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December 10, 2013

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Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South, B2
Denver, CO 80246-1530

SUBJECT: Operable Unit 2 (OU2) Cap Penetration Plan, Former Lowry Air Force Base, Colorado

Dear Mr. Stovall,

IRG Redevelopment I (IRGI) is re-submitting this Cap Penetration Plan to outline the procedures that must be followed in order to perform any subsurface investigations at its property, which includes the former landfill (OU2), located at the former Lowry Air Force Base (Lowry). IRGI has received written comments on this document and has also received additional comments during several working sessions from the Colorado Department of Public Health and Environment ("CDPHE" or the "Department"). It has been brought to IRGI's attention that some of CDPHE comments did not make it into the December 4, 2013 document, please disregard this previous submittal and accept this updated version of the document.

IRGI appreciates the Department's willingness to work with us on this important project. No modifications to this plan will be made without the Department's prior approval. If you have any questions regarding the procedures outlined in this plan, please contact me at (303) 972-6633.

Sincerely,
IRG Redevelopment I, LLC

Brent C. Anderson
President

Lowry Vista

Cap Penetration Plan for Subsurface Soil Borings on the Landfill Zone, Operable Unit 2 (OU2)

Former Lowry Air Force Base, Colorado

Prepared for:

IRG Redevelopment I

7991 Shaffer Parkway, Suite 300

Littleton, Colorado

Prepared by:

IRG Assumptions, LLC

December 10, 2013

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Attachment B	OU2 Phase 2 Cap specifications (Section 02921)
Attachment C	Diversion Berms and Erosion Control Matting (Section 02261)

Acronym List

ACM	Asbestos Containing Material
AF	US Air Force
AFB	Air Force Base
AOC	area of concern
ASTM	American Society for Testing & Materials
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CABI	Colorado-certified Asbestos Building Inspector
CAP	Corrective Action Plan
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain-of-custody
COI	Chemical of interest
CBGWS	Colorado Basic Groundwater Standards
DPT	Direct Push Technology
DRO	Diesel Range Organics
EPA	Environmental Protection Agency
FFS	Focused Feasibility Study
FOSET	Finding of Suitability for Early Transfer
FOST	Finding for Suitability of Transfer
GC-MS	Gas chromatography–mass spectrometry
GRO	gasoline-range organic
HSA	Hollow Stem Auger
HAZWOPER	Hazardous Waste Site Operations and Emergency Response
HMWMD	Hazardous Materials and Waste Management Division
ID	Inside Diameter
IDW	Investigation Derived Waste
IRGI	IRG Redevelopment I
kg	Kilogram
LAFB	Lowry Air Force Base
LPL	low permeability layer
mg/L	milligrams per liter
OD	Outside Diameter
OU	Operable Unit
OU2	Operable Unit 2
PID	photoionization detector
PVC	polyvinyl chloride
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment

RI	Remedial Investigation
SACM	suspect asbestos containing material
SIM	Selective Ion Monitoring
SRI	Supplemental Remedial Investigation
SVOC	semi volatile organic compound
TCLP	toxicity characteristic leaching procedure
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
VL	Vegetative Layer
VOC	volatile organic compound

1.0 Introduction

The procedures outlined in this Cap Penetration Plan will apply to all future investigative work where cap penetrations are proposed for these activities. It is anticipated that IRG Redevelopment I (IRGI) will conduct an initial subsurface investigation to answer some fundamental questions regarding subsurface conditions at the property known as Lowry Vista (Site). This information will be integral in determining/confirming possible environmental constraints for future redevelopment of this Site. IRGI will submit a specific investigation work plan under a separate cover. Once the results of the IRGI subsurface investigation activities are known, IRGI would ultimately, as part of the process, provide a Revised Closure Plan and request to once more modify the State Environmental Covenant in order to redevelop the Site. Any investigations that may be required as part of prospective buyers due diligence will need to follow the requirements of this Cap Penetration Plan, and submit a subsurface investigation work plan and meet financial assurance requirements tied to proposed scope of work to the Colorado Department of Public Health and the Environment (CDPHE) for approval in accordance with this Plan and the State Environmental Covenant, as modified and/or amended (collectively the "State Environmental Covenant"). IRGI will provide a global environmental insurance policy as surety for this portion of the project.

The Site consists of property owned by IRGI and is comprised of approximately 79.3 acres of land east of the AMLI apartments, located north of East Alameda Avenue at its intersections with Clinton and South Xenia Streets in Denver, Colorado (Figure 1). The property known as Operable Unit 2 (OU2) comprises the major portion of the property at 69.7 acres transferred to IRGI under a Finding for Suitability for Early Transfer (FOSET). Approximately, 1.3 acres of the property (triangle shaped piece) designated as OU2 on the east side of Westerly Creek is not currently contemplated in the IRGI redevelopment plans. The remaining 8.3 acres was transferred under a Finding for Suitability of Transfer (FOST) to IRGI in conjunction with the transfer of the property designated as OU2. These areas are a thin strip of property along the southern boundary adjacent to Alameda and the western portion of the property east of the AMLI Apartment Complex. IRGI's redevelopment plans contemplate approximately 78.1 acres (with the exception of the 1.3 acre piece) for a mixed-use redevelopment, including open space, commercial and multi-family uses.

2.0 Environmental Covenant and Use Restrictions

A large portion of the Site is impacted by deed and covenant restrictions due to its historic activities associated with the base landfill OU2 (Figure 1). Those restrictions require approval of the CDPHE prior to commencement of activities that may affect the current use, remedy and post-closure requirements. A copy of draft Modified Covenant is provided in (Attachment A). Once finalized and executed, the Modified Covenant will be incorporated into this document.

In order to evaluate the redevelopment of this area, IRGI has been working with the CDPHE in creating a review and approval process for performing pre-development activities (e.g., subsurface investigations) at the Site. At this time, IRGI is not proposing any change in use of the Site.

As owner of the Site, IRGI is responsible for compliance with the State Environmental Covenant related to OU2. The procedures presented in this document are intended to provide IRGI an approved process for site-specific due diligence activities associated with the potential redevelopment of this area, and to ensure that any intrusive activities are conducted with appropriate precautions in order to be protective of human health and the environment, protect and restore the integrity of the landfill cap, and are designed to not adversely impact the current post-closure program. In addition, this Plan will also provide prospective buyers and other third parties the threshold requirements for any soil disturbing activity related to OU2.

3.0 Site Background

OU2 was historically used for disposal of base-related waste and associated construction and demolition debris. Disposal most likely occurred from approximately 1948 until 1986. Disposal was generally done in trenches that were excavated in the landfill surface. IRGI conducted an extensive review of historical aerial photographs of the Lowry Vista Site to identify trenching/disposal locations. Based on this analysis, IRGI estimates that approximately 14 % of the overall area of the OU2 is covered with waste disposal trenches (Figure 2). IRGI assumes that the remaining area outside of the trenches is native or disturbed fill materials.

IRGI acknowledges that its estimates are significantly different from the original estimates provided during the previous investigations and aerial photography review by Parsons Engineering and Science

(Figure 3) (Parsons, 1995) and by Versar, Inc. (Figure 4) (Versar, 1998). IRGI reviewed the historical aerial photographs from various sources from 1948 through 2004, and re-reviewed these against the other interpretive maps provided in previous reports (Figure 3 and Figure 4).

Major investigations were conducted at OU2 during the 1990 Remedial Investigation (RI), 1995 Supplemental Remedial Investigation (SRI), and the 1998 Focused Feasibility Study (FFS) to determine the nature and extent of contamination present in soil, soil gas, surface water, and groundwater. Table 1 provides a list of those previous investigations, closure, and post-closure plans that form the basis of today's knowledge about OU2.

Table 1
Previous Investigations/Reports
Operable Unit 2

Event	Date	Citation
Air Force		
IRP Phase 1 records search	1983	Engineering Science, 1983 (AR_5)
IRP Phase II Confirmation/Quantification Stage 1 – included groundwater sampling at landfill	1987	Dames and Moore, 1986 (AR_9)
RI	1990	SAIC, 1990 (AR_57)
SRI for the landfill zone	1995	Parsons, 1995 (AR_289)
FFS	1998	Versar, 1998 (AR_400; AR_549)
Proposed Plan	1998	LAC, 2003, Phase 2 CAP Operable Unit 2, Appendix A
Final Coal Storage Yard (West) Record of Decision	2000	Versar, 2000
Site Closeout Report No Further Response Action Planned Decision Document for the Coal Storage Yard (West)	2003	Gomez-MTARRI JV, January 2003
Long-Term Monitoring for Radiological Parameters OU2, Former Lowry Air Force Base,	2004-2005	Cabrera Services, Inc., 2005

Colorado		
Privatization – LAC	August 2002	
Preliminary Closure Plan for OU2	2003	LAC, June 2003
Phase 2 CAP	2003	LAC, 2003
Landfill Closure Report	2004-2005	LAC, March 2005
Post-Closure Monitoring – 30 Year	Initiated 2006	LAC 2007 (First Quarter), LAC 2007 (2nd Quarter)
Additional Radiological monitoring	2007	LTE, May 2007, July 2007, LAC 2008
Post-Closure Operation and Maintenance Report - November 2007 through October 2008	2007	LTE 2007
Groundwater, Surface Water, and Soil Vapor Monitoring Report - Post-Closure Monitoring Q3 and Q4 2007	2007	LTE 2007 (Q3), LTE 2007 (Q4)
Post-Closure Operation and Maintenance Report - November 2007 through October 2008	2008	LTE 2008
Groundwater, Surface Water, and Soil Vapor Monitoring Report - Post-Closure Monitoring Q1, Q2, Q3, and Q4 2008	2008	LTE 2008
Post-Closure Operation and Maintenance Report - November 2008 through October 2009	2009	LTE, Nov 2009
Post-Closure Operation and Maintenance Report - November 2009 through October 2010	2010	LTE 2010
Groundwater, Surface Water, and Soil Vapor Monitoring Report - Post-Closure Monitoring Q1, Q2, Q3, and Q4 2009	2009/2010	LTE 2009, LTE 2010
Groundwater, Surface Water, and Soil Vapor Monitoring Report - Post-Closure Monitoring Q1,Q2,Q3, and Q4 2010	2010/2011	LTE 2010, LTE 2011
Post-Closure Operation and Maintenance Report - November 2010 through October 2011	2011	LTE 2011
Groundwater, Surface Water, and Soil	2011/2012	LTE 2011, LTE 2012

Vapor Monitoring Report - Post-Closure Monitoring Q1,Q2,Q3, and Q4 2011		
Post-Closure Operation and Maintenance Report - November 2010 through October 2011	2011	LTE 2011
Groundwater, Surface Water, and Soil Vapor Monitoring Report - Post-Closure Monitoring Q1,Q2,Q3, and Q4 2012	2012/2013	LTE 2012, LTE 2013

CDPHE approved the final construction report for the new OU2 soil cap in September 2006. The current in-place remedy included construction of an 18-inch-thick low permeability layer ("LPL") with a maximum hydraulic conductivity (permeability) of 1 x 10^{-5} centimeters per second over the entire area using soil from offsite borrow sources; placement of a 6-inch-thick vegetative layer (VL) on top of the LPL using soil imported from offsite borrow sources; installation of landfill gas vents and monitoring probes in culvert extension bedding material and around the southern and western perimeters of the landfill on 200-foot centers; and construction of surface water drainage structures to control run-on and runoff from the 100-year, 24-hour storm. Import and stockpiling of soil began in late 2003, and construction was completed in the fall 2004.

In accordance with the Post-Closure plans approved with the Corrective Action Plan (CAP) for the Operable Unit 2 Landfill Closure at Lowry (Phase 2 CAP), groundwater, surface water, and soil gas monitoring are being performed at the Site. Groundwater and surface water sampling is being conducted to monitor water quality and to detect potential leachate contamination that may originate from OU2. The monitoring network set forth in the Phase 2 CAP, Appendix G, Post Closure Monitoring Plan currently includes nine groundwater monitoring wells and three surface water sample locations along Westerly Creek. During the first two (2) years of post-closure monitoring, groundwater and surface water samples were collected quarterly and analyzed for general water quality parameters, metals, volatile organic compounds, and radionuclides (gross alpha and gross beta). Following this baseline monitoring, the frequency decreased to semiannual. In accordance with the Post Closure Monitoring Plan mentioned above, samples are collected to measure volatile organics, metals and radiological parameters in groundwater surrounding the landfill. The data are then reviewed statistically to identify potential releases from the landfill; no releases have been observed.

Soil gas monitoring is being conducted to ensure that any detected methane gas concentrations in the subsurface soil do not exceed the lower explosive limit (LEL) of methane. Twenty-seven (27) above

ground monitoring probes, located in the western and southern portion of the OU2 landfill, were installed to monitor for the presence of methane gas.

As of January 2012, eight (8) semi-annual monitoring events have been completed following the initial two (2) years of quarterly baseline monitoring. All quarterly, semi-annual, and annual summary reports have been submitted and approved by the CDPHE. The results of this monitoring indicate that chemicals of concern are not leaching from the landfill mass into groundwater and no other environmental issues that would cause concern have been detected.

As for soil gas, the January 2012 quarterly sampling event indicated that none of the sporadic detections of methane in soil gas probes have equaled or exceeded the action levels set forth in the Phase 2 CAP.

The documents referenced above are available for review and study by the public at the CDPHE HMWMD Records Center located at 4300 Cherry Creek Drive South, Denver. A project library is also maintained by Lowry Assumption, LLC (LAC) in its office located at 7290 East 1st Ave, Denver; an appointment to review documents at the project library can be made by calling (303) 972-6633. These key documents are also available on the internet at the U.S. Air Force Administrative Record for the Former Lowry Air Force Base at https://afrpaar.lackland.af.mil/ar/docsearch.aspx

4.0 Site Investigation Requirements

IRGI and prospective buyers will need to perform landfill cap subsurface investigations in order to:

- Assess the location, and distribution of waste trenches and other fill materials beneath the cap and in the subgrade above the trenches;
- Obtain geotechnical information for the design of buildings, roadways, and utilities;
- Ascertain if landfill gas exists directly above identified trenches to evaluate mitigation needs for the construction of residential and commercial buildings, roadways, and utilities; and,
- Evaluate groundwater conditions. This will include penetrating and sampling groundwater. *(Note: IRGI is not planning to penetrate groundwater or attempt to locate bedrock as part of its Subsurface Investigation Work Plan, however, prospective buyers may request to acquire this information as part of their due diligence requirements. Therefore, this plan contemplates such activities. Any future activities that would require the collection of this type of*

data, a separate work plan would be required and submitted to the Department for prior approval.)

CDPHE-approval will be required of each follow-on subsurface investigation work plan and written notification will be required 5 calendar days prior to mobilization. In addition, all parties desiring to perform subsurface investigations at OU2 must provide financial assurance to CDPHE in accordance with Colorado Hazardous Waste Regulations, 6 CCR 1007-3, Part 266.

Prior to initiating any soil disturbing activities at OU2, IRGI will provide written notification of the planned start of Site activities at least five (5) days prior to commencement of such activities. In addition, the IRGI Construction Oversight coordinator must be notified (720-309-1550) at least 24 hours in advance in order to schedule a Colorado-certified asbestos building inspector (CABI) to observe the soil disturbing activity. The IRGI Oversight Coordinator is responsible for maintaining the CABI master schedule and ensuring that a CABI is onsite during all soil disturbing activities. The CABIs report to the IRGI Oversight coordinator and the IRGI oversight Coordinator reports to the overall IRGI Project Manager. It is the responsibility of the contractor performing the soil disturbing activity to make the appropriate notifications to the IRGI Oversight coordinator in order to get on the master schedule prior to initiation of all soil disturbing activities. The soil disturbing activity will not be allowed to proceed without proper notifications.

Generally, the subsurface investigations will be accomplished by the use of one of two investigation methods, depending on the conditions and the specific needs/requirements of a specific location. The two methods are:

1) Truck/track-mounted, direct push technology (DPT) methods; and,

2) 4-inch diameter hollow-stem auger (HSA) drilling using a truck/track-mounted drilling rig.

The DPT method will be used for shallow environmental subsurface investigations primarily focused on the location and character of the waste trenches, soil gas, and groundwater sampling. The HSA method will be primarily used for geotechnical subsurface investigations focused on the engineering properties of the underlying materials.

Fieldwork, data collection, sampling for chemical analysis, and report preparation will be conducted under the supervision of an environmental professional. All Site work will be completed by certified

Hazardous Waste Site Operations and Emergency Response (HAZWOPER) trained personnel. Geotechnical analysis will be conducted under the supervision of a registered professional engineer. IRGI will provide on-site personnel with operational protocols to ensure that test hole advancement is in compliance with applicable regulations and guidelines as they pertain to personnel safety, environmental monitoring, materials handling, equipment decontamination, etc., again, utilizing all the mandatory procedures outlined in the Cap Penetration Plan.

Samples and materials brought to the surface will be visually assessed for the possible presence of solid waste, asbestos, hazardous materials, or otherwise impacted soil. This assessment will be performed by a qualified environmental professional, and IRGI will provide a Colorado-certified building inspector (CABI) for oversight of all soil disturbing activities to assure that materials are handled properly. If such materials are encountered, the contractor will be responsible for containing, characterizing, and arranging transport of those materials to an appropriate disposal facility. Specific requirements pertaining to environmental monitoring, specimen containment, and disposal procedures are described in further detail below.

4.1 Borehole Drilling and Logging

The following sections describe the borehole drilling, logging, and abandonment procedures to be followed. All borings will cease once waste has been identified and in no cases will borings be advanced further than the upper four feet of any waste body discovered. Some waste may be encountered in the subgrade material (concrete debris /fly ash) and the intent is to drill through this material to identify trenches. Drilling through potential waste trenches is strictly forbidden.

4.1.1 Drilling

Boreholes will be drilled using 7-5/8 inch outside diameter (OD), or 4-1/4 inch inside diameter (ID) continuous flight hollow-stem augers or by DPT methods as stated above. Continuous soil samples will be collected from each borehole for lithologic logging purposes. The continuous samples will typically be collected using a split spoon that will be advanced ahead of the auger or drill bit. The core barrel will be equipped with an end cap to ensure core recovery in loose, unconsolidated formations.

A log of drilling activities will be kept in a bound field notebook. Information in the log book will include location, time on site, personnel and equipment present, down time, materials used, samples

collected, measurements taken, and any other observations or information that would be necessary to reconstruct field activities at a later date. At the end of each day of drilling the drilling supervisor will complete a Daily Drilling Log. All items on the log must be completed, if known.

4.1.2 Logging

The lithology in each borehole will be continuously logged. Information that will be recorded on the Lithologic Log includes the borehole location; drilling information; sampling information such as sample intervals, recovery, and blow counts; and sample description information. Collection of lithologic cores using continuous coring methodology, where no hammer is used, will preclude the availability of blow count data.

Lithologic descriptions of unconsolidated materials encountered in the boreholes will generally be described in accordance with American Society for Testing & Materials (ASTM) D-2488-90 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM, 1990). Descriptive information to be recorded in the field will include:

- Identification of the predominant particles size and range of particle sizes;
- Percent of gravel, sand, fines, or all three;
- Description of grading and sorting of coarse particles;
- Particle angularity and shape;
- Maximum particle size or dimension;
- Plasticity of fines;
- Color (using Munsell Color System);
- Moisture (dry, wet, or moist);
- Consistency of fine grained soils;
- Structure of consolidated materials;
- Cementation (weak, moderate, or strong); and
- Identification of the Unified Soil Classification System (USCS) group symbol.
- Evaluate the nature and extent of any waste identified

Additional information to be recorded includes the depth to the water table, caving or sloughing of the borehole, changes in drilling rate, depths of laboratory samples, presence of organic materials, presence of

fractures or voids in consolidated materials, detailed description of any and all waste encountered, and other noteworthy observations or conditions, such as the locations of geologic boundaries.

4.2 Monitoring Well Construction and Development

It is anticipated that at some point during the due diligence period, installation of a temporary monitoring well or wells will be requested by prospective buyers. The following section sets forth the installation procedures for any new wells installed during that time frame. Drilling through potential waste trenches is strictly forbidden. Some waste may be encountered in the subgrade material (concrete debris /fly ash) and the intent is to drill through this material to identify trenches. If a trench is confirmed, drilling will stop and the borehole will be abandoned according to the abandonment procedures outlined below. In all cases, prospective buyers must receive written approval from the Department prior to initiation of such activities.

Temporary monitoring wells will be constructed in accordance with the State of Colorado Revised and Amended Rules and Regulations of the Board of Examiners of Water Well Construction and Pump Installation Contractors [2 Code of Colorado Regulations (CCR) 402-2] and the Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring: Draft Technical Guidance Document (EPA, 1993), as applicable. Monitoring well completion details will be recorded in the field logbook as well as on a monitoring well completion diagram. The monitoring well completion diagrams will include the following information, at a minimum:

- Well location and identification;
- Installation date;
- Elevation of ground surface, well casing, and protective casing;
- Total borehole depth and well depth;
- Lengths and types of screen and casing;
- Length and description of filter pack, bentonite seal, and casing grout;
- Elevation of water surface before and after well development; and
- Type of surface completion.

An approximate completion depth for each borehole will be determined prior to the start of drilling. The actual completion depth and location of the screened interval will be determined by the on-site geologist, taking into account the depth to first groundwater, presence of confining or retarding layers, depth of the

groundwater unit of interest at each particular site, and specific sampling goals of each monitoring well. The on-site geologist will ensure that the monitoring well is not screened across more than one water bearing unit.

4.2.1 Casing and Screen Installation

All wells shall be installed using direct push technology (DPT) and shall be continuously sampled. Wells will be installed in the alluvial water bearing unit when it is present at the drilling location. The actual completion depth and location of the screened interval will be determined by the on-site geologist, taking into account the depth to first groundwater, presence of confining or retarding layers, depth of the groundwater unit of interest at each particular location, and specific sampling goals of each piezometer. The piezometer shall not be screened across more than one water bearing unit. Piezometers shall be constructed using new nominal one (1) inch diameter Schedule 40 Polyvinyl chloride (PVC) casing and pre-packed screen. Nominal length of the PVC well screen shall generally be five (5) feet, and screen slot sizes will be 20-slot unless geologic conditions dictate otherwise.

The PVC riser casing and screen shall be set through the drive casing or borehole casing into the borehole. For water table wells, the screen will be placed so that the top of the screen is at least one (1) feet above the water table at the time of well installation, to account for fluctuation of the water table. As the annular space is being filled, the well casing will be centered and suspended such that it does not rest on the bottom of the borehole. The PVC riser casing will have a stick-up of at least two (2) feet, and will be capped with a PVC well cap. Completed temporary wells will be sufficiently straight and plumb to allow passage of pumps, bailers, and other sampling or monitoring devices. To minimize cross contamination issues, protective casing will be required in areas where multiple water bearing zones are identified.

4.2.2 Filter Pack

An additional filter pack will consist of inert silica sand, and will be certified as chemically clean by the manufacturer. Nominal grain size will be 10-20 mesh unless geologic conditions dictate otherwise. The filter pack will be emplaced down the drive casing on top of the pre-pack screen to prevent fouling by the bentonite seal. The filter pack will extend at least two (2) feet above the top of the pre-pack well screen. The depth to the top of the filter pack will be frequently sounded with a decontaminated weighted measuring tape. If bridging of the filter media occurs, a small amount of clean water may be used to

remove the bridge and allow the filter pack to settle uniformly. In no case will the filter pack be placed higher than five (5) feet below ground surface. The five (5) foot interval consists of the minimum length requirements for the bentonite seal and cement-bentonite grout.

4.2.3 Bentonite Seal

Bentonite seals will consist of one hundred (100) percent sodium bentonite pellets, and will have a minimum thickness of two (2) feet. The bentonite seal will be emplaced down the drive casing on top of the pre-pack screen and the additional filter pack material. The coated bentonite pellets will be hydrated with clean water from an approved source prior to placement. A minimum hydration time must be allowed for the bentonite seal to hydrate before material is added above the seal as determined by the drilling contractor, environmental consultant or engineer. The depth to the top of the bentonite seal should be sounded with a decontaminated, weighted measuring tape. If bridging of the bentonite occurs, a small amount of clean water may be used to remove the bridge and allow the bentonite to settle uniformly.

4.2.4 Casing Grout

The casing grout will extend from the top of the bentonite seal to the ground surface, and will be mixed in the following proportions: ninety-four (94) pounds of Type I Portland or API Class A cement, not more than four (4) pounds of 100 percent sodium bentonite powder, and not more than eight (8) gallons of clean water. The grout will be thoroughly mixed until it is consistent and free of lumps. The casing grout will be emplaced down the drive casing on top of the pre-pack screen, additional filter pack, and bentonite seal.

4.2.5 Well Development

All temporary monitoring wells will be developed within one (1) week of installation, but no sooner than twenty-four (24) hours after installation to allow the casing grout to cure.

Wells will be developed using surge blocks and bailers or pumps. Each well will be surged, and then evacuated with either a bailer or pump until clear of sediment. The well will then be bailed or pumped until a minimum of three well casing volumes has been removed, clarity is achieved, and the following criteria are met:

- The temperature, pH, and electrical conductivity (EC) have stabilized as follows: Temperature +/- 1 degree Centigrade (°C); pH +/- 0.1 units; EC +/- 5 percent.

The suspended sediment, temperature, pH, and EC values will be monitored at the beginning of and periodically during well development. Well development data will be recorded on the well development form. If the parameters listed above have not stabilized after the equivalent of five (5) well volumes have been removed, or if the rate of recovery is extremely slow, development will not be continued. The failure to complete satisfactory development will be noted on the well development form.

4.3 Soil Gas Probe Installation

Using direct push methods, a continuous core will be collected to first identifiable waste or a depth of at least ten feet bgs to identify potential soil gas above identified waste trenches. The deepest soil gas probe will be installed within one foot of the waste/fill interface and is anticipated to represent the worst case, or highest potential concentration of soil gas. Target depths are approximately 8 feet bgs; however, these depths will be adjusted based on lithology and depth to waste to best define the concentrations within the soil column. After the soil gas sampling location is cored, a small diameter sampling tube (1/4 inch) with a gas sampling probe tip will be installed. The pre-assembled probe tip and tubing will be placed through the drive casing and suspended while the sand pack is placed. The sand pack will placed by pouring sand directly through the casing. One foot of granular bentonite will be placed above the sand pack, followed by hydrated medium bentonite chips to the ground surface. A gas-tight fitting will be installed at the top of the sampling tube no more than 6 inches above the surrounding grade.

4.3.1 Preferred Leak Test Method

Soil vapor samples will be collected in the field using current state of the art procedures and soil vapor probes will not be disturbed for at least 24 hours before sampling. During soil vapor sampling activities, a clean, small plastic or stainless steel shroud with two small ports will be placed over each soil vapor probe and weighted down. An air-tight seal of hydrated bentonite or foam will be placed on the ground surface around the edge of the shroud where it contacts the ground. The soil vapor probe tube, which is fitted with an air-tight valve, will be extended up through the air-tight seal of hydrated bentonite or foam to the exterior side of the shroud. If required, the probe tubing will be extended above ground surface with an additional piece of Nylaflow® tubing. All connections will be located inside the shroud to verify that

the seals are air-tight. Each soil vapor tube, connected to an air-tight valve, will be connected with a tedlar bag attached to one side of the valve and the sampling tube on the other side of the valve (both outside of the shroud). Prior to purging or sampling activities, helium tracer gas will be released via a small diameter tube through a port in the shroud into the enclosure beneath the shroud. A sample of the air inside the shroud will be measured through the second port using a portable helium detector to determine the concentration of helium within the enclosure beneath the shroud. Each soil vapor probe will have approximately 1.0 liter purged, at a flow rate of 0.1 liters per minute, into a tedlar bag. The tedlar bag will then be connected to a portable helium detector to measure for the presence of helium gas in the purged vapor. If high concentrations (>10% of the shroud concentration) of helium are observed in the purge vapor, the soil vapor probe seal and shroud seals will be checked and/or enhanced to reduce the infiltration of ambient air into the enclosure and another sample collected. If helium concentrations are less than 10% of the shroud concentration, a soil vapor sample will be collected for analysis.

4.3.2 Soil Gas Sample Collection

Soil gas samples will be collected from the temporary soil gas points. All temporary soil gas points will be inspected for damage and cleaned with a clean paper towel prior to sampling. The purpose of these samples is to define the concentrations of the contaminants of interest (COIs) in soil gas in areas overlying areas designated for residential development. All soil vapor samples will be collected and analyzed by EPA Method TO-15. This method employs a passivated (inert), stainless-steel, evacuated sampling sphere (canister) for collecting indoor and outdoor air samples. A 1-liter canister will be used for collecting soil vapor samples. The canister is received from the laboratory, individually certified clean, evacuated, and prepared for sampling. The pressure in the canister is approximately 50 millitorr (compared to 760 torr of pressure in the atmosphere at sea level). This is equivalent to about -30 inches of mercury at sea level. It should be noted that the pressure difference between sea level laboratories and Denver, Colorado is approximately -4inches of mercury, and that this must be considered when evaluating vacuum data for quality control purposes.

For each soil gas sample, new tubing will be connected with a three-way valve to a sample pump, a Tedlar® purge bag, and a sample canister. Approximately one liter of air will be purged from the soil gas monitoring point. Following the purge, a sample will be collected for analysis, using a one-liter SUMMA®-passivated or Silco® stainless steel canister. Each sampling system will consist of a canister and a dedicated flow controller or critical orifice. The analytical laboratory will preset the dedicated flow

controller/critical orifice for each sample canister to a nominal 100 to 200 milliliter per minute (ml/min) flow rate.

Soil gas samples will be collected in the canisters as composite sub-atmospheric samples over a nominal five (5) to ten (10) minute time period. A duplicate soil gas sample will be collected each day that samples are collected. Each complete sampling system will be certified for acceptable blank levels of COIs prior to shipment by the laboratory. Each canister will be evacuated to a nominal 29 to 30 inches of Mercury (Hg), sealed, and shipped to the field under chain-of-custody documentation. The vacuum will be noted and recorded in the field at the beginning and end of each sampling event.

Field Quality Assurance / Quality Control

Field QA/QC will consist of daily reviews by the onsite geologist/engineer or project manager of field activities to assess whether work was performed in accordance with this work plan. If deviations from this work plan are noted, they will be evaluated to assess the impact on the data collected. Analytical results of QC samples will be evaluated as soon as they are available. If results indicate there is contamination in the blanks, field practices will be reevaluated. Corrective actions will be implemented where practicable and the deviation and corrective action will be recorded.

Field QA/QC Requirements

Field QA/QC sampling requirements are summarized below. The rationale for specific field QA/QC sampling requirements is discussed in the following sections. The results of field or trip blanks analyses will not be used to correct data. If contaminants are found in blanks, the source of the contamination should be identified and corrective action, possibly including resampling, should be initiated.

Field Duplicates

Field duplicates consist of two canister samples collected simultaneously and side by side. In the case of soil vapor samples, sequential Summa canister samples will be collected. Field duplicates are prepared to evaluate sampling technique and laboratory procedures through the analysis of representative samples obtained from a relatively homogenous medium. One field duplicate will be collected per day.

Sample Chain of Custody Forms

A chain-of-custody form will accompany all samples to the designated laboratory. The following minimum information concerning the sample will be documented on the chain-of custody (COC) forms:

- Unique sample identification;
- Date and time of sample collection;
- Sample location identification;
- Sample matrix;
- Preservative used (if any);
- Analyses requested;
- Custody transfer signatures and dates and times of sample transfer; and
- Bill of lading or transporter tracking number (if applicable).

4.3.3 Laboratory Analysis

All soil gas samples will be analyzed for volatile organic compounds (VOCs) using the *Compendium Method TO-15*, Selected Ion Monitoring (SIM) Modes specified in the EPA document EPA/625/R-96/010b using the specific *Colorado Guidance for Analysis of Indoor Air Samples* (USEPA, 2000) (www.colorado.gov/cs/Satillite/CDPHE-HM/CBON/1251615961696) and the contract laboratory standard operating procedures (SOPs). A Gas chromatography–mass spectrometry (GC-MS) operated in the SIM Mode (GC/MS-SIM) will be used to quantify concentrations of chemical of interest (COIs) in the collected samples.

The laboratory reporting limits are initially established for an undiluted laboratory standard. When a sub-atmospheric integrated sample is collected, the canister does not fill completely. A diluent gas is added to pressurize the canisters for analysis. Consequently, sample reporting limits can vary for each sample, depending on sample volume and sample matrix effects.

In addition to the above analysis, methane will be measured and analyzed in each of the 31 gas monitoring probes.

4.3.4 Laboratory QA/QC Requirements

Laboratories will analyze air and soil vapor samples in accordance with modified EPA method TO-15. QA/QC requirements and corrective action procedures are developed by each laboratory in accordance with applicable EPA method requirements and each laboratory's internal standard operating procedures and quality assurance plans. Laboratories will certify that sample canisters are clean and provide appropriate documentation. Laboratory QA/QC results will be reviewed during data validation.

4.3.5 Equipment Inspection, Maintenance and Calibration Requirements

All field and laboratory instrumentation must be calibrated prior to use. Laboratory instruments must be calibrated with calibration blanks and standards following SW-846, EPA 600/4-79-020, EPA/625/R-96/010b, etc., as appropriate. Divergence from acceptable benchmark criteria, defined by method-specific protocol and instrument type, requires correction before analysis can begin. Calibration blank and instrument performance standard check results must be recorded in the instrument logbook, which will also contain evaluation procedures, benchmark criteria and maintenance records. Standard Reference Materials from the National Institute of Standards and Technology, the EPA, or other certifiable sources should be obtained and analyzed to assess and ensure the accuracy of the measured parameter.

Field instrumentation to be used may include, for example, Helium meters. The Helium meters will be calibrated using known standards on a daily basis using the procedures outlined in the field instrumentation manual.

4.3.6 Laboratory Data Verification

Laboratory data reports will be reviewed for appropriate QA/QC procedures and data flagging. Applicable EPA analytical methods (e.g., SW-846, TO-15) encourage laboratories to develop in house QA/QC limits, and require adherence to in-house limits for data reporting, flagging and corrective actions. Verification of appropriate laboratory flagging will be conducted during data validation.

Although it is the laboratory's responsibility to ensure that its results meet minimum internal QA/QC standards and are properly flagged, the data validation process will also include the following checks:

• Ensure that the required quality control tests were performed at the required frequency. If quality control results cannot be obtained from the laboratory, all associated data will be flagged • Ensure that initial calibration verification and reference sample test results were within laboratory-specified control limits. Any data reported with associated initial calibration verification or reference standards that are outside of control limits will be invalidated.
• Confirm that the laboratory properly flagged the data.

4.4 Investigation-Derived Waste (IDW) Management and Equipment Decontamination

All material brought to the surface below the upper two feet from ground surface will be considered IDW. IDW generated during field activities may also include decontamination water, soil accumulated in decontamination water, soil cuttings (below 2 feet), and other wastes (expendable PPE, plastic bags, paper towels, etc.). All waste will be directly into U.S. Department of Transportation approved 55-gallon drums with a sealable/securable lid. Contractor will remove and store all IDW in a secure offsite location.

All IDW will be characterized as required for disposal. IDW will be analyzed for TCLP RCRA 8 metals, VOCs, DRO/GRO, priority PAHs, reactivity, corrosiveness, and ignitability (RCI). A qualified environmental consultant will perform the sampling. A minimum of one (1) composite sample will be collected for every three 55-gallon drums generated. Representative aliquots will be collected from each of the three drums and composited into one representative sample. All IDW will be manifested according to the IDW sampling analytical results and properly disposed of at the appropriate disposal facility. No containerized materials will be stored for more than 60 days after accumulation.

Waste management practices implemented for environmental investigations are summarized below.

4.4.1 IDW Containers

Soil destined for off-site disposal will be placed in lined, U.S. Department of Transportation (DOT) approved 55 gallon drums that will be kept in the designated area. After the IDW has been placed in the containers and sampled for waste designation in accordance with disposal facility requirements, the containers will be covered and secured. The condition of the containers will be determined during weekly inspections by IRGI until they are removed from the site. Containers will be managed as if they were hazardous waste, but labeled “Pending Analysis” until such time as test results on the corresponding waste designation samples demonstrate that the soil is hazardous or not. Based on analytical results, the container labels will be changed to reflect the waste’s regulatory status as hazardous or non-hazardous.

4.4.2 Drilling Waste

Drilling waste will be placed directly into 55-gallon drums with a sealable/securable lid by the drilling contractor. Each drum will be filled to 90-percent of capacity and sealed with a compatible lid. Drums

will be moved at the end of each day to a designated staging area at the direction of IRGI. All containers will be labeled non-hazardous waste pending analysis, with the following information at a minimum: the date generated, generator address, and contents.

4.4.3 Liquid Investigation-Derived Waste

Decontamination will be containerized in U.S. Department of Transportation approved 55-gallon drums. Drums will be moved at the end of each day to a designated staging area at the direction of IRGI. When the containers are full, samples of the liquid IDW will be collected. Results of these analyses will determine appropriate disposal options for the liquid waste.

4.4.4 Other Investigation-Derived Waste

Other IDW (i.e., used PPE) will be treated as ordinary solid waste and disposed using usual waste collection practices at the Site. These wastes will be disposed in a local sanitary landfill.

4.4.5 Equipment Decontamination

Equipment mobilizing from one area to another will be thoroughly decontaminated as to not spread potential contaminants across the Site. A centralized temporary equipment decontamination area will be set up in coordination with the contractor and at the direction of the property owner. The contractor will provide a portable steam cleaner and a decontamination system capable of capturing decontamination water and soil. Heavy accumulations of potentially contaminated materials will be removed by scraping with a shovel or similar tool and, where appropriate, by brushing with stiff bristle brushes. Collected decontamination IDW will be decanted into separate 55 gallon drums for solid and liquid material. Drums will be moved at the end of each day to a designated staging area at the direction of IRGI.

All equipment that may come in contact with samples will be decontaminated at the onsite decontamination area. All non-disposable sampling equipment that can be hand-manipulated will be decontaminated in accordance with the following procedures:

1. Scrub with a solution of “approved” water and Alconox®, or equivalent laboratory-grade detergent.

2. Thoroughly rinse all equipment with clean potable water.

Allow decontaminated equipment to air dry. If the sampling device will not be used immediately, it should be wrapped or placed on clean plastic.

4.5 Saturated Soils Procedures

If soil that is saturated with groundwater is encountered during investigative activities, the saturated soil will be segregated and containerized in a 55-gallon steel drum. Precautions such as placement of plastic on the surface, or erection of a berm will be taken to ensure that potentially contaminated groundwater water does not spill onto the surface or run off the Site. Containerized soil will be sampled to characterize it for disposal and manifesting purposes by the contractor as outlined above. Furthermore, if groundwater is encountered, the equipment that comes in contact with the soil cuttings will be decontaminated nearby the worksite (not on the cap). Any equipment that may have contacted groundwater will be thoroughly rinsed clean with water. The water and soil will be collected in a tub or trough will be containerized and characterized and/or properly disposed in the same manner as described in the IDW management section below. If groundwater is encountered, notifications will be made to the CDPHE as to the nature and extent of the encounter in accordance with state laws and regulations unles otherwise stated in a CDPHE-approved work plan. It is not anticipated that such an encounter will be made without obtaining prior written approval from CDPHE.

4.6 Dewatering Procedures

In no case will dewatering be performed without the prior approval of the CDPHE. In cases where pumping of contaminated groundwater is required and approved by the CDPHE, the contractor will containerize the groundwater and then sample it for characterization and disposal as outlined in the IDW Management Section above. Groundwater exceeding the Colorado Basic Groundwater Standards (CBGS) will be stored at the designated storage area and disposed of in accordance with all federal, state, and local regulations or may be treated on site in accordance with Appendix 2 of CDPHE's Corrective Action Guidance Document (May, 2002 - http://www.cdphe.state.co.us/hm/caguidance.pdf).

4.7 Temporary Well/Borehole Abandonment Procedures

Temporary well and borehole abandonment will be performed, at a minimum, in accordance with applicable State of Colorado regulations regarding test hole/borehole abandonment specifically the State Engineers Office RULE 16 STANDARDS FOR PLUGGING, SEALING, AND ABANDONING WELLS AND BOREHOLES. Site-specific additional requirements required, include documentation of total test hole depth and depth to static water (if encountered) to be measured at each test hole prior to abandonment. Borings will be abandoned by filling each test hole with medium bentonite chips to the ground surface. The bentonite chips will be poured directly into the test hole and hydrated with a minimum of 5 gallons of potable water. Once hydrated, the bentonite will swell and seal off the borehole. This will ensure that the permeability of the test hole from top to bottom will be significantly less than the permeability of the surrounding soils, the LPL, and the vegetative layer. Settlement of the hydrated bentonite shall be checked 24 hours after it is placed prior to restoration of the vegetative layer. If settlement is identified (> 6 inches), additional bentonite will be added and hydrated so that it extends beyond the LPL to the ground surface.

If monitoring wells are installed in the future, they will be abandoned in accordance with applicable State of Colorado regulations regarding test hole/borehole abandonment specifically the State Engineers Office RULE 16 STANDARDS FOR PLUGGING, SEALING, AND ABANDONING WELLS AND BOREHOLES. Site-specific procedures will require the well casing to be over drilled to at least 2 feet below the ground surface. The well will be plugged by filling the well to the static water level with clean 10/20 clean sand, then with medium chip bentonite or high solid bentonite grout to top of casing then hydrated with at least 5 gallons of clean water if using chips. The casing will be removed to at least two feet below ground surface. The over drilled hole shall be filled with medium bentonite chips to the ground surface and hydrated with several gallons of clean water. This will insure that the materials added are less permeable than the surrounding LPL soils. Any damage caused to the vegetative layer will be restored according to the vegetative layer repair section below.

5.0 Hazardous Materials

No hazardous materials are expected to be stored on Site. Hazardous materials are defined as those chemicals subject to reporting requirements under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA). Petroleum liquids such as fuel, oil, and grease used for drilling and other equipment

will be supplied offsite to support investigation activities. There will be no storage of liquid petroleum fuels such as diesel on site and no refueling will occur on the cap. The person who discovers a petroleum leak shall first inform IRGI and the contractor to coordinate an appropriate response. Immediate remedial actions to be performed in the event of a spill include:

1) Minimize fire hazards associated with the fuel spill by extinguishing any open flames or ignition sources in the vicinity of the spill;

2) Minimize exposure of personnel to the spilled material;

3) Assess if the spilled material is sufficiently contained, and use on-site equipment to contain the material with soil berms, if needed; and

4) Remove contaminated soil and dispose of as appropriate.

In addition, the Lowry Assumption, LLC (LAC) OU2 Project Manager (John Yerton email: jyerton@irgco.com and address: 7290 E. 1st Ave Denver, Colorado) will be notified (303-304-2933) and the IRGI oversight Coordinator (David Matteocci) by phone only (720-309-1550) in the event of a significant spill or release. On behalf of the USAF, LAC currently is responsible for the long term operations and maintenance of OU2.

6.0 Vegetative Layer Repair

Cap repair and re-vegetation for boreholes is not expected to be required since the size of the disturbance is expected to be small and the bentonite seals are expected to be better than or equal to the permeability of the existing cap. Areas of disturbed vegetation will be documented and restored as necessary. If the vegetative layer and native grasses are damaged during the subsurface investigations, then the damaged areas will be repaired as described below or for larger damaged areas as outlined in the OU2 Phase 2 Cap specifications Section 02921 located in Attachment B and Section 02261 located in Attachment C, or as recommended by EPA, 1993, *Technical Guidance Document, Quality Assurance and Quality Control for Waste Containment Facilities*, EPA/600/R-93/182.

6.1 Preparation and Seeding

All damage to the vegetative layer including but not limited to: ephemeral rill erosion features, ruts, depressions, gouges, scrapes caused by planned investigations will be repaired by smoothing out the

damaged vegetative layer area soils in preparation for re-seeding. Additional clean soil will be brought in to fill any depressions to prevent ponding. Bare surfaces will be prepared by texturizing the soil prior to seeding. The approved OU2 seed mixture will be used for seeding in the restoration area (Attachment B). The approved seed mixture will be hand broadcast over the entire restored area.

6.2 Erosion Mat

For large significantly damaged area repairs for the cap, including diversion berms and existing drainage channels, the reseeded area will receive new short-term temporary erosion control blanket to provide erosion control, sediment control, vegetation establishment, and/or vegetation reinforcement. The matting should extend to the limits of the damaged and re-seeded area. The erosion control blanket will be installed according to staple pattern recommended by the supplier installation instructions. Engineering specifications for the diversion berms and erosion control matting (Section 02261) provided in Attachment C.

7.0 Cap Penetration Documentation

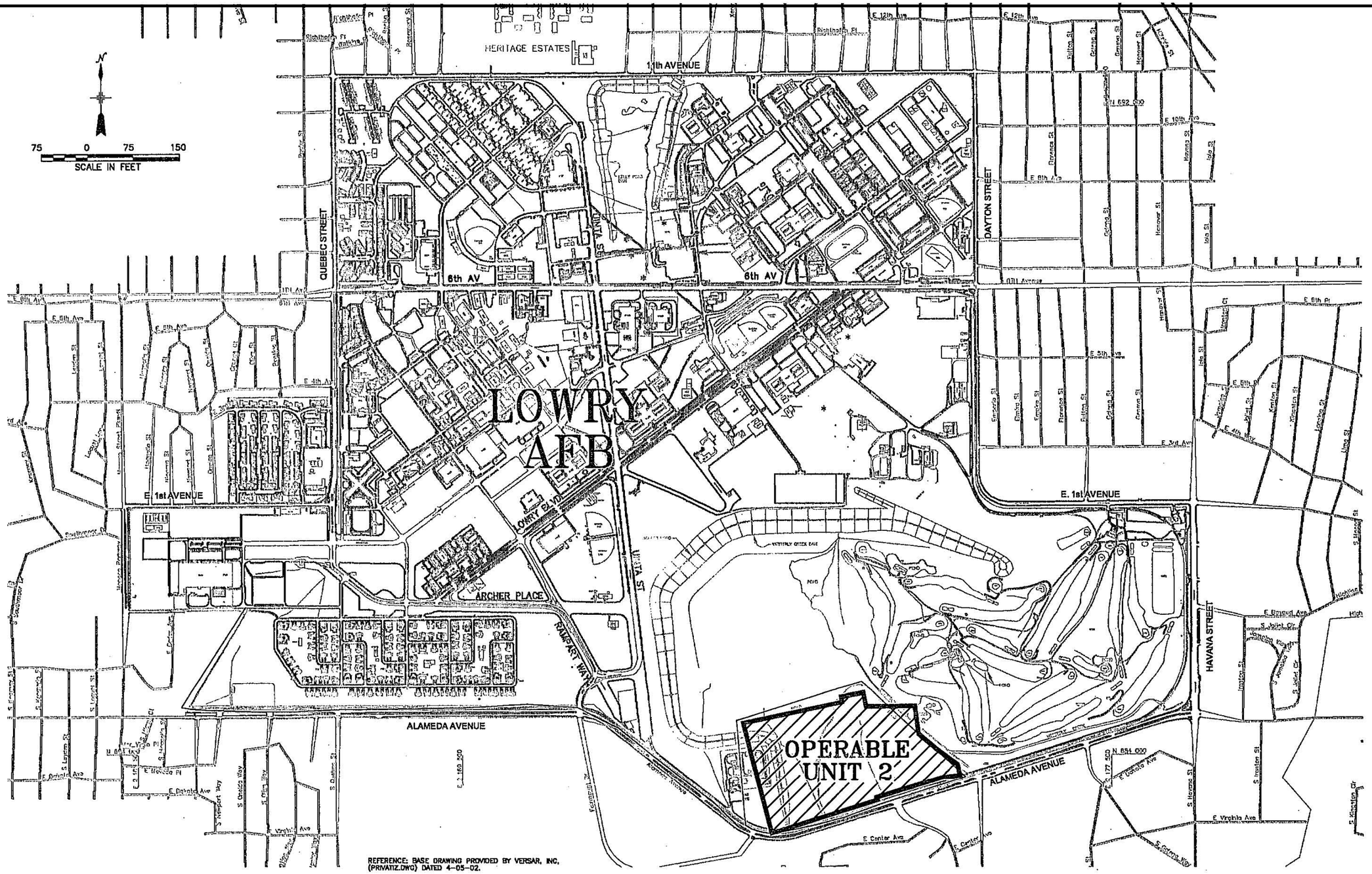
All data resulting from all investigations will be submitted to CDPHE in written reports within 60-90 days of the completion of field efforts. The report will consist of a presentation of the raw analytical data, any deviations from the approved work plan, summaries of the review and verification effort, as appropriate, as well as interpretative findings relative to the data and observations. The report will also include information regarding the disposition of all IDW generated during the field effort and documentation of all cap repairs. Copies of all IDW waste manifests will also be included in the report.

Reports will contain final analytical results, analytical methods, detection limits, method blank data, and results of QC samples (where applicable). In addition, special analytical problems and/or any modifications of referenced methods will be noted. The number of significant figures reported will be consistent with the limits of uncertainty inherent in the analytical method. Data are normally reported in units commonly used for the analyses performed.

IRGI will collect and maintain complete report and field records (log books, drawings, test results, reclamation activities, etc.) of all cap penetration activities.

FIGURE 1

SITE LOCATION MAP

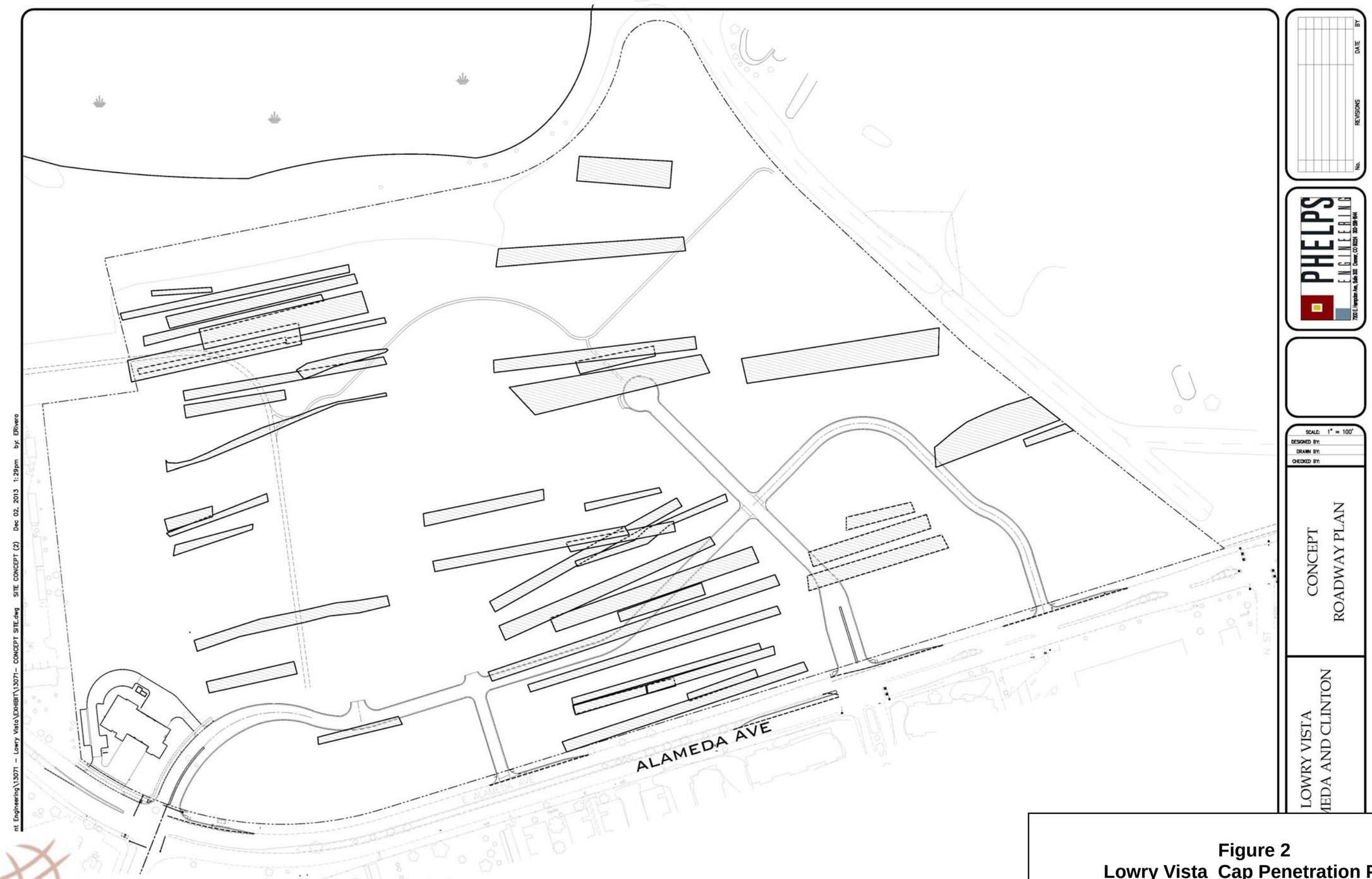


IRG

Figure 1
Lowry Vista Cap Penetration Plan
Operable Unit 2 Landfill Zone
Former Lowry Air Force Base
IRG– Assumptions, LLC

FIGURE 2

TRENCH DRAWING LOCATIONS

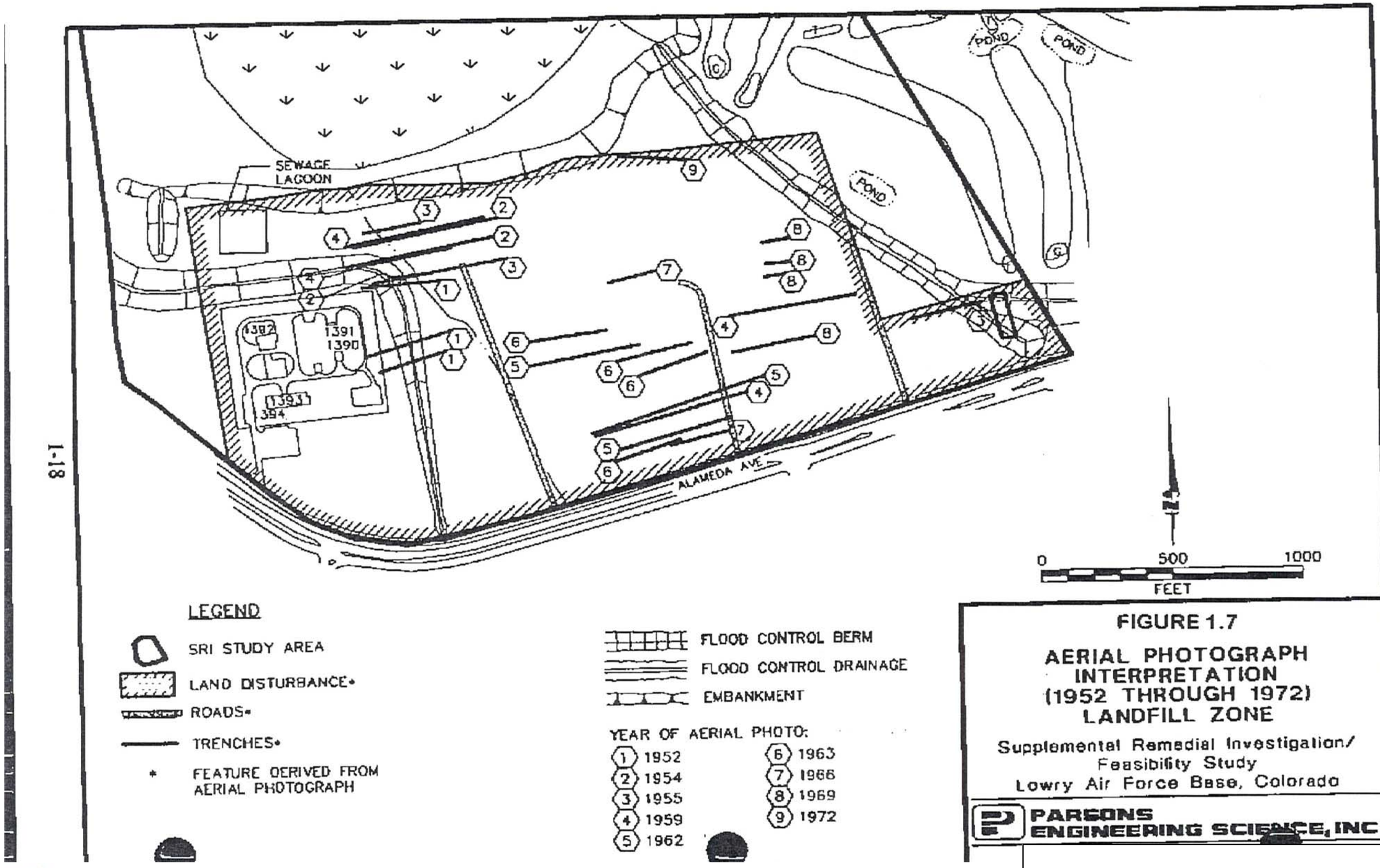


IRG

Figure 2
Lowry Vista Cap Penetration Plan
Operable Unit 2 Landfill Zone
Former Lowry Air Force Base
IRG– Assumptions, LLC

FIGURE 3

PARSONS ENGINEERING TRENCH DRAWING LOCATIONS

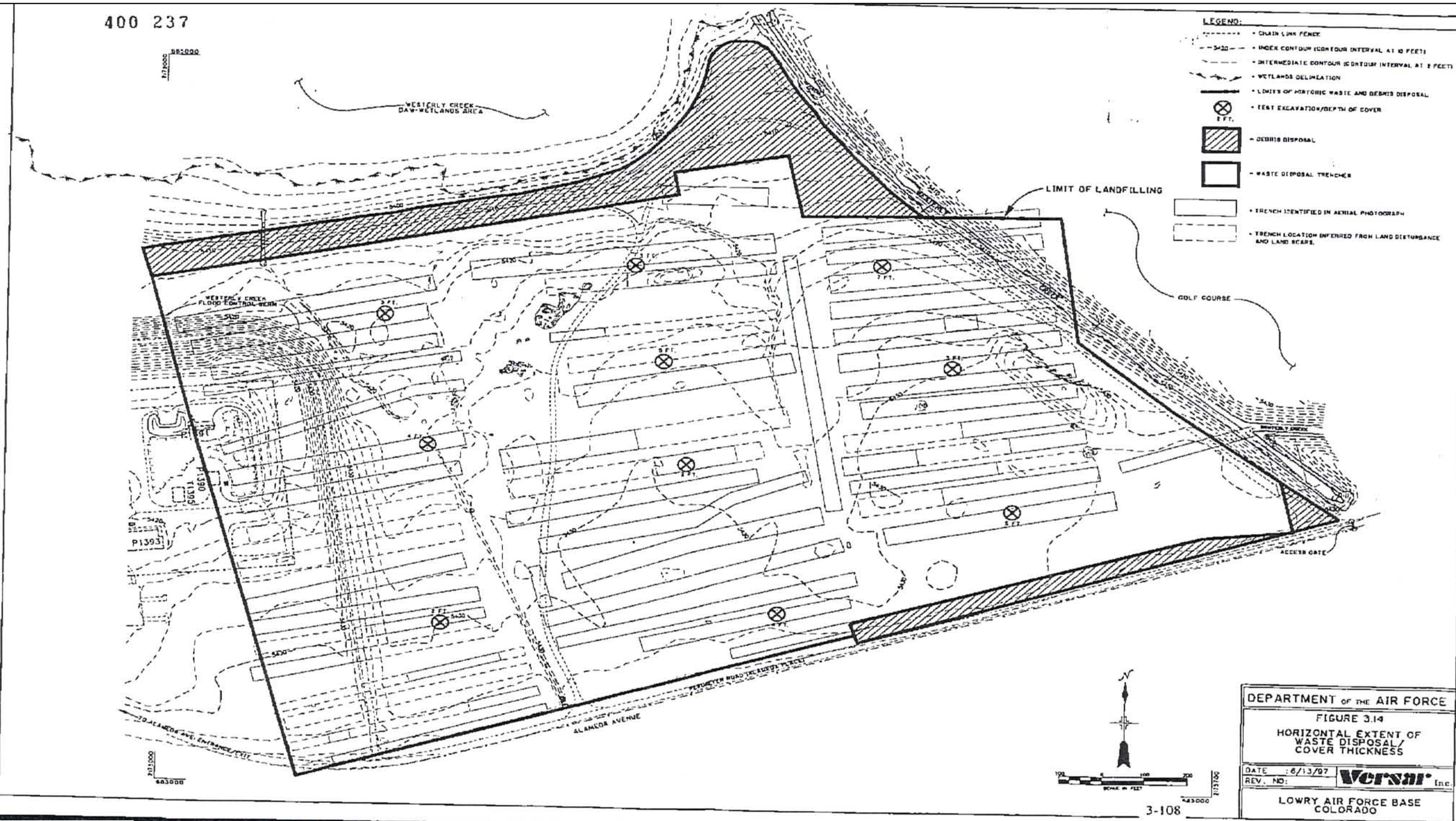


IRG

Figure 3
Lowry Vista Cap Penetration Plan
Operable Unit 2 Landfill Zone
Former Lowry Air Force Base
IRG– Assumptions, LLC

FIGURE 4

AIR FORCE TRENCH DRAWING LOCATIONS



IRG

Figure 4
Lowry Vista Cap Penetration Plan
Operable Unit 2 Landfill Zone
Former Lowry Air Force Base
IRG– Assumptions, LLC

ATTACHMENT A

This property is subject to an Environmental Covenant held by the Colorado Department of Public Health and Environment pursuant to section 25-15-321, C.R.S.

MODIFIED ENVIRONMENTAL COVENANT

IRG Redevelopment I, LLC ("IRGI" or "OWNER" or "Grantor") grants this Modified Environmental Covenant ("Covenant") this _____ day of _____, ____ to the Hazardous Materials and Waste Management Division of the Colorado Department of Public Health and the Environment ("the Department" or "Grantee") pursuant to § 25-15-321 of the Colorado Hazardous Waste Act, § 25-15-101, *et seq*. The Department's address is 4300 Cherry Creek Drive South, Denver, Colorado 80246-1530.

WHEREAS, IRGI is the owner of certain property commonly referred to as the Lowry Landfill OU2, located at the former Lowry Air Force Base ("LAFB") in Denver, Colorado, more particularly described in Attachment A, attached hereto and incorporated herein by reference as though fully set forth (hereinafter referred to as "the Property");

WHEREAS, the Hazardous Materials and Waste Management Division of the Colorado Department of Public Health and the Environment ("the Department"), is authorized to approve Environmental Covenants pursuant to § 25-15-320 of the Colorado Hazardous Waste Act, § 25-15-101, *et seq*.;

WHEREAS, pursuant to Consent Agreement Number 01-08-07-02, the Property is the subject of enforcement and remedial action pursuant to the Colorado Hazardous Waste Act, § 25-15-301, et. seq. ("CHWA"). The Property was the former base landfill (also known as Operable Unit 2 (OU2)). OU2 was historically used for disposal of Air Force waste, and associated construction waste and debris primarily from training activities conducted at LAFB. OU2 has been closed in accordance with the Phase 2 Corrective Action Plan for the Operable Unit 2 Landfill Closure at Lowry;

WHEREAS, the purpose of this Covenant is to ensure protection of human health and the environment by minimizing the potential for exposure to any hazardous substance, hazardous waste, hazardous constituents, and/or solid waste that remains in the landfill on the Property. The Covenant will accomplish this by prohibiting those activities that may interfere with the landfill cover or its monitoring or control systems and by creating a review and approval process to ensure that any such intrusive activities are conducted with appropriate precautions to avoid or eliminate any hazards;

WHEREAS, it is the intent of IRGI and the Department that this Modified Environmental Covenant shall restate and replace the Environmental Covenant entered into between the United States of America, acting by and through the Secretary of the Air Force, and the Department dated January 4, 2006 and recorded in the real property records of Denver County on _____ at Reception No. _____; and

____ ____
Initials

WHEREAS, IRGI desires to subject the Property to certain covenants and restrictions as provided in Article 15 of Title 25, Colorado Revised Statutes, which covenants and restrictions shall burden the Property and bind IRGI and all persons now or subsequently having any right, title or interest in the Property, or any part thereof, and any persons using the land, as described herein, for the benefit of the Department, and OWNER.

NOW, THEREFORE, IRGI hereby grants this Environmental Covenant to the Department, and declares that the Property as described in Attachment A shall hereinafter be bound by, held, sold, and conveyed subject to the following requirements set forth in paragraphs 1 through 11, below, which shall run with the Property in perpetuity and be binding on Grantor and all persons now or subsequently having any right, title or interest in the Property, or any part thereof, and any persons using the land, as described herein. As used in this Environmental Covenant, the term OWNER means the then current record owner of the Property and, if any, any other person or entity otherwise legally authorized to make decisions regarding the transfer of the Property or placement of encumbrances on the Property, other than by the exercise of eminent domain.

1) Use restrictions. The Property is subject to the following restrictions:

a) The Property shall only be used as "open space/non-irrigated park" following closure.

b) In general, the OWNER shall not use or conduct any activity on OU2 that will adversely affect:

i. the integrity of the cover;
ii. the effectiveness of drainage or erosion controls;
iii. slope stability; or
iv. groundwater or gas monitoring or control systems.

Specifically, no activity shall be conducted or permitted by the OWNER, nor shall the OWNER use OU2 in any manner that is inconsistent with the use designated in this paragraph or that is not in compliance with the requirements of section 3.6.1(A) of 6 CCR 1007-2, Part 1 or the Department-approved Phase 2 Corrective Action Plan for the Operable Unit 2 Landfill Closure at Lowry dated November 2003, as amended or otherwise set forth herein or approved by the Department.

c) OWNER shall not extract or utilize in any manner whatsoever any water from the upper aquifer below the surface of the ground within OU2 for any purpose whatsoever unless the OWNER shall first have obtained the prior written approval of the Department. This limitation shall not apply to a qualified environmental professional, obtaining ground water samples for analysis from existing monitoring wells located on the Property or other future monitoring wells installed on the Property, as approved by the Department.

d) Any plans for soils disturbance activities or cap penetration, including, without limitation, excavation, grading, construction, geotechnical or environmental investigations, soil

____ ____
Initials

stockpiling, or other contact-intensive activity on the Property that will adversely affect the integrity of the cover, the effectiveness of drainage or erosion control systems, slope stability, or groundwater or gas monitoring or control systems, except pursuant to the Department- approved Soil Stockpile Management Plan and Cap Penetration Plan, must receive written approval from the Department prior to initiation of such activities.

e) For the duration of this covenant, the Air Force shall perform all of the requirements set forth in the Post-Closure Operation and Maintenance Plan, Appendix E of the Phase 2 Corrective Action Plan for the Operable Unit 2 Landfill Closure at Lowry dated November 2003, or subsequent modifications approved by the Department.

2) Modifications. This Covenant runs with the land and is perpetual, unless modified or terminated pursuant to this paragraph. OWNER may request that the Department approve a modification or termination of the Covenant. The request shall contain information showing that the proposed modification or termination shall, if implemented, ensure protection of human health and the environment. The Department shall review any submitted information, and may request additional information. If the Department determines that the proposal to modify or terminate the Covenant will ensure protection of human health and the environment, it shall approve the proposal. No modification or termination of this Covenant shall be effective unless the Department has approved such modification or termination in writing. Information to support a request for modification or termination may include one or more of the following:

a) a proposal to perform additional remedial work;
b) new information regarding the risks posed by the residual contamination;
c) information demonstrating that residual contamination has diminished;
d) information demonstrating that an engineered feature or structure is no longer necessary;
e) information demonstrating that the proposed modification would not adversely impact the remedy and is protective of human health and the environment; and
f) other appropriate supporting information

3) Conveyances. OWNER shall notify the Department at least fifteen (15) days in advance of the closing on any proposed sale or other conveyance of any interest in any or all of the Property.

4) Notice to Lessees. OWNER agrees to incorporate either in full or by reference the restrictions of this Covenant in any leases, licenses, or other instruments granting a right to use the Property.

5) Notification for proposed construction and land use. The OWNER and/or its transferees shall notify the Department simultaneously when submitting any application to a local government for a building permit or change in land use.

6) Inspections. The Department shall have the right of entry to the Property at reasonable times with prior notice for the purpose of determining compliance with the terms of this Covenant. Nothing in this Covenant shall impair any other authority the Department may otherwise have to enter and inspect the Property.

____ ____
Initials

7) Third Party Beneficiary. The OWNER of the Property is a third party beneficiary with the right to enforce the provisions of this Covenant as provided in §25-15-322, C.R.S.

8) No Liability. The Department does not acquire any liability under State law by virtue of accepting this Covenant.

9) Enforcement. The Department may enforce the terms of this Covenant pursuant to §25-15-322. C.R.S. OWNER may file suit in district court to enjoin actual or threatened violations of this Covenant.

10) Owner's Compliance Certification. OWNER shall execute and return a certification form provided by the Department, on an annual basis, detailing OWNER's compliance, and any lack of compliance, with the terms of this Covenant.

11) Notices. Any document or communication required under this Covenant shall be sent or directed to:

Federal Facilities Remediation and Restoration Unit Leader
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and the Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

IRG Redevelopment I, LLC
c/o of International Risk Group, LLC
7991 Shaffer Parkway, Suite 300
Littleton, CO 80127

____ ____
Initials

IN WITNESS WHEREOF, IRGI has caused this instrument to be executed this ___ day of _____, 2013

By: _____
Title:_____

State of COLORADO)
) s.s.
County of _____)

The foregoing instrument was acknowledged before me this ____ day of _____, 2013 by _____ as _____ or IRGI Redevelopment I, LLC.

My Commission expires:_____

_____
Notary Public
Address:_____
_____

Accepted by the Colorado Department of Public Health and Environment this ____ day of _____, _____.

By:

Title: Director, Hazardous Materials and Waste Management Division

STATE OF COLORADO)
) ss:
COUNTY OF)

The foregoing instrument was acknowledged before me this ___day of _____, _____ by _____ on behalf of the Colorado Department of Public Health and Environment.

My Commission expires:_____

_____
Notary Public
Address:_____
_____

ATTACHMENT B

SECTION 02921

SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

For disturbed areas to be vegetated as indicated on the Drawings, provide seed as specified herein. Furnish and place vegetative layer material, lime, compost, seed, and mulch in the areas indicated, and maintain new seeding through the contract maintenance period.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02315: Earthwork

B. Section 02261: Diversion Berms and Erosion Control Matting

C. Section 02370: Erosion and Sedimentation Control

1.3 SUBMITTALS

Submit the following in accordance with Section 01330: “Submittal Procedures”.

A. Grass Seed Vendor’s Certificate:

Submit the seed vendor’s certified statement for the grass seed mixture required, showing common name, percentage of seed mix by weight, percentages of purity and germination, year of production, date of packaging, and location of packaging.

B. Compost:

Submit the compost manufacturer’s product data showing suitability for specified seeding.

C. Hydraulic Seeding Method:

If the Hydraulic Seeding Method is used, submit a certified statement as to the number of pounds of materials to be used per 100 gallons of water, and specify the number of square feet of seeding that can be covered with the quantity of solution in the hydroseeder.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

Obtain and retain as part of the project records, certifications, and/or labels of materials supplied.

B. Vegetative Layer Material:

See Section 02315: "Earthwork".

C. Compost:

Fertilizer is not required. In lieu of fertilizer, add an Engineer – approved, quality compost before seeding.

D. Lime:

Ground limestone composed of not less than 85 percent calcium and magnesium carbonates and to not less than 40 percent calcium and magnesium oxides; at least 85 percent shall pass a No. 10 mesh screen and 50 percent shall pass a No. 40 mesh screen.

E. Seed:

Shall meet the following minimum requirements:

1. The grass seed mixture shall include no "primary noxious weed seeds."
2. Furnish in fully-labeled, standard sealed containers.
3. Percentage and germination of each seed type in the mixture, purity, and weed seed content of the mixture shall be clearly stated on the label.
4. Subject to the testing provisions of the USDA, with the month and year of test clearly stated on the label.
5. Seed which has become wet, moldy, or otherwise damaged will not be acceptable.
6. Use seed mixtures as specified below:

Species	Variety	% of Mix	PLS #/ac Drilled	PLS #/ac Broadcast
Western wheatgrass	Arriba	20	3.2	6.4
Sideoats grama	Vaughn	20	1.8	3.6
Blue Grama	Hachita	20	0.6	1.2
Prairie junegrass	native	15	0.2	0.3
Sandberg bluegrass	native	15	0.5	0.9
Sheep fescue	Covar	10	0.4	0.8
TOTALS		100	6.7 #/ac	13.2 #/ac

7. Other suitable seed mix is acceptable if approved by the Engineer and is recommended by the local office of the Natural Resources Conservation Service (NRCS).
8. For temporary seeding requirements see Section 02370: "Erosion and Sedimentation Control".

F. Mulch:

1. Straw or hay – unrotted air dried, small grain straw, salt hay, or hay free from noxious weeds or undesirable seeds and coarse material.
2. Wood Cellulose Fiber – having no growth or germination inhibiting materials.

G Binders for Mulch:

Binders for straw or hay mulch shall consist of emulsified asphalt, organic and vegetable based gels, synthetic plastic emulsion, or fiber mulch as approved by the NRCS.

H. Erosion Control Blankets:

See Section 02370: "Erosion and Sedimentation Control" for temporary matting which may be used for mulching.

PART 3 - EXECUTION

3.1 PREPARATION

A. All Areas to be Seeded:

1. Shall be worked with a disk, harrow, dragged with a chain, mat or blade, machine-raked, or hand-worked as necessary to provide a reasonably firm but friable seedbed.
2. Shall meet the specified grades and are free of growth and debris.
3. Take care to prevent the formation of low places and pockets where water will stand.

B. Depth of Tillage:

1. Provide minimum of 2 inches for all applications.
2. On slopes steeper than 3:l, reduce depth of tillage to 1 inch.
3. Where rye grass has been planted for temporary erosion control and has not been eliminated prior to the completion of the work, disk at least 4 inches deep and seed to permanent grasses.

3.2 APPLICATION

A. Vegetative Layer Soil:

Vegetative Layer soil shall be placed using earth moving equipment. The soil shall be spread in a minimum uniform loose depth of six (6) inches and compacted. The soil shall not be worked when it is in a saturated state. The soil surface shall be left free of ruts or channels. Remove all large stiff clods, lumps, brush, roots, stumps, litter, and other foreign material and stones over 2-inch in size. See Section 02315: "Earthwork" for additional requirements.

B. Compost and Lime:

1. Apply by means of a mechanical spreader or other acceptable method which is capable of maintaining a uniform rate of application.
2. Conduct when the soil is in a moist condition and at least 24 hours before sowing the seed.
3. Compost shall be applied at the rate based on the results of the nutrient analysis tests or when nutrient analysis is not provided apply at a minimum rate of 500 pounds per acre with 50% water insoluble nitrogen.

4. Lime shall be applied at the rate based on the results of the soil tests. When testing is not provided apply at a minimum rate of 2 tons per acre.

C. Seeding:

1. Seed mixture shall be applied at the rate identified in Paragraph 2.1.E.
2. Perform erosion control items of work such as seeding and mulching upon completion of a unit or portion of the project. Optimum seeding dates are 3/1 to 4/30 and 8/15 to 10/15. When weather and soil conditions are suitable, other seeding times may be acceptable as approved by the Engineer.
3. When immediate protection of newly graded areas is necessary at a time which is outside of the normal seeding season, apply hay, straw or other approved mulch with the seeding done at the same time or done later, or both, as ordered.
4. When immediate seeding is required on areas of the project which are not to be regraded or disturbed, use specified seed mixture.
5. Areas of the project which are to be left temporarily and which will be regraded or otherwise disturbed later during construction may be ordered to be seeded with temporary seed mix as required in Section 02370: "Erosion and Sedimentation Control".
6. Special care must be taken during the hot dry periods from June to mid to late August. Do not seed during windy weather or when the ground is frozen, excessively wet, or otherwise untillable.

D. Mulch:

1. Undertake immediately after each area has been properly prepared.
2. Apply hay or straw unless otherwise protected with erosion control blankets that has been thoroughly fluffed at approximately, but not to exceed, 3 tons per acre when a crimper is used and at a rate of 1-1/2 to 2 tons per acre when a liquid mulch binder is used.
3. Blowing chopped mulch will be permitted when authorized.
4. Authorization will be given when it can be determined that the mulch fibers will be of such length and applied in such a manner that there will be a minimum amount of matting that would retard the growth of plants.
5. Hay or straw mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing cannot see ground through the mulch.
6. Remove matted mulch or bunches.
7. Dispose of all baling wire or rope outside the limits of the project in approved areas.

3.2 SEEDING METHODS

A. General:

Compost, limestone, mulch material if required, and seed of the type specified may be placed at the locations shown or ordered by one of the following methods, provided an even

distribution is obtained. The maximum seeding depth shall be 1/4-inch when using methods other than hydroseeding.

B Dry Method:

1. Power Equipment: Use mechanical seeders, seed drills, landscape seeders, cultipacker seeders, compost spreaders, or other approved mechanical seeding equipment or attachments when seed, limestone, and compost are to be applied in dry form.
2. Manual Equipment: On areas which are inaccessible to power equipment, permission may be given to use hand-operated mechanical equipment when the materials are to be applied in dry form. The use of hand shovels to spread the materials will not be allowed.
3. Do not mix limestone and compost together prior to their application, but work into the soil together to the specified depth.
4. After seeding, compact the entire area by a suitable roller weighing 60 to 90 lbs. per lineal foot.
5. Allow at least 24 hours between composting and seeding.
6. Unless otherwise ordered, mulch areas covered with seed.

C. Hydraulic Method:

1. The application of grass, seed, compost, limestone, and a suitable mulch, if approved, may be accomplished in one operation by the use of an approved spraying machine.
2. Mix materials with water in the machine and keep in an agitated state in order that the materials may be uniformly suspended in the water.
3. The spraying equipment shall be so designed that when the solution is sprayed over an area, the resulting deposits of limestone, compost, and grass seed are equal in quantity to the required rates.
4. Flush and clean hydraulic seeding and composting machine each day before seeding is to be started, and thoroughly flush of all residue after the completion of application on every 10 acres.
5. If the results of the spray operations are unsatisfactory, abandon this method and apply the materials by the dry method.
6. When inoculum is required, mix with the seed and spray.
7. Compaction or rolling not required.
8. Unless mulch material required is applied during the seeding operation or within 1/2 hour following the seeding operation, take measures to protect the seed from sunlight and heat such as the use of a light brush dragged over the seeded areas to stir the seed into the soil, taking care not to carry the seed ahead.

3.4 CARE AFTER SEEDING (MAINTENANCE)

A. Protection:

Protect and care for seeded areas until final acceptance of the work, and repair any damage to seeded areas caused by pedestrian or vehicular traffic or other causes. If necessary, place barricades and suitable signs to protect the seeded areas.

Control weeds during establishment either through mechanical or chemical means. Once grass is established, mow once or twice a year at a height of 4 inches.

B. Water:

Apply water to maintain proper moisture to promote growth and/or as directed by the Engineer. Use approved water wagons or tanks or other approved devices to apply water in the form of a spray or sprinkle without erosive force. Apply water prior to 10:00 a.m. and after 4:00 p.m. to minimize losses due to evaporation.

C. Acceptance:

To be acceptable, a stand of grass shall show a reasonably thick, uniform stand, free from sizable areas of thin or bare spots, with a minimum coverage of approximately 80 percent.

D. Reseed:

Any parts of seeded areas which fail to show a uniform stand, reseed until all areas are covered with acceptable grass growth.

E. Maintenance Period:

This period shall extend until to end of the contract warranty period or once the area is completed and accepted by the Owner. During this period do all necessary mowing to keep the grass between 5 and 8 inches in height.

-- END OF SECTION --

Table 12
Summary of Revegetation Seed Data
OU 2 Landfill Closure at Lowry

Seed Type (Variety) (from seed tag)	% Pure Seed/Acre (from seed tag)	Total lbs/Acre (% Pure x Net Wt)	% Germination (from seed tag)	PLS lbs/Acre (Total lbs x % Germ)	Specified PLS lbs/Acre (from Spec 02921)	Ratio of Actual to Specified (Actual / Specified)
Western Wheatgrass (Arriba)	38.99%	11.17	86%	9.60	3.2	3.0
Sideoats Grama (Vaughn)	20.50%	5.87	92%	5.40	1.8	3.0
Blue Grama (Hachita)	6.76%	1.94	93%	1.80	0.6	3.0
Prairie Junegrass (VNS)	2.23%	0.64	94%	0.60	0.2	3.0
Sandberg Bluegrass (VNS)	6.24%	1.79	84%	1.50	0.5	3.0
Sheep Fescue (Covar)	4.66%	1.33	90%	1.20	0.4	3.0
Winter Wheat	10.38%	2.97	97%	2.88	Not Specified	Not Applicable
SubTotal	**89.76%**	**25.71**		**22.99**	**6.70**	**3.4**
Crop	0.25%	0.07				
Inert	9.91%	2.84				
Weeds	0.08%	0.02				
Noxious Weeds	0.00%	0.00				
Total (calculated)	**100.00%**	**28.64**		**22.99**	**6.70**	
Net Weight/Acre (lbs, from seed tag)		28.64				
PLS lbs/Acre (from seed tag)				22.98		

PLS = Pure Live Seed
lbs = Pounds
% = Percent

This table obtained from Completion Report for the Operable Unit 2 Landfill Closure at Lowry prepared by MACTEC and dated March 2005.

ATTACHMENT C

SECTION 02261

DIVERSION BERMS AND EROSION CONTROL MATTING

PART 1 - GENERAL

1.01 SUMMARY

This Specification section covers the construction of overland drainage diversion berms and the supply and installation of erosion control matting over the berms as shown on the Drawings. All activities performed by the Contractor or any subcontractor at any tier shall be in accordance with all applicable Federal, State, and local laws and regulations.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02315: Earthwork

B. Section 02370: Erosion and Sedimentation Control

1.03 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referenced in the text by basic designation only.

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4355	(2002) Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc type Apparatus)
ASTM D 5035	(1995) Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
ASTM D 5199	(2001) Standard Test Method for Measuring Thickness of Textile Materials
ASTM D 5261	(1996) Standard Test Method for Mass Per Unit Area of Geotextiles

1.04 GENERAL

The Contractor shall implement the storm water pollution prevention measures specified in this section and in Section 02370: “Erosion and Sedimentation Control” in a manner which will ensure that all soils are retained on-site.

1.05 SUBMITTALS

The following shall be submitted in accordance with Section 01330: “Submittal Procedures.”

1. Manufacturing, Sampling, and Testing

A minimum of 14 days prior to scheduled use, erosion control matting manufacturer's quality control manual including instructions for storage, handling, installation, seaming, and repair.

2. Erosion Control Matting

A minimum of 14 days prior to scheduled use, Manufacturer's certificate of compliance stating that the erosion control matting meets the requirements of this section. This submittal shall include copies of manufacturer's quality control test results. The certificate of compliance shall be attested to by a person having legal authority to bind the erosion control matting manufacturing company.

1.06 CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL

A. The Contractor shall abide by all qualification and submittal requirements of the Construction Quality Assurance/Quality Control (QA/QC) Plan.

B. Work will be monitored and tested in accordance with the requirements of the above mentioned QA/QC Plan.

C. The Contractor shall be aware of all activities outlined in the QA/QC Plan, and the Contractor shall account for these activities in the construction schedule. No additional cost to IRGI shall be allowed by the Contractor as a result of the performance of the QA/QC activities.

PART 2 - PRODUCTS

2.01 DIVERSION BERM FILL

Common Fill and Vegetative Layer Material as described in Section 02315: “Earthwork”.

2.02 EROSION CONTROL MATTING

A. Temporary (12-month longevity) erosion control matting shall be a machine-produced matting consisting of 100 percent straw fiber.

The matting shall be of consistent thickness with the straw evenly distributed over the entire area of the matting. The matting shall be covered on the top side with a 100% biodegradable woven natural organic fiber netting. The netting shall consist of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine strands to form an approximate 0.50 x 1.00 inch mesh. The matting shall be sewn together with biodegradable thread in 1.50 inch centers. Straw erosion control matting shall be NAG S75BN as manufactured by North American Green, or Engineer-approved equivalent. The temporary (12-month longevity) erosion control matting shall conform to Table 02261-1.

Table 02261-1

Material Content	
Straw	100% (.50 lb/yd^2)
Netting	One side only, Leno woven 100% biodegradable natural organic fiber (9.3 lb/1,000 ft^2 approximate weight)
Thread	Biodegradable
Physical Specifications (Roll)	
Width	6.67 feet +/- 5 percent
Length	108.00 feet +/- 5 percent
Weight	46.40 pounds +/-10 percent
Area	80 yd^2
Stitch spacing	1.5 inches

B. The permanent erosion control matting shall be a machine produced matting of 100% UV stabilized polypropylene fiber matrix incorporated into a permanent three-dimensional netting structure. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between three super heavy duty UV stabilized nettings with 0.50 x 0.50 inch openings. The middle netting shall form prominent closely spaced ridges across the entire width of the matting. The three nettings shall be stitched together on 1.50 inch centers with UV stabilized polypropylene thread to form a permanent three dimensional structure.

Permanent erosion control matting shall be P550 as manufactured by North America Green, or Engineer-approved equivalent. The permanent erosion control matting shall conform to Table 02261-2.

Table 02261-2

Property	Test Method	Value	Units
Resiliency	ASTM D6524	95	Percent
Thickness	ASTM D 6525	0.76	Inches
Mass per Unit Area	ASTM D 5261	20.28	Oz/yd^2
Tensile Strength (TD)	ASTM D 5035	1523	Lbs/ft
Elongation (TD)	ASTM D 5035	13	Percent
Tensile Strength (MD)	ASTM D 5035	1381	Lbs/ft
Elongation (MD)	ASTM D 5035	13	Percent
Density	ASTM D 792	0.528	Oz/in^3
Porosity	ECTC Guidelines	96	Percent
Open Volume/Unit Area	ECTC Guidelines	122,906	In^3/yd^2
Stiffness	ASTM D1388/ECTC	366.27	Oz-in
Light Penetration	ECTC Guidelines	16	Percent
UV Stability	ASTM D 4355	100	Percent

Table 02261-2 (continued)

Property	Test Method	Value	Units
Physical Specifications (Roll)			
Width	Measured	6.50	Feet
Length	Measured	55.50	Feet
Weight	Measured	52 +/- 10 percent	Lbs.
Area	Measured	40	yd^2
Stitch Spacing	Measured	1.50	Inches
MD = Machine direction			
TD = Transverse direction			

PART 3 - EXECUTION

3.01 CONSTRUCTION OF DIVERSION BERMS

A. Placement

1. Diversion berm material shall be placed to the thickness, lines, and grades shown on the Drawings.

2. Diversion berms shall be surveyed in-place at 50-foot intervals (maximum) to verify the appropriate slopes (shown on the Drawings) along the flow line. The results of the survey shall be reported to the Engineer.

B. Compaction

1. Common fill and Vegetative layer soil shall be compacted as required for each soil type in Section 02315, “Earthwork”. Soil compaction techniques shall be approved by the Engineer.

C. Finished Grade

The finished surface of the diversion berm shall be free of irregularities, depressions, loose soils, large rocks, roots, and debris, and shall conform to dimensions and grades shown on the Drawings.

D. Erosion Control Method

Diversion berms shall receive NAG (or Engineer-approved equivalent) erosion control matting as shown on the Drawings and in accordance with these Specifications.

E. Protection of Work

1. The Contractor shall use all means necessary to protect all materials and the Work.

2. In the event of damage, the Engineer will identify areas requiring repair in accordance with the QA/QC Plan, and the Contractor shall make repairs and replacements necessary to the approval of the Engineer at no additional cost to the IRGI.

3.02 STAPLE PATTERNS

A. GENERAL

The following stable patterns shall be used for erosion control matting placed on overland drainage berms.

1. Staple Pattern “D” (NAG S75BN)

   3.4 staples per square yard using 6-inch, 11 gauge. Wire “U” staples. 8-inch staples and longer may be used for loose soils. 9 gauge. Wire staples or heavier may be necessary in hard or rocky soils. Staples shall be placed along the long edge at 4-foot intervals and along the shorter edge at 20-inch intervals. Contractor shall obtain staple pattern guide from Manufacturer.

2. Staple Pattern “E” (NAG P550)

   3.75 staples per square yard using 6-inch, 11 gauge. Wire “U” staples. 8-inch staples and longer may be used for loose soils. 9 gauge. Wire staples or heavier may be necessary in hard or rocky soils. Staples shall be placed along the long edge at 2-foot intervals. Short edge rows shall alternate between 20-inch intervals starting at the edge and 20-inch intervals starting from an additional staple placed 10 inches from the edge. Contractor shall obtain staple pattern guide from Manufacturer.

-- END OF SECTION --