIOR TO FINAL RELEASE FROM THE SITE ....	3



## **1.0 SCOPE AND APPLICABILITY**

This standard operating procedure (SOP) presents the decontamination procedures to be used during Pre-Design studies at the Church Rock Mine and Mill Site. The purpose of these decontamination procedures is to prevent foreign contamination of the samples and cross-contamination between sites and material types during excavation, drilling, and sampling.

This document focuses on methods and equipment that are readily available and typically applied during geotechnical soil sampling activities. It is not intended to provide an all-inclusive discussion of decontamination methods. This SOP does not replace any site-specific decontamination procedures, nor does it address all the requirements for equipment decontamination prior to release from the site.



## **2.0 PROCEDURES**

### **2.1 DECONTAMINATION OF GEOTECHNICAL SAMPLING EQUIPMENT**

All geotechnical soil sampling equipment that may directly contact samples will be decontaminated on site prior to use at each sampling location. The following decontamination procedures will be observed:

1. Remove all visible soil and debris from the surface of the equipment with brushes or scrapers.
2. Rinse with clean water to remove all visible debris.
3. For large equipment such as excavator buckets and drilling augers, a pressure washer may be necessary to thoroughly remove all material.
4. For smaller equipment such as split-spoon samplers or shovels, a bucket may be used to rinse the equipment.
5. If the equipment has only come in contact with cover material or clean borrow material, all decontamination debris and rinse water may be discharged to the ground surface at the sampling location.
6. If the equipment has come into contact with tailings or other contaminants, all decontamination debris and rinse water will be directed down the auger hole, CPT hole, or test pit, as applicable. Plastic sheeting will be used if necessary to prevent the debris and rinse water from contacting clean material.
7. Decontamination will take place at each sampling location prior to moving to the next location.

### **2.2 DECONTAMINATION OF CHEMICAL SAMPLING EQUIPMENT**

To decontaminate equipment used to collect samples for chemical analysis, the following additional procedures will be observed:

1. Wash and scrub the equipment with detergent (laboratory grade, non-phosphate detergent)
2. Rinse with tap water
3. Rinse twice with deionized water
4. Air dry
5. Protect the cleaned equipment from fugitive dust



### **2.3 DECONTAMINATION PRIOR TO FINAL RELEASE FROM THE SITE**

All sampling equipment including drill rigs, drill augers, excavators, small equipment, and support vehicles will be decontaminated and inspected prior to leaving the site. This work will take place under the direction of the site Radiation Safety Officer (RSO) and will include, at a minimum:

1. At the last sampling location prior to leaving the site, thoroughly clean all equipment according to the procedures in Section 2.1 above.
2. Inspect all equipment to ensure all visible soil and debris has been removed. Pressure washing may be necessary to thoroughly clean the equipment.
3. Scan the equipment using the methods and equipment specified by the site RSO.

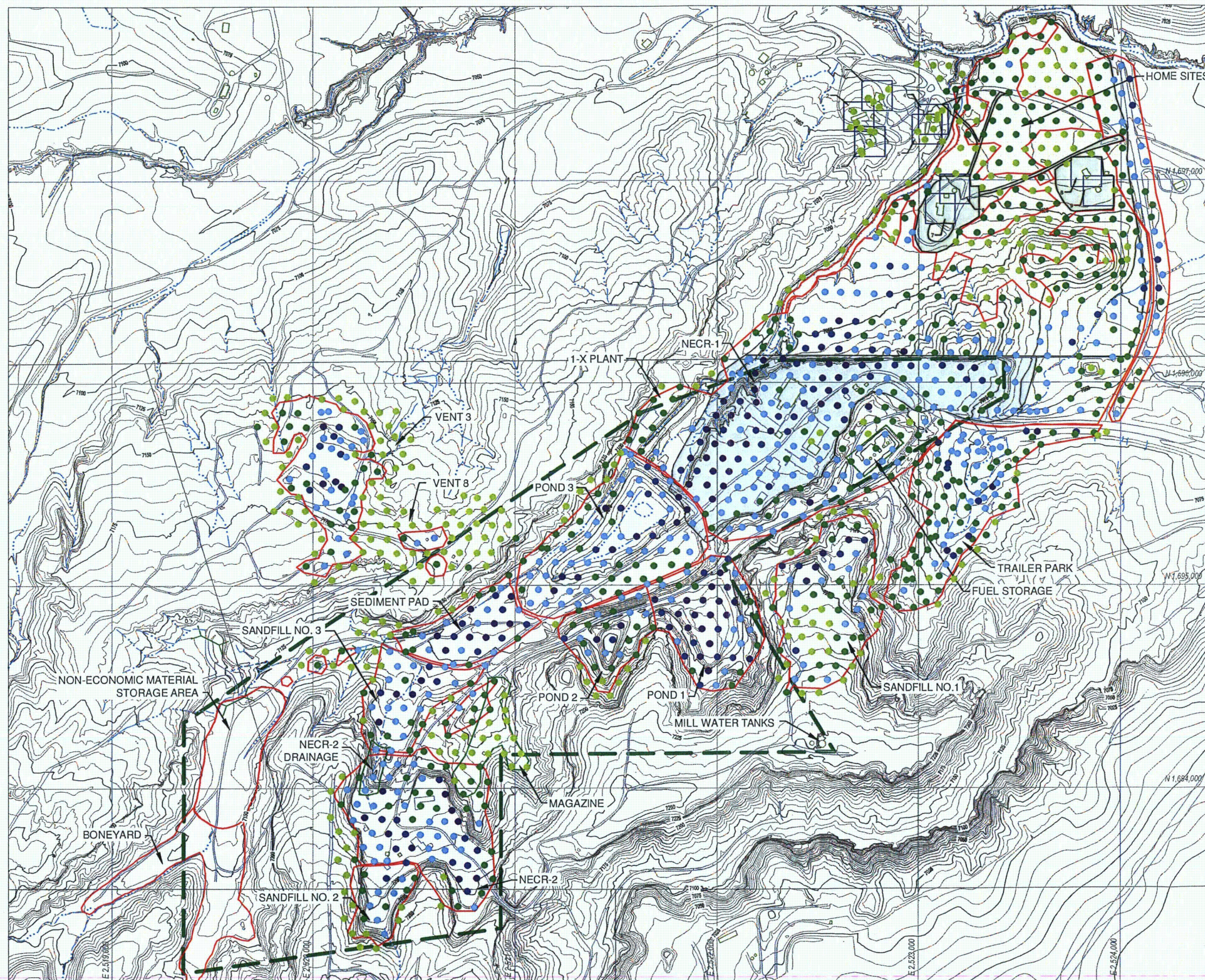


**APPENDIX B**

**REMOVAL SITE EVALUATION FIGURES**



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SCALE  
250' 0' 250'  
CONTOUR INTERVAL  
5 FT.

## LEGEND

- CONTOURS
- STREAMS
- ROADS
- STRUCTURES
- PERMIT BOUNDARY
- MINE FEATURE BOUNDARY
- HOME SITE 0.5ACRE SURVEY AREA BOUNDARY
- AREAS ABOVE FIELD SCREENING LEVEL
- EPA REMOVAL ACTION AREA  
(APPROXIMATE 5,300 C.Y. OF IMPACTED SOIL  
REMOVED BY EPA IN 2007 HOME SITES  
REMOVAL ACTION (DISPOSED OFFSITE))
- INTERIM REMOVAL ACTION AREA  
(NECR-1 PAD WAS REGRADED AND COVERED  
WITH UP TO 20 FEET OF IMPACTED SOIL AND  
6"-12" OF IMPORTED SOIL)
- INTERIM REMOVAL ACTION AREA  
(APPROXIMATE 100,000 C.Y. OF IMPACTED SOIL  
REMOVED BY UNC/GE IN 2009/2010  
PLACED/COVERED ON NECR MINE SITE)

STATIC GAMMA MEASUREMENT LOCATIONS SHOWING  
EQUIVALENT Ra-226 (pCi/g) CONCENTRATION

- < 2.2
- 2.2 ~ 6.0
- 6.1 ~ 22.4
- 22.4 ~ 50
- > 50

## NOTES:

1. SURFACE TOPOGRAPHY GENERATED FROM AERIAL  
PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS  
CO. NEW MEXICO WEST STATE PLANE COORDINATES, NAD 83.

1	SUPPLEMENTAL RSE PLANNING 2011	04/11	T.Lesson	C.Fowler	T.Lesson
0	ISSUE FOR INTERNAL REVIEW	01/08	T.Lesson	E.Marks	T.Lesson
REV. NO.	REVISIONS	DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY



P.O. BOX 3077  
Gallup, New Mexico 87305-3077

PROJECT: **SUPPLEMENTAL REMOVAL SITE  
EVALUATION REPORT**

DRAWING TITLE:  
**RESULTS OF FIELD GAMMA  
RADIATION SURVEY**



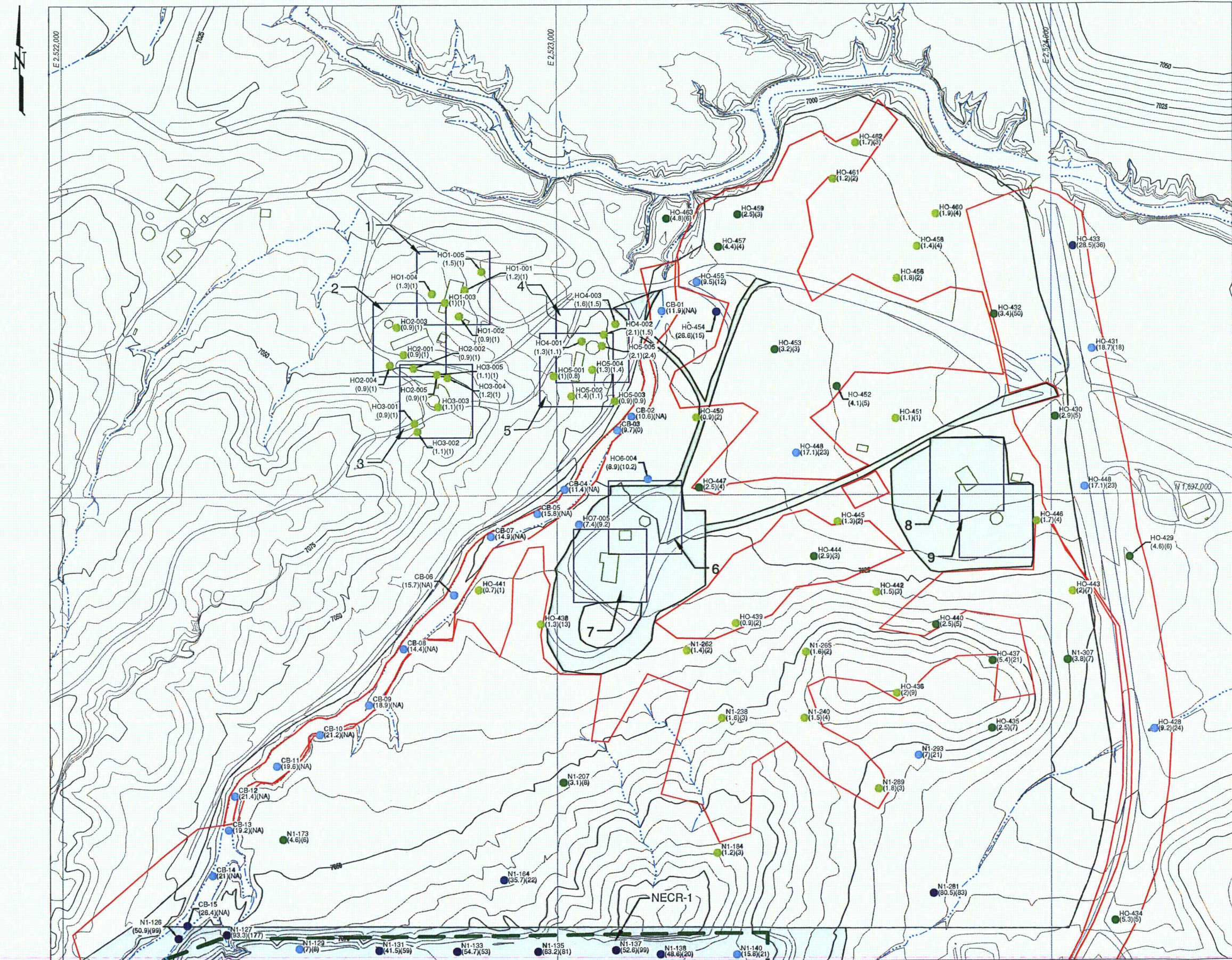
**MWH**

SCALE:  
As Shown

FIGURE No.  
**3-1**



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# LEGEND

- CONTOURS
- STREAMS
- ROADS
- STRUCTURES
- PERMIT BOUNDARY
- MINE FEATURE BOUNDARY
- HOME SITE 0.5-ACRE SURVEY AREA BOUNDARY
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SURFACE SOIL SAMPLE LOCATIONS SHOWING  
Ra-226 LABORATORY RESULTS (pCi/g)

- < 2.2
  - 2.2 ~ 6.0
  - 6.1 ~ 22.4
  - 22.4 ~ 50
  - > 50
- (2.7)(5.3) AS,U (mg/Kg)
- NA NOT-ANALYZED

## NOTES:

- SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. NEW MEXICO WEST STATE PLANE COORDINATES, NAD 83.
- URANIUM VALUES ARE ROUNDED TO ZERO DECIMAL PLACES.

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PROJECT: **SUPPLEMENTAL REMOVAL SITE  
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**SURFACE SOIL ANALYTICAL  
RESULTS**



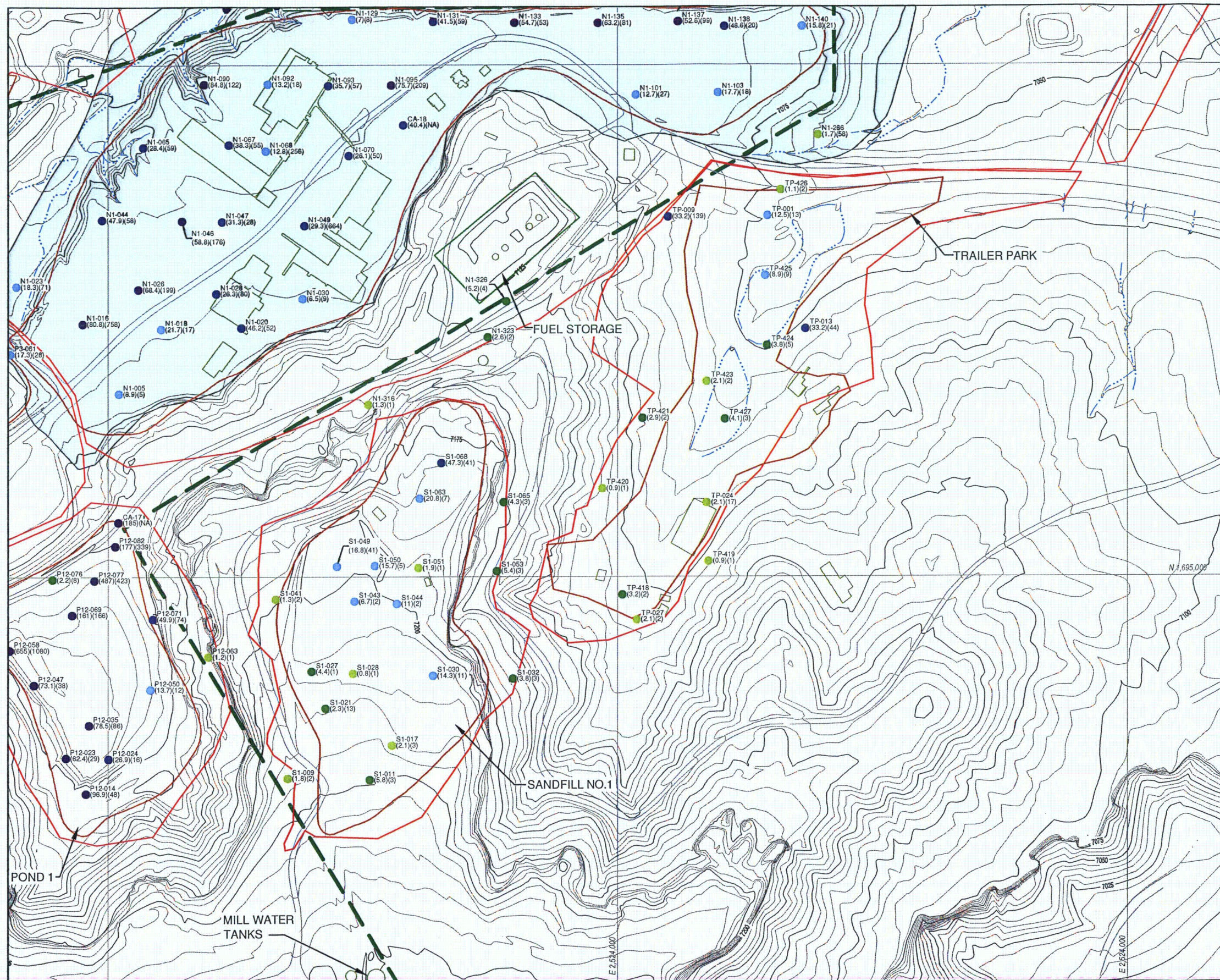
**MWH**

SCALE:  
As Shown

FIGURE No.  
**3-2.1**



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## LEGEND

- CONTOURS
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DRAWING TITLE:  
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RESULTS**

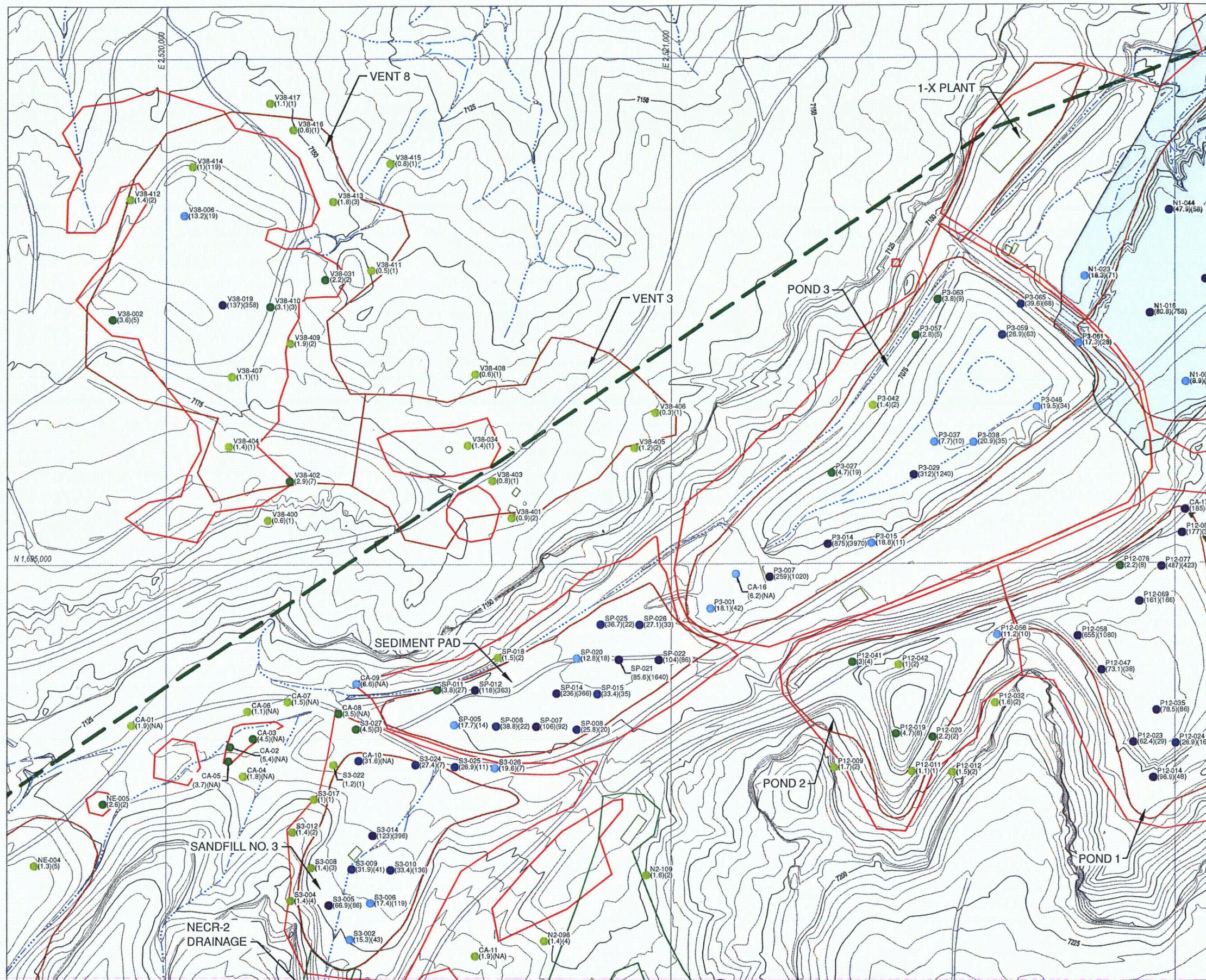


**MWH**

SCALE: **As Shown**  
FIGURE No. **3-2.2**

SCALE  
200' 0 200'  
CONTOUR INTERVAL 5 FT.





## LEGEND

- CONTOURS
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RESULTS**

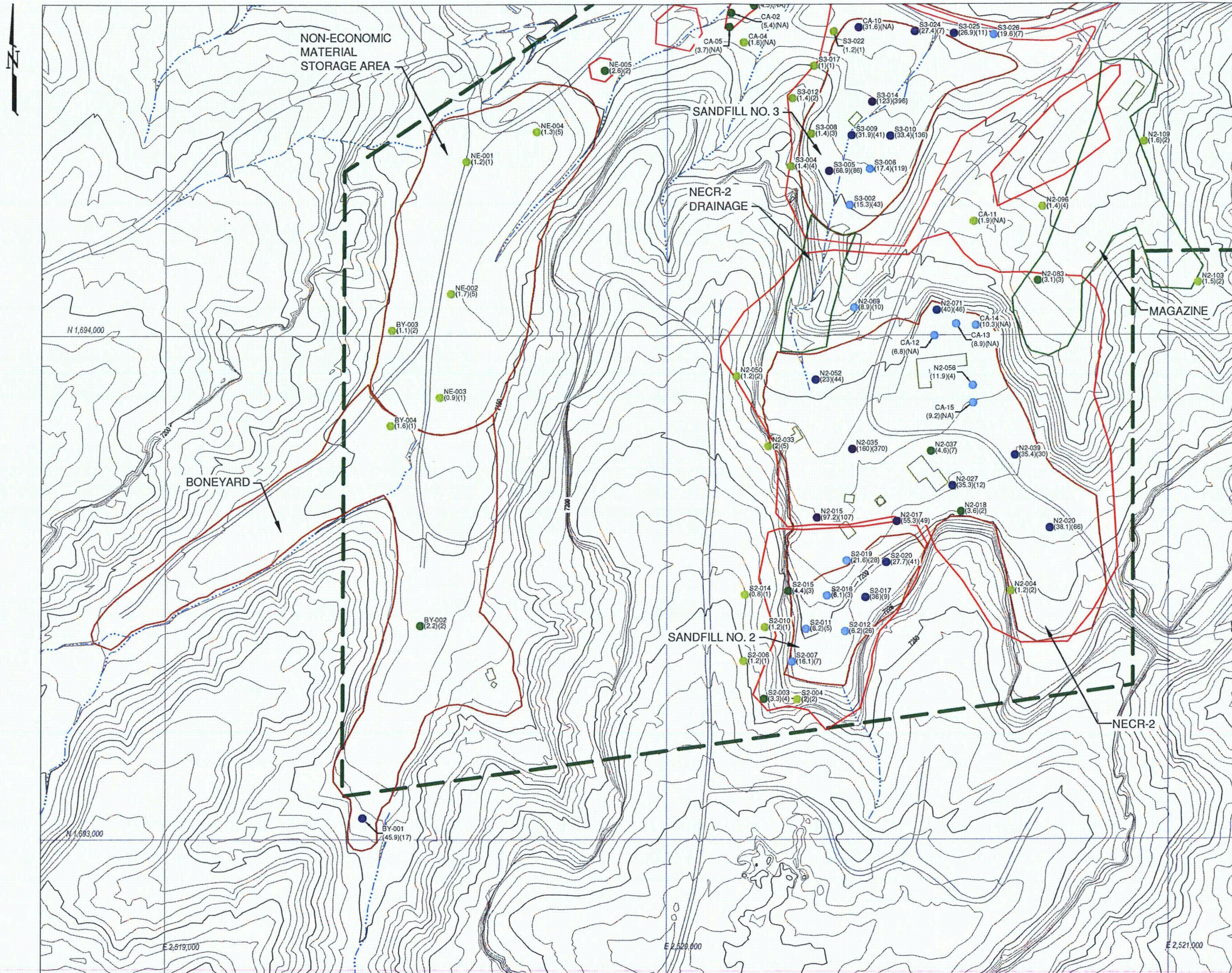


SCALE: **As Shown**  
FIGURE No. **3-23**

SCALE  
200' 0 200'  
CONTOUR INTERVAL 5FT.



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## LEGEND

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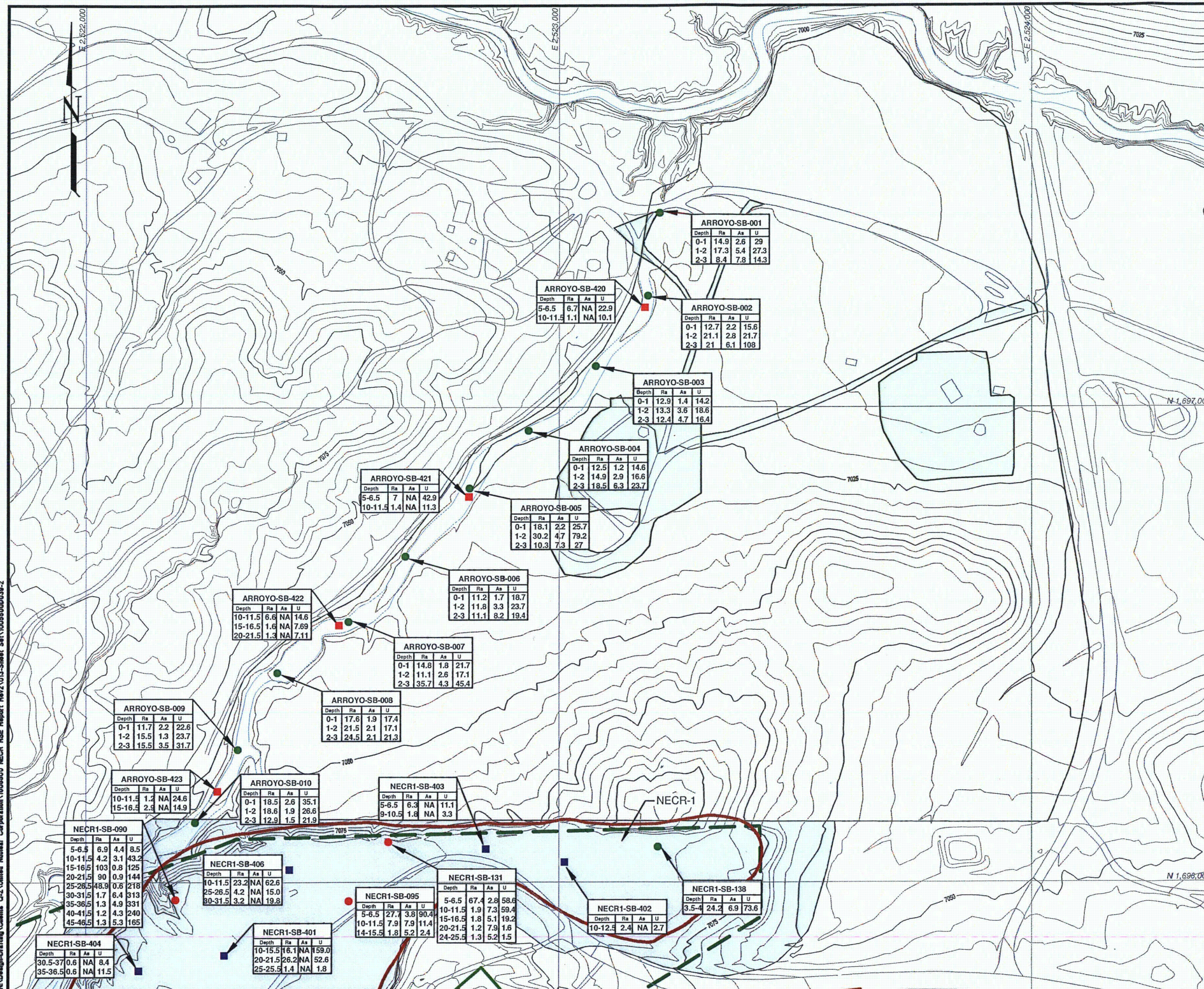
PROJECT: **SUPPLEMENTAL REMOVAL SITE  
EVALUATION REPORT**

DRAWING TITLE:  
**SURFACE SOIL ANALYTICAL  
RESULTS**



SCALE: **As Shown**  
FIGURE No. **3-24**

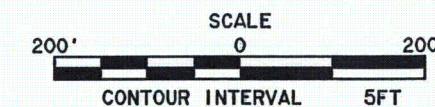




## LEGEND

- PERMIT BOUNDARY
- SURVEY AREA BOUNDARY
- TEST PIT LOCATION
- SOIL BORING LOCATION
- SUPPLEMENTAL SOIL BORING LOCATION (FEBRUARY, 2008)
- SUPPLEMENTAL SOIL BORING LOCATION (APRIL, 2008)
- EPA REMOVAL ACTION AREA (APPROXIMATE 5,300 C.Y. OF IMPACTED SOIL REMOVED BY EPA IN 2007 HOME SITES REMOVAL ACTION (DISPOSED OF OFFSITE))
- INTERIM REMOVAL ACTION AREA (NECR-1 PAD WAS REGRADED AND COVERED WITH UP TO 20 FEET OF IMPACTED SOIL AND 6"-12" OF IMPORTED SOIL)
- INTERIM REMOVAL ACTION AREA (APPROXIMATE 100,000 C.Y. OF IMPACTED SOIL REMOVED BY UNCL/GE IN 2009/2010 PLACED/COVERED ON NECR MINE SITE)

- NOTES:
1. Ra-226 CONCENTRATIONS ARE IN pCi/g; AS AND U ARE IN mg/Kg.
  2. RSE SAMPLES COLLECTED NOV.2006; SRSE SAMPLES COLLECTED FEBRUARY 2008 (ID# 400-413); SRSE PHASE 2 SAMPLES COLLECTED APRIL 2008 (ID# 414-423).
  3. DEPTH IN FEET bgs.
  4. SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. NEW MEXICO WEST STATE PLANE COORDINATES, NAD 83.



2	SUPPLEMENTAL RSE PLANNING 2011	04/11	T.Lee	C.Fowler	T.Lee
1	Issued For Supplemental Draft	04/08	T.Lee	C.Fowler	T.Lee
0	Issued For Final	08/07	T.Lee	C.Fowler	T.Lee
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PROJECT:  
**REMOVAL SITE EVALUATION REPORT**

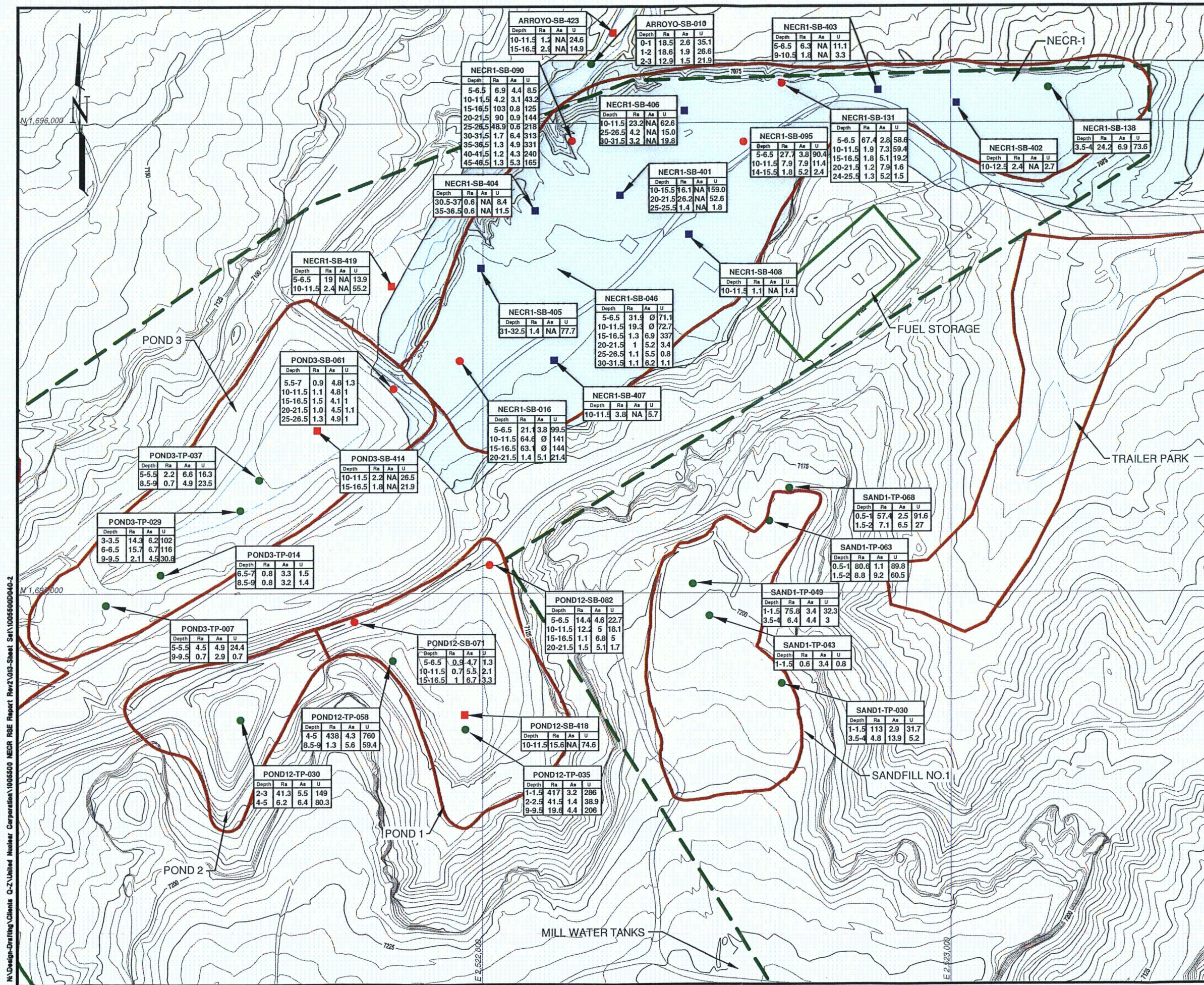
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**SUBSURFACE SOIL ANALYTICAL RESULTS**



Sheet 1 of 3 Sheets  
SCALE: AS SHOWN  
FIGURE NO. 3-4



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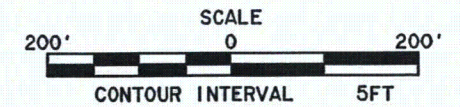


### LEGEND

- PERMIT BOUNDARY
- SURVEY AREA BOUNDARY
- MINE FEATURE BOUNDARY
- ARROYO
- TEST PIT LOCATION
- SOIL BORING LOCATION
- SUPPLEMENTAL SOIL BORING LOCATION (FEBRUARY 2008)
- SUPPLEMENTAL SOIL BORING LOCATION (APRIL 2008)
- EPA REMOVAL ACTION AREA (APPROXIMATE 5,300 C.Y. OF IMPACTED SOIL REMOVED BY EPA IN 2007 HOME SITES REMOVAL ACTION (DISPOSED OFFSITE))
- INTERIM REMOVAL ACTION AREA (NECR-1 PAD WAS REGRADED AND COVERED WITH UP TO 20 FEET OF IMPACTED SOIL AND 6"-12" OF IMPORTED SOIL)
- INTERIM REMOVAL ACTION AREA (APPROXIMATE 100,000 C.Y. OF IMPACTED SOIL REMOVED BY UNC/GE IN 2009/2010 PLACED/COVERED ON NECR MINE SITE)

### NOTES:

1. Ra-226 CONCENTRATIONS ARE IN pCi/g; AS AND U ARE IN mg/Kg.
2. RSE SAMPLES COLLECTED NOV.2006; SRSE SAMPLES COLLECTED FEBRUARY 2008 (ID# 400-413); SRSE PHASE 2 SAMPLES COLLECTED APRIL 2008 (ID# 414-423).
3. DEPTH IN FEET bgs.
4. SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. NEW MEXICO WEST STATE PLANE COORDINATES, NAD 83.



REV.	REVISIONS	DATE	DESIGN BY	DRAWN BY	REVIEWED AND SIGNED BY
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PROJECT:  
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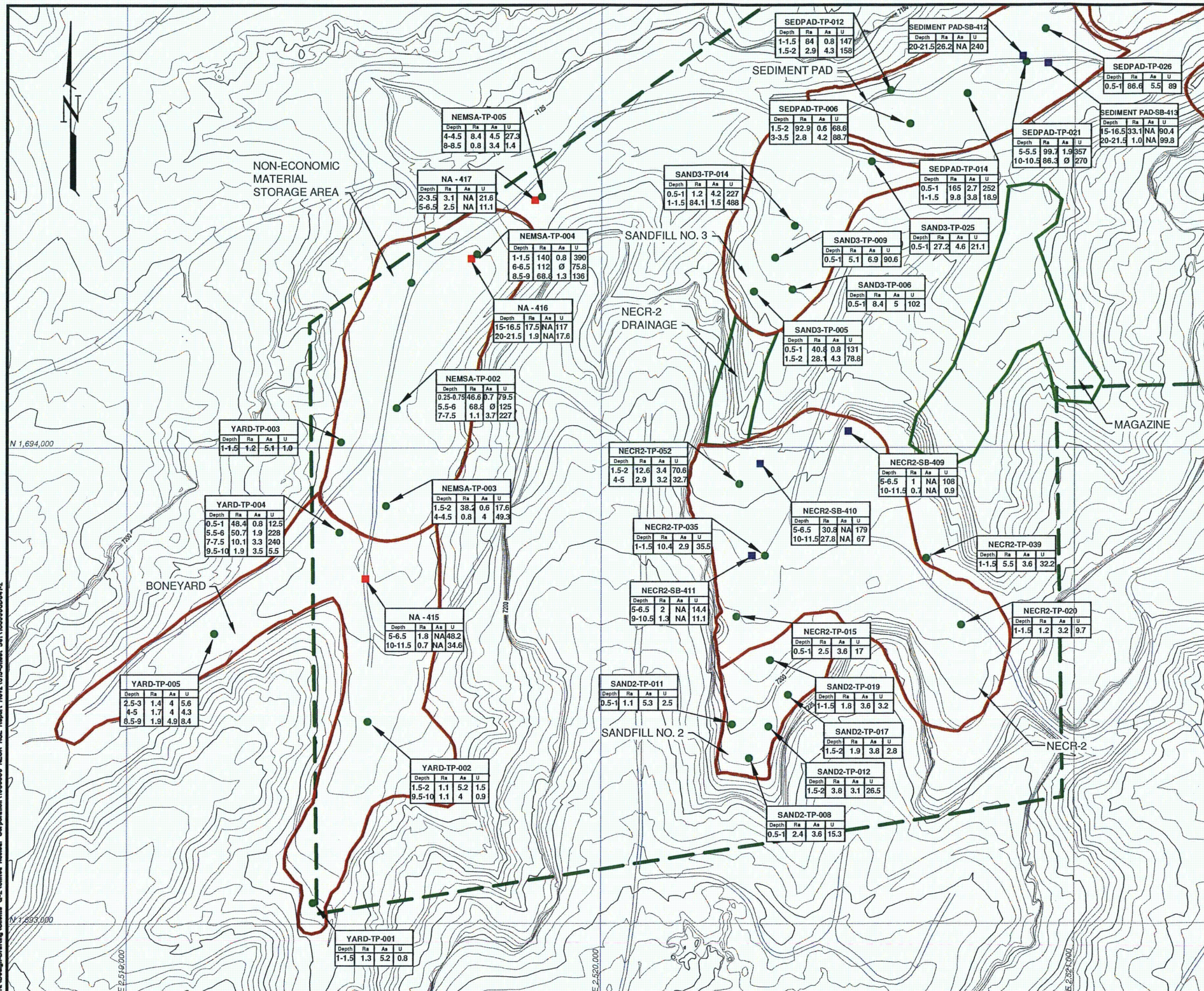
DRAWING TITLE:  
**SUBSURFACE SOIL ANALYTICAL RESULTS**



Sheet 2 Of 3 Sheets  
SCALE: As Shown  
FIGURE NO. 3-4



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## LEGEND

- PERMIT BOUNDARY
- SURVEY AREA BOUNDARY
- MINE FEATURE BOUNDARY
- TEST PIT LOCATION
- SUPPLEMENTAL SOIL BORING LOCATION (FEBRUARY 2008)
- SUPPLEMENTAL SOIL BORING LOCATION (APRIL 2008)

## NOTES:

1. Ra-226 CONCENTRATIONS ARE IN pCi/g; AS AND U ARE IN mg/Kg.
2. RSE SAMPLES COLLECTED NOV.2006; SRSE SAMPLES COLLECTED FEBRUARY 2008 (ID# 400-413); SRSE PHASE 2 SAMPLES COLLECTED APRIL 2008 (ID# 414-423).
3. DEPTH IN FEET bgs.
4. SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. NEW MEXICO WEST STATE PLANE COORDINATES, NAD 83.

SCALE  
200' 0 200'  
CONTOUR INTERVAL 5FT

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PROJECT:  
**REMOVAL SITE EVALUATION REPORT**

DRAWING TITLE:  
**SUBSURFACE SOIL ANALYTICAL RESULTS**



Sheet 3 of 3 Sheets  
SCALE: As Shown  
FIGURE No. 3-4