PES Environmental, Inc.
Engineering & Environmental Services

A Document Prepared for:

Stauffer Management Company LLC/Syngenta Crop Protection, Inc., and
Olin Corporation

DATA TRANSMITTAL REPORT
GEOPHYSICAL SURVEY OF POTENTIAL BURIED DRUMS AT BHC CAKE PILE 3 AND AREA SOUTH OF FORMER PHOSPHORIC ACID POND FORMER STAUFFER CHEMICAL COMPANY FACILITY HENDERSON, NEVADA

DECEMBER 17, 2008

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JURAT

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state, and local statutes, regulations and ordinances.

The services provided and attested to with this document include preparation of the *Data Transmittal Report, Geophysical Survey of Potential Buried Drums at BHC Cake Pile 3 and Area South of Former Phosphoric Acid Pond, Former Stauffer Chemical Company Facility, Henderson, Nevada.*

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12/17/2008
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LIST OF ACRONYMS AND ABBREVIATIONS

bgs	Below ground surface
BHC	Benzene hexachloride
CEM	Nevada Certified Environmental Manager
CSM	Conceptual Site Model
DTR	Data Transmittal Report
EM	Electromagnetic
H_3PO_4	Phosphoric Acid
H+A	Hargis + Associates, Inc.
NDEP	Nevada Division of Environmental Protection
Olin	Olin Chlor Alkali Products
PES	PES Environmental, Inc.
QAPP	Quality Assurance Project Plan
SMC	Stauffer Management Company LLC
Stauffer	Stauffer Chemical Company
Syngenta	Syngenta Crop Protection, Inc.
TM	Total magnetic
%	Percent

1.0 INTRODUCTION

This Data Transmittal Report (DTR) has been prepared on behalf of Stauffer Management Company LLC/Syngenta Crop Protection, Inc., and Olin Corporation to document the methods and findings from implementation of the scope of work presented in the July 31, 2008 *Work Plan for Geophysical Survey, Potential Buried Drums at BHC Cake Pile 3, Former Stauffer Chemical Company Facility, Henderson, Nevada* (Work Plan [PES, 2008a]), and as expanded per discussion with the Nevada Division of Environmental Protection (NDEP) on August 29, 2008. The Work Plan work was deemed acceptable with conditional approval as documented in the NDEP's response letter dated August 29, 2008. As described in the Work Plan, the scope of work was performed in response to the discovery of a 1970 hand-drawn figure that depicts previously unidentified locations of "Buried Drums" and "Waste Drums" at the former Stauffer Chemical Company (Stauffer) facility in Henderson, Nevada (i.e., the Site, as shown on Plate 1).

The Site is located within the southwest portion of the Black Mountain Industrial Complex in an unincorporated portion of Clark County, Nevada, as shown on Plate 1. The Site is currently operated by Olin Chlor Alkali Products (Olin) for the manufacture of liquid chlorine, caustic soda, hydrochloric acid and bleach. The property is zoned by Clark County as Industrial and Manufacturing. A comprehensive description of the site is provided in the July 25, 2008 *Revision 1.0 Conceptual Site Model* (Hargis, 2008). A description of BHC Cake Pile 3 and summary of soil and groundwater data pertinent to this area are provided in the April 11, 2008 *Area-Specific Conceptual Site Models: BHC Cake Pile 3 (Component of LOU No.12); ACD Drum Burial Waste Management Area (LOU No. 5); Former Leach Beds and Phosphoric Acid Pond (LOU No.4) and Trenches (LOU No. 9); Inactive ACD Ponds 1 & 2 (LOU No. 7) and Former HCL/BCME Release Area (LOU No. 29)* (PES, 2008b).

The following sections of this DTR provide background information regarding the geophysical survey and a description of the methods and results from implementation of the subject scope of work.

2.0 BACKGROUND

The following sections summarize available information regarding the two geophysical investigation areas and the 1970 hand-drawn figure.

2.1 BHC Cake Pile 3

Lindane (gamma-benzene hexachloride [BHC]) was manufactured at the Site from 1946 through 1958. This process created a waste by-product known as "BHC cake", which consists of the alpha- and beta-isomers of BHC. BHC cake was stockpiled in three areas (BHC Cake Piles 1, 2, and 3 as shown on Plate 2). From approximately 1974 through 1976, BHC Cake Piles 1 and 2, were moved via front-end loader and consolidated at BHC Cake Pile

3. The reported consolidated volume of BHC Cake Pile 3 is approximately 22,000 cubic yards (Weston, 1993) or the rough equivalent of 50,000 tons (Stauffer, 1987).

The detailed methods and documentation for the closure of BHC Cake Pile 3 are provided in the *Data Transmittal Report, Assessment of Soil Covers, Former Stauffer Chemical Company Facility, Henderson, Nevada* (Assessment of Soil Covers [PES, 2007]). As described in the Assessment of Soil Covers, BHC Cake Pile 3 was closed (1978-1979) by "filling to grade with sludges removed from Wastewater Pond I during construction of CAPD Pond 7" (Westin, 1993), and placing a clay cap overlain by a protective cover of compacted native soil.

2.2 Area South of Former Phosphoric Acid Pond

Other than reference to the "Waste Drums" shown on the 1970 hand-drawn figure, no other information is available regarding the potential presence of waste materials in the subject area south of the Former Phosphoric Acid Pond. A detailed summary of references and information regarding the Former Phosphoric Acid Pond is available in the Area-Specific CSM (PES 2008b).

2.3 1970 Hand-Drawn Figure

Provided in Appendix A, the 1970 hand-drawn figure depicts the following waste management features: (1) "Imidan Leach Beds and H_3PO_4 Leach Trenches" which comprise the previously documented Former Phosphoric Acid Pond and Three Trenches (Lou No. 4), and Leach Beds (Lou No. 9); (2) "Buried Drums w/Phos. Mat." and "Half Waste Mat. & H_3PO_4 + Half Off-Spec. Imidan" which comprise the previously documented ACD Drum Burial Waste Management Area (LOU No. 5); (3) "BHC Beta Cake Pile Dumpsite" which comprises the previously documented BHC Cake Pile 3 (LOU No. 12); (4) "Buried Drums" which appears to be potentially located in the southern portion of BHC Cake Pile 3; and (5) "Waste Drums" which appears to be located approximately 150 feet south of the Former Phosphoric Acid Pond. Unlike most of the aforementioned waste management areas that have previously been identified at the Site, no previous information has been available regarding the subject "Buried Drums" and "Waste Drums" shown on the 1970 hand-drawn figure.

As shown on the 1970 hand-drawn figure, the "Buried Drums" comprise an approximate 4,800 square foot area located approximately 30 feet south of "BHC Beta Cake Pile Dumpsite" (i.e., under the southern portion of BHC Cake Pile 3 as shown on Plate 3). Also shown on the 1970 hand-drawn figure, the "Waste Drums" comprise an approximate 1,100 square foot area located approximately 150 feet south of "H_3PO_4" (i.e., along the southern boundary of the capped Former Phosphoric Acid Pond and Three Trenches as shown on Plate 3). Further review of available records indicates the subject figure represents the sole source of information which identifies the possible presence of "Buried Drums" at BHC Cake Pile 3 and "Waste Drums" in the area south of the Former Phosphoric Acid Pond. No other information is available regarding a description or details of the subject areas "Buried Drums" or "Waste Drums".

3.0 SCOPE OF WORK

The objective of the scope of work was to perform geophysical surveys in the subject areas to assess the possible presence of the respective "Buried Drums" and "Waste Drums" as shown on the 1970 hand-drawn figure. To assist in the assessment of these features, PES contracted with GEO*Vision* Geophysical Services, Inc. (GEOVision) to perform two geophysical investigations in the areas shown on Plate 2. The geophysical survey at BHC Cake Pile 3 comprised an area approximately 350 feet wide by 400 feet long (140,000 square feet). The geophysical survey in the area south of the Former Phosphoric Pond comprised an area approximately 75 feet wide by 120 feet long (9,000 square feet). The geophysical methods included a combination of electromagnetic in-phase (EM in-phase), electromagnetic conductivity (EM-conductivity) and total magnetic (TM) surveys. The detailed procedures employed for the geophysical investigations and data processing are provided in Sections 2, 3, and 4 of the report prepared by GEOVisions (provided in Appendix B).

Field activities were completed under the direct supervision of a State of Nevada Certified Environmental Manager (CEM) and in accordance with the detailed procedures and methodologies specified in the Work Plan. Field documentation and equipment calibration was also performed in accordance with the October 30, 2006 *Quality Assurance Project Plan, Site-Wide Soil and Groundwater Investigations, Former Montrose and Stauffer Sites, Henderson, Nevada* (QAPP [H+A, 2006]).

4.0 SUMMARY OF RESULTS

The following sections summarize the results of the field program.

4.1 Validation of Field Program

Activities conducted during performance of the field programs were evaluated to ensure that methods for data collection and documentation were performed in accordance with the Work Plan and QAPP. The results of the evaluation indicate that field procedures for the collection and documentation of data were consistent with the aforementioned planning and guidance documents, and meet project requirements for their intended purpose.

4.2 Geophysical Survey - BHC Cake Pile 3

Results of the geophysical investigation conducted at BHC Cake Pile 3 are summarized below and in the GEOVision report (Appendix B). Plate 3 presents the 1970 hand-drawn figure superimposed upon the Site Plan, and shows the geophysical survey areas along with the magnetic anomalies identified during the survey. The findings from geophysical survey are summarized below:

- Results of the total magnetic field intensity indicate six large magnetic anomalies were identified (A-1 through A-6 as shown on Plate 3) which GEOVison reports are consistent with subsurface metallic objects. These anomalies range in size from approximately 260 square feet (A-6) to 1,900 square feet (A-4). As shown on Plate 3, Anomaly A-2 coincides with the location of the "Buried Drums" identified on the 1970 hand-drawn figure. However, Anomaly A-2 represents an area that is approximately 85 percent (%) smaller in size compared to the area of the "Buried Drums" identified on the 1970 hand-drawn figure;

- Results from the EM-conductivity survey did not identify any magnetic anomalies. GEOVison reports these findings suggest Anomalies A-1 through A-6 are likely present at depths greater than 5 feet below ground surface (bgs);

- Results of the total magnetic field intensity also indicate three small magnetic anomalies were identified as shown on Plate 3. GEOVison reports that "the source of these buried anomalies is too small to be consistent of multiple drums";

- With the exception of Anomaly A-6, all the aforementioned anomalies are located within the capped area of BHC Cake Pile 3; and

- Results from the EM-conductivity survey indicate the presence of distinct high conductivity layers located on both the east and west margins of BHC Cake Pile 3. In contrast to the lower conductivity of the surrounding native soils and the overlying soil/clay cover cap, the high conductivity layers identified on the east and west margins of BHC Cake Pile 3 appear to be consistent with the reported closure method for BHC Cake Pile 3 which included "filling to grade with sludges removed from wastewater Pond I during construction of CAPD Pond 7 and capping with a clay cover" (Westin, 1993). The high conductivity layers could be indicative of such sludge materials or other low permeability fill materials used to shore up the sides of the BHC cake material during the closure of BHC Cake Pile 3 (i.e., as shown as "Section BB at 160'" on the 1980 drawing prepared by Stauffer and presented in Appendix C [Stauffer, 1980]).

4.3 Geophysical Survey - Area South of Former Phosphoric Acid Pond

The location of the geophysical survey performed in the area south of the Former Phosphoric Acid Pond is shown on Plate 3. The findings from geophysical survey are summarized below.

- Results of the total magnetic field intensity indicate one large magnetic anomaly was identified (A-7 as shown on Plate 3) which GEOVison reports is consistent with a buried metallic object(s). This feature is approximately 20 feet by 10 feet in size and coincides with the location of the "Waste Drums" identified on the 1970 hand-drawn figure. However, Anomaly A-7 represents an area that is approximately 75 % smaller in size compared to the area location of the "Waste Drums" identified on the 1970

hand-drawn figure. GEOVison reports the source of Anomaly A-7 "may be at a depth of less than 5 feet bgs"; and

- Results of the total magnetic field intensity also indicate three small magnetic anomalies (as shown on Plate 3) and one linear anomaly (inferred to be the Buried Gas Line as referenced on nearby signs) were identified. GEOVison reports that the source of each small anomaly is "caused by a small metallic object(s), rather than large concentrations of buried metallic objects".

5.0 REFERENCES

Hargis + Associates (H+A), 2006. *Quality Assurance Project Plan, Site-Wide Soil and Groundwater Investigations, Former Montrose and Stauffer Sites, Henderson, Nevada*. October 30.

H+A, 2008. *Revision 1.0 Conceptual Site Model, Former Montrose and Stauffer Facilities and Downgradient Areas to Las Vegas Wash, Henderson, Clark County, Nevada.* July 25.

PES Environmental, Inc. (PES), 2007. *Data Transmittal Report, Assessment of Soil Covers, Former Stauffer Chemical Company Facility, Henderson, Nevada*. October 16.

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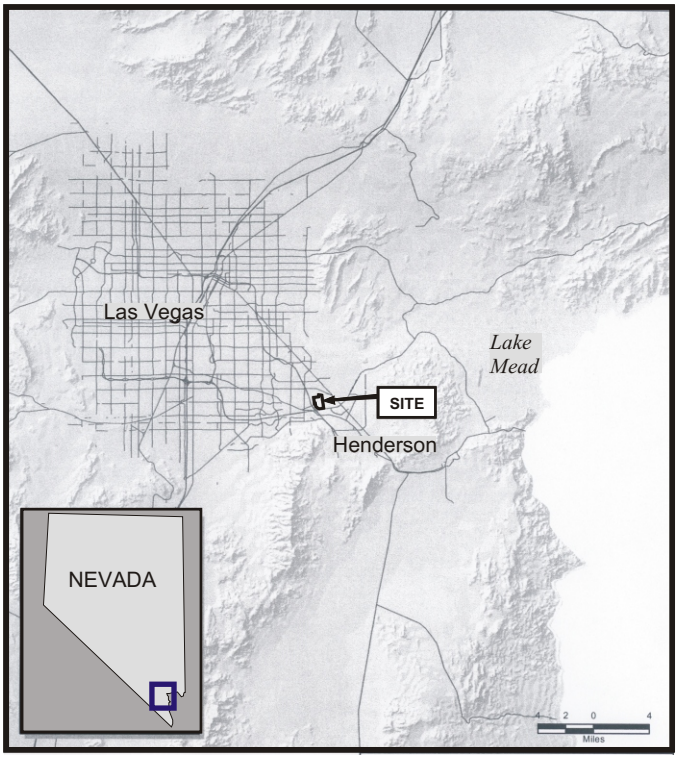
PES, 2008b. *Area-Specific Conceptual Site Models: BHC Cake Pile 3 (Component of LOU No.12); ACD Drum Burial Waste Management Area (LOU No. 5); Former Leach Beds and Phosphoric Acid Pond (LOU No.4) and Trenches (LOU No. 9); Inactive ACD Ponds 1 & 2 (LOU No. 7) and Former HCL/BCME Release Area (LOU No. 29), Former Stauffer Chemical Company Facility, Henderson, Nevada*. April 11.

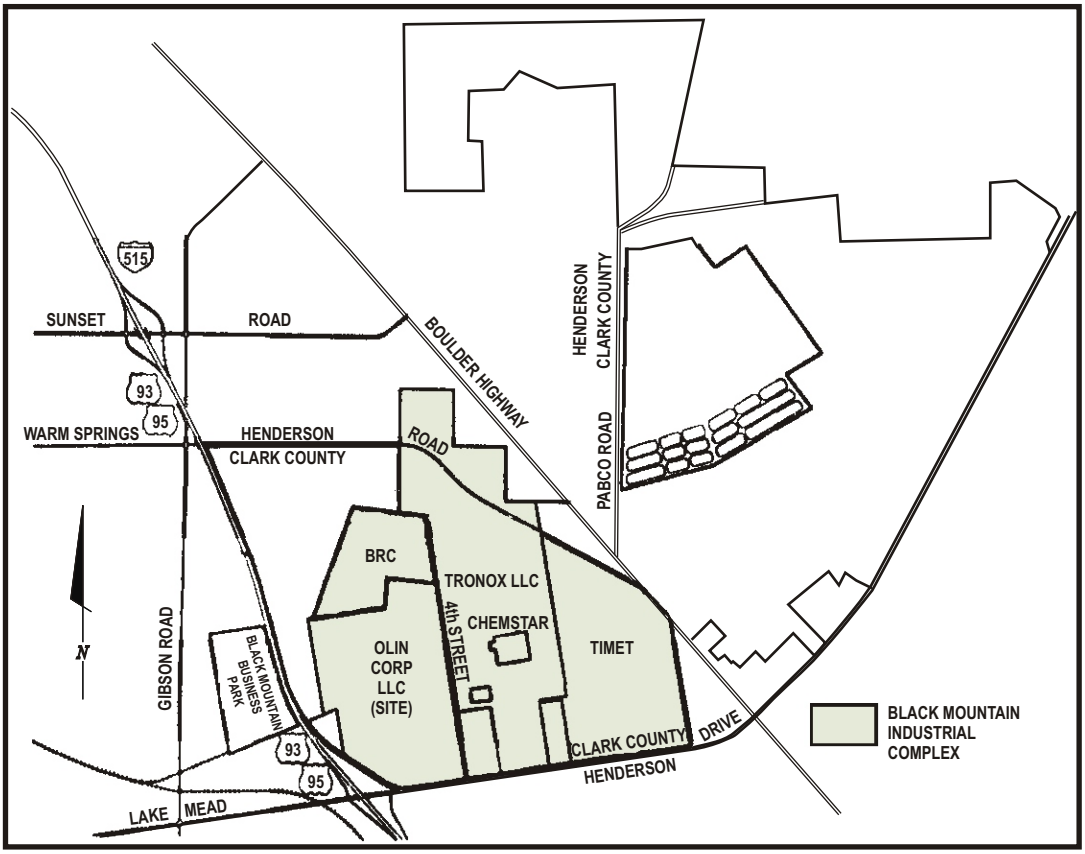
Stauffer Chemical Company, 1980. *Letter and Drawing transmitted to Division of Environmental Protection, State of Nevada (proposed closure of BHC pile at Henderson plant)*. January 14.

Stauffer Management Company (SMC) and Pioneer Chlor Alkali Company, Inc., 1997. *Response to L.O.U Information Request*. August 8.

Weston, 1993. Phase I Environmental Conditions Assessment Report, Pioneer Chlor Alkali Company, Inc., Stauffer Chemical Company Site. March 22.

PLATES





PES Environmental, Inc.
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Site Location Map
Data Transmittal Report
Geophysical Survey of Potential Buried Drums
Former Stauffer Chemical Company Facility
Henderson, Nevada

PLATE
1

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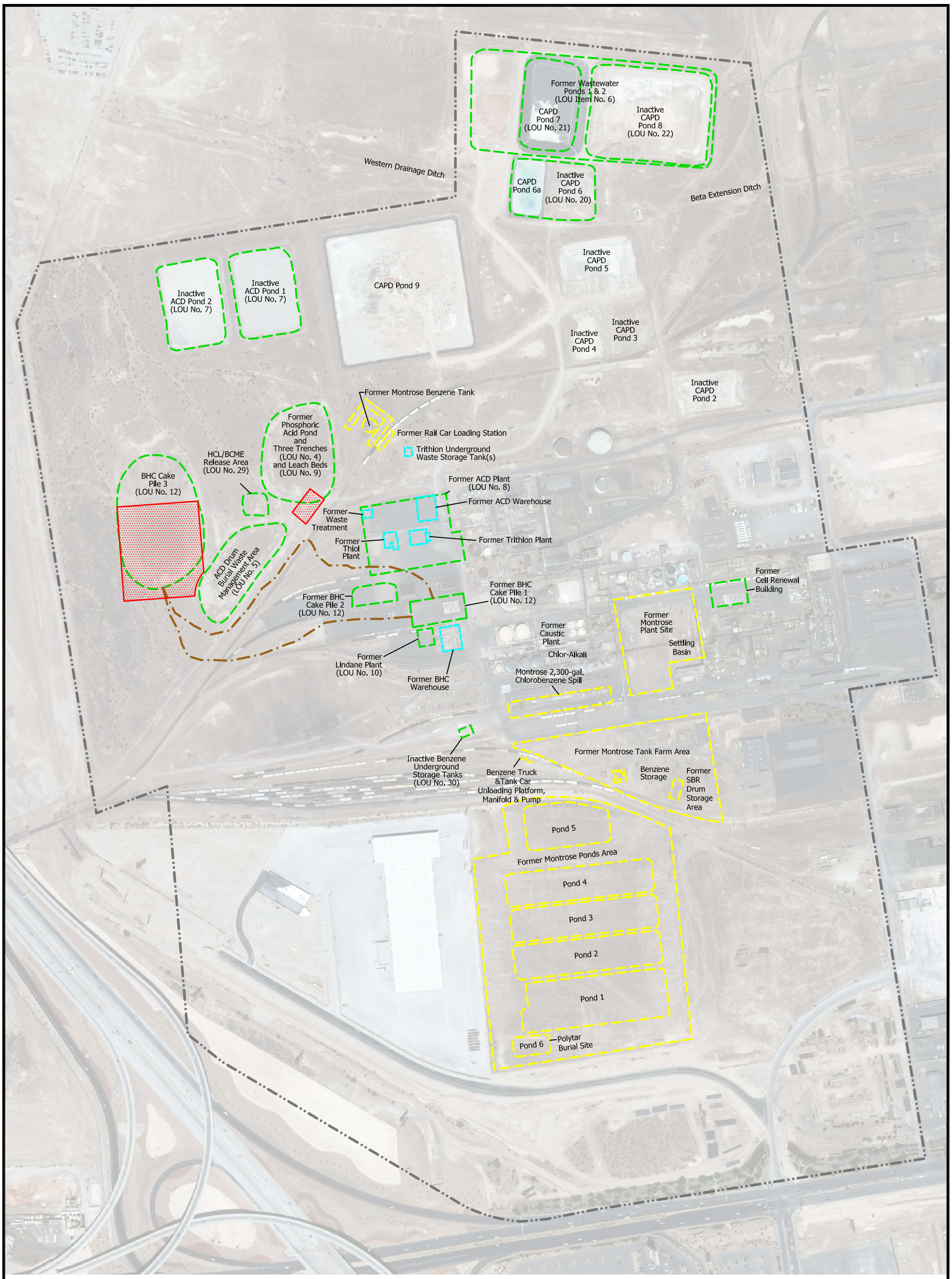

Explanation

- Geophysical Survey Area
- Stauffer/Pioneer Phase II LOU Study Item
- Montrose Site Feature
- Former Stauffer Site Feature
- Approximate Property Boundary
- BHC Loader Haul Route

N

0 400

APPROXIMATE SCALE IN FEET

Base Map: Aerial Photograph 2007

PES Environmental, Inc.
Engineering & Environmental Services

Site Plan
Data Transmittal Report
Geophysical Survey of Potential Buried Drums
Former Stauffer Chemical Company Facility
Henderson, Nevada

PLATE 2

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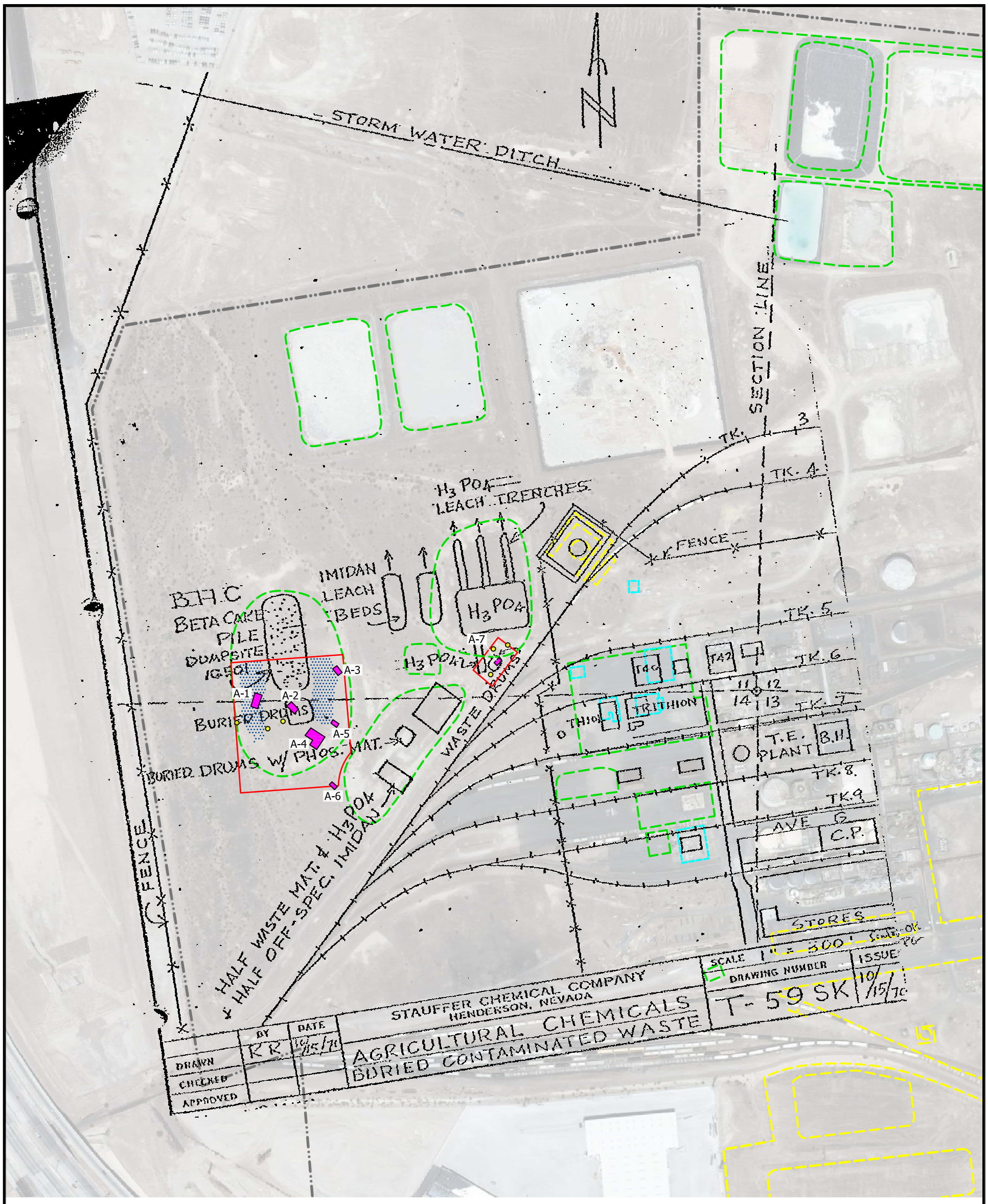
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Explanation

- Geophysical Survey Area
- EM High Conductivity Layer
- A-7 Geophysical Metallic Anomaly
- Small Buried Metallic Object/Debris
- Stauffer/Pioneer Phase II LOU Study Item
- Montrose Site Feature
- Former Stauffer Site Feature
- Approximate Property Boundary

Note: The 1970 hand-drawn figure was superimposed upon the Site Plan using a visual, best-fit approach to match features. The position and location of the drawing is an approximation.

N

0 300
APPROXIMATE SCALE IN FEET

Base Map: Aerial Photograph 2007

PES Environmental, Inc.
Engineering & Environmental Services

Results of Geophysical Surveys
Data Transmittal Report
Geophysical Survey of Potential Buried Drums
Former Stauffer Chemical Company Facility
Henderson, Nevada

PLATE 3

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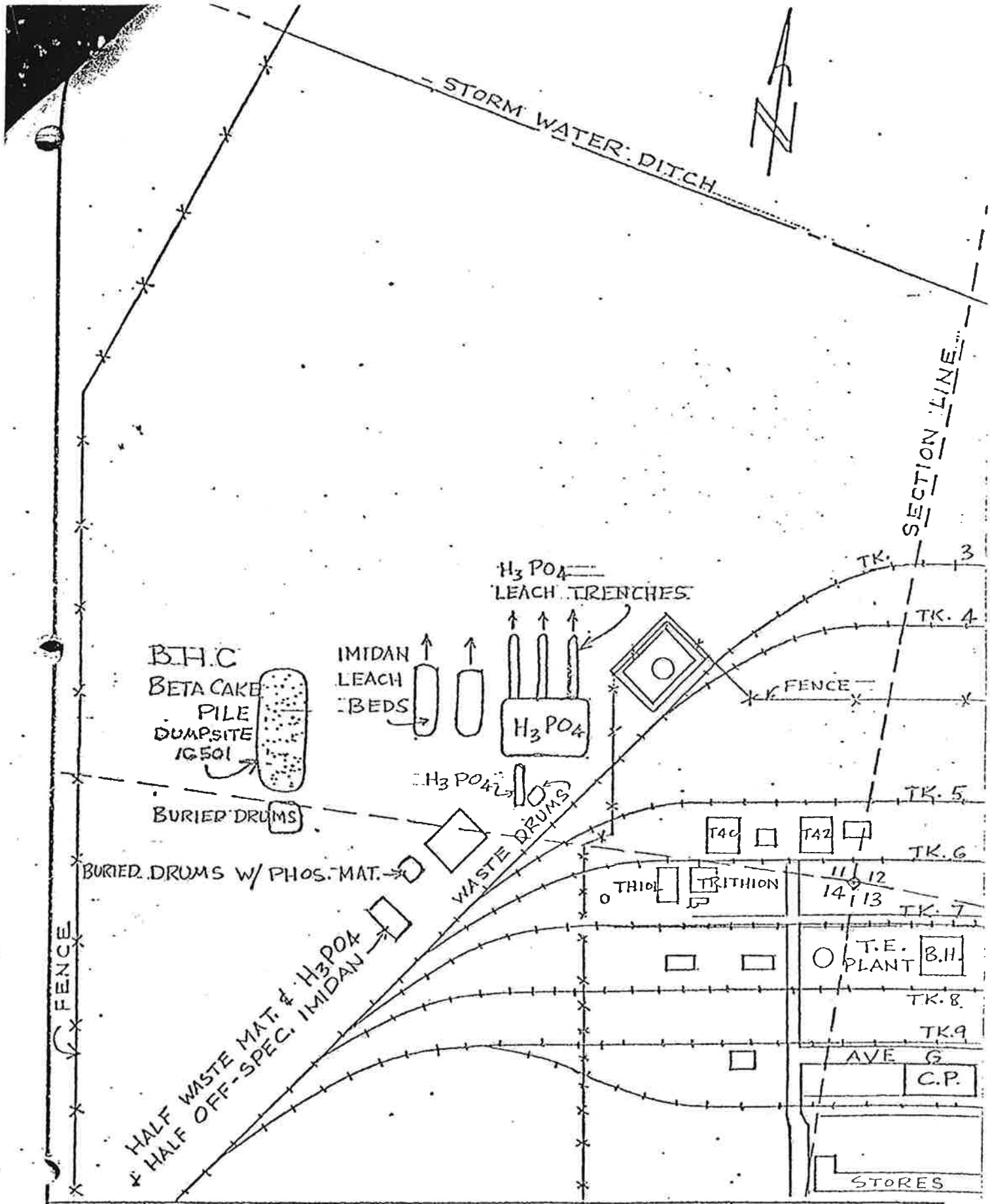
APPENDIX A

1970 Hand-Drawn figure – Stauffer Chemical Company, Henderson, Nevada



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APPROVED			BURIED CONTAMINATED WASTE		

APPENDIX B

Geophysical Investigation Report:
Geophysical Survey of Potential Buried Drums
Prepared by: GEO*Vison* Geophysical Services, Inc.

REPORT
GEOPHYSICAL INVESTIGATION

Geophysical Survey of Potential Buried Drums at BHC Cake Pile 3 and Area South of Former Phosphoric Acid Pond Olin Chlor Alkali Products Property 8000 Lake Mead Parkway Henderson, Nevada

GEOVision Project No. 8434

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December 2, 2008

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FIGURE 5 COLOR CONTOUR MAP OF GEONICS EM-31 IN-PHASE RESPONSE, AREA B

ATTACHMENT A GEOPHYSICAL TECHNIQUES FOR SHALLOW ENVIRONMENTAL INVESTIGATIONS

1 INTRODUCTION

A geophysical investigation was conducted on October 7 and 8, 2008, at the Olin Chlor Alkali Products property located in Henderson, Nevada. The purpose of the investigation was to screen two areas on the site for possible locations of buried drums.

The two survey areas were established using GPS positions provided by PES, as shown on Figure 1. Area A (BHC Cake Pile 3) is located on the western portion of the site, on top of a graded mound. Area B (Miscellaneous Area) is located to the east of Area A and west of a set of railroad tracks.

Geophysical techniques used during this investigation included the magnetic and electromagnetic (EM) methods. These techniques complement one another as each responds to different physical properties and has different strengths and limitations.

Geophysical techniques used during the investigation are discussed in Section 2. Field procedures are described in Section 3. Data processing and interpretation are discussed in Section 4. The results of the geophysical survey are presented in Section 5, and our professional certification is presented in Section 6.

2 GEOPHYSICAL TECHNIQUES

This section presents background information on the magnetic and EM methods used during this investigation. A description of the geophysical methods used during this investigation, common applications of the methods, photographs of the instruments, and example applications are included in Attachment A.

The magnetometer used during this investigation consisted of a Geometrics G858 optically pumped cesium-vapor magnetometer (G858). This instrument measures the intensity of the earth's magnetic field in nanoteslas (nT) and, optionally, the vertical gradient of the earth's magnetic field in nanoteslas per meter (nT/m). The vertical magnetic gradient is calculated by measuring the total magnetic field with two sensors at different heights, subtracting the top sensor reading from the bottom sensor reading, and dividing by the sensor separation. Buried ferrous metallic objects give rise to anomalies in the earth's magnetic field. These anomalies are generally dipolar with a positive response south and a negative response north of the object. The dimensions and amplitude of a magnetic anomaly are a function of the size, mass, depth, and magnetic properties of the source. Magnetometers are not able to detect nonferrous metals such as aluminum or brass. The magnetometer has the greatest depth of investigation of the instruments applied to this survey.

EM equipment used during this investigation consisted of a Geonics EM-31 Terrain Conductivity Meter. The EM-31 consists of a transmitter and receiver coil, one at each end of a 12-foot long boom. An alternating current is applied to the transmitter coil, causing the coil to radiate a primary EM field. This primary field generates eddy currents in subsurface materials, which give rise to a secondary field EM field. The EM-31 measures the components of the secondary EM field both in-phase and 90-degrees out-of-phase with the primary EM field. The out-of-phase component is converted to apparent conductivity in millisiemens per meter (mS/m) and the in-phase component is measured as parts per thousand of the primary EM field. A negative EM-31 response with positive shoulders is generally observed over shallow, buried metallic objects. When the instrument boom is orientated parallel to a long, linear conductor such as a pipe a positive response centered over the conductor is typically observed. The EM-31 must pass directly over or immediately adjacent to a buried metallic object to detect it. Because of the 12-foot separation between the transmitter and receiver coils, the EM-31 cannot detect very small, buried metallic objects. Approximately 70% of the EM-31 conductivity response arises from material in the upper 18 feet; however, the instrument is most sensitive to materials in the upper 5 feet.

3 FIELD PROCEDURES

This section describes the field procedures used during the investigation, including site preparation, magnetic and EM-31 survey procedures and verification of geophysical anomalies.

3.1 Site Preparation

Before conducting the geophysical investigation, the corners of the survey areas were staked using GPS locations provided by PES. Survey ropes and surveyors paint were used in Area A to place 7.5 foot marks at the ends of the site, to aid in survey control. A 300 foot survey rope, a Nikon AP-7 auto level and surveyors paint were used to create a 10 ft by 10 ft grid in Area B. The grid was used to aid in survey control. Each geophysical instrument was used in conjunction with a Trimble ProXRS GPS system with OmniSTAR real-time, submeter corrections as discussed below. GPS data was collected in the geodetic coordinate system and then converted to Nevada State Plane 1983, NAD83 (Conus), East Zone (2701) in US Survey Feet, during data processing. Obvious surface cultural features that could potentially affect the geophysical data (i.e. metallic signs and other surface metallic objects) were identified in the field and the positions taken using a submeter GPS system. A site map, transcribed from the GPS locations, showing the location of the geophysical survey area, Nevada State Plane coordinates and surficial features is presented as Figure 1.

3.2 Magnetic Survey

Prior to data acquisition, the G858 was programmed with the appropriate sampling interval and GPS input settings. Measurements of the earth's total magnetic field and vertical magnetic gradient were made at 0.2-second intervals as the operator walked along approximately south to north (S-N) survey lines nominally spaced 7.5 feet apart for Area A and 5 feet apart for Area B. A Trimble ProXRS GPS system with OmniSTAR differential corrections was used for spatial control. Real-time submeter corrections were input every second into the data collector of the magnetometer using a serial cable and a GGA NMEA stream GPS output. The magnetic data were stored in the internal memory of the magnetometer, along with GPS statistics and location data. If a location error was made on a survey line (station mark skipped, etc.) the line was repeated to attain desired coverage. Magnetic data were downloaded to a laptop computer at the end of the survey using the program MAGMAP 2000 by Geometrics Inc.

3.3 Geonics EM-31 Survey

The EM-31 was assembled and battery levels were checked and found to be within acceptable levels. The EM-31 digital data logger was then programmed with the appropriate file name and sample rate (5 readings/sec). EM-31 measurements were made at along approximately S-N survey lines nominally spaced 7.5 feet apart for Area A and 5 feet for Area B. A Trimble ProXRS GPS system with OmniSTAR differential corrections was used for spatial control. Real-time submeter corrections were input every second into the data

collector of the EM-31 using a serial cable and a GGA NMEA stream GPS output. The EM-31 data were stored in a digital data logger, along with GPS statistics and location data. If a location error was made on a survey line (station mark skipped, etc.) the line was repeated to attain desired coverage. EM-31 data were downloaded to a laptop computer at the end of the survey using the computer program Trackmaker31 by Geomar Software Inc.

4 DATA PROCESSING AND INTERPRETATION

This section presents the data processing procedures and interpretation of the geophysical data.

4.1 Data Processing

Color-enhanced contour maps of magnetic and EM data were generated using the GEOSOFT® Oasis montaj ™ geophysical mapping system. The maps were color-enhanced to aid in the interpretation of subtle anomalies. Prior to map generation, a number of preprocessing steps were completed and included:

- Backup of all original field data files to computer.
- Correcting of all data acquisition errors (typically removing null data and erroneous GPS points)
- Reformatting field data files to free format XYZ files containing at a minimum GPS time and field measurements.
- Merging GPS position data and geophysical data using commercial and in-house software.
- Merging of multiple data files into a single file and sorting, if necessary.

These data adjustments were made using a combination of commercial and in-house software. All adjustments made to data files and resulting file names were documented and are retained in project files.

The outputs of the data preprocessing were data files containing the various data measurements. The magnetic data file contained total magnetic field intensity and vertical magnetic gradient. The EM-31 data file contained conductivity and in-phase response.

Data processing steps included the following:

- Reformatting of data files to GEOSOFT® format.
- Generating final map scale.
- Gridding data using down- and cross-line splines or minimum curvature.
- Masking grid in areas where data not acquired (i.e. around site perimeter or building).
- Applying Hanning filter to smooth the data, as necessary.
- Generating color zone file describing color for different data ranges.
- Contouring the data.
- Generating map surrounds (title block, legend, scale, color bar, north arrow, etc.)
- Annotating anomalies.
- Merging various plot files and plotting final map.

The names of the files generated and the processing parameters used were documented and are retained in project files. All files generated during the processing sequence were archived on a backup drive.

4.2 Interpretation

Color-enhanced contour maps of the total magnetic field intensity and EM-31 conductivity response for Area A are presented as Figures 2 and 3, respectively. Color-enhanced contour maps of the total magnetic field and EM-31 in-phase response for Area B are presented as Figures 4 and 5, respectively. The coordinates shown on these figures reference the Nevada State Plane 1983, NAD83 (Conus), East Zone (2701) coordinate system in US Survey Feet. The color bar indicates the amplitude of the measured quantity with the magenta and cyan colors representing high and low amplitudes, respectively. The light orange, yellow and light green colors indicate average "background" values of the measured quantity.

Anomalies in the magnetic and EM-31 data were checked using GPS locations of known metallic objects to determine if a source of metal at the surface caused the anomaly. Several surface anomalies imaged in the data were caused by signs, telephone poles and metallic debris. These anomalies are labeled as “SM” on the respective contour maps.

4.2.1 Area A (BHC Cake Pile 3)

Seven anomalies, labeled A-1 through A-6, are interpreted in Area A that require further discussion. Each of these anomalies bears a high amplitude dipolar response in the magnetic data, as shown in Figure 2. These anomalies are caused by subsurface metallic objects. Anomaly A-4 has the largest magnetic response and is approximately 50 ft by 50 ft in size. Anomalies A-2, A-3 and A-6 do not have a typical south-up, north-down dipolar magnetic response. The response may indicate a metal object/debris with permanent magnetization or specific orientation to produce a positive response on the north side of the dipole. Anomalies A-2, A-3 and A-6 are, therefore, expected to have similar sources and/or orientations. There are also several subsurface anomalies labeled “BM” on the Area A magnetic contour map. The source of these buried anomalies is too small to be consistent of multiple drums. The EM-31 conductivity data for Area A did not yield any anomalies that were interpreted as buried metallic objects, indicating that the larger metallic objects/debris are deeper than 5 ft. Two large zones of conductive material are located on the western and eastern portion of the survey area, as shown in Figure 3. In contrast to the native soil type, these zones are likely caused by emplaced clay or conductive fill material. Additionally, EM-31 in-phase data was collected for Area A, which corroborated the total magnetic field intensity data and the EM-31 conductivity results.

4.2.2 Area B (Area South of Former Phosphoric Pond)

There is one anomaly in Area B that requires further discussion. This anomaly is labeled A-7 and is located to the east of a telephone pole. Anomaly A-7 is approximately 20 ft by 10 ft in size. The anomaly has a magnetic dipole response as well as, a large negative EM-31 in-phase response with positive shoulders. This anomaly is caused by a buried metallic object(s). The size of the in-phase response indicates that the source of this anomaly may be at a depth of less than 5 feet. There are three anomalies labeled “BM” in the magnetic data for Area B. The source of each small anomaly is caused by a small metallic object(s) rather than large concentrations of buried metallic objects. One linear anomaly in Area B is interpreted as an underground pipe or utility. This linear anomaly is most likely the buried

metallic Gas Line referenced by nearby signs. Additionally, EM-31 conductivity data was collected for Area B, which corroborated the total magnetic field intensity data and the EM-31 in-phase results.

5 SUMMARY

A geophysical survey was conducted at the Olin Chlor Alkali Products property in order to identify the locations of possible buried, metallic drum locations, utilizing magnetic and electromagnetic methods. Six anomalies were identified in the data for Area A as likely locations for buried metallic objects, and one location was identified in Area B as a possible location for buried metallic objects.

The geophysical survey was designed to map anomalous areas that could indicate buried metallic objects to be on site. It is our opinion that the geophysical survey was appropriately designed to locate a single buried drum to a depth of about 5 feet deep, or a group of buried drums to a depth of about 15 feet. The presence of surface features, such as small metal debris, would have a minor impact on the resolution and depth range of the survey equipment.

6 CERTIFICATION

All geophysical data, analysis, interpretations, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a **GEO*Vision*** California Professional Geophysicist.

Prepared by

12/02/08

William Dalrymple — Date
Project Geophysicist
GEO*Vision* Geophysical Services

Reviewed and approved by

12/02/08

Antony Martin — Date
California Professional Geophysicist, P.RGP 989
GEO*Vision* Geophysical Services

* This geophysical investigation was conducted under the supervision of a California Professional Geophysicist using industry standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition, through data processing interpretation and reporting. All original field data files, field notes and observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

  A professional geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations or ordinances.

LEGEND

ORIGINAL STAKED BOUNDARY OF GEOPHYSICAL SURVEY AREA

RAILROAD TRACKS

GAS PIPELINE

GEOPHYSICAL ANOMALY DISCUSSED IN REPORT

BURIED METALLIC OBJECT/DEBRIS

0 50 100 150 (feet)

NOTE: STATE PLANE COORDINATE SYSTEM NAD 83 (CONUS), NEVADA EAST 2701, US FT

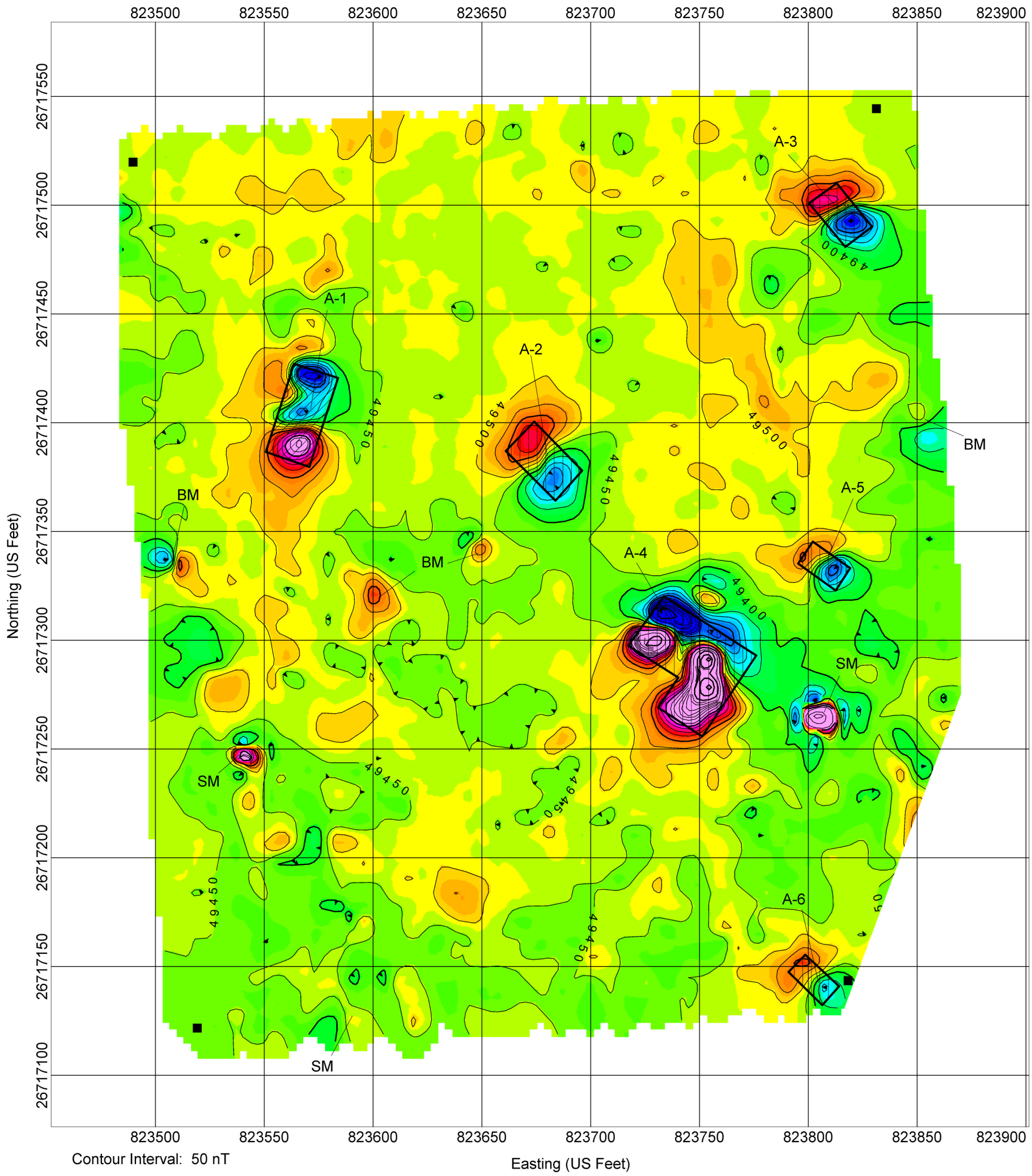
GEOVision geophysical services

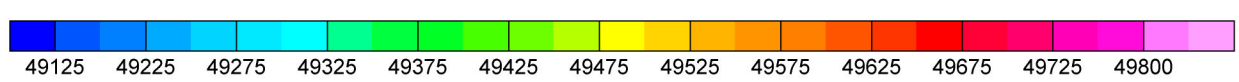
Project #	8434
	Dec 02,2008
Developed by	W DALRYMPLE
Drawn by	T RODRIGUEZ
Approved by	
G:\8474\8474-1.dwg	

FIGURE 1
SITE MAP WITH GEOPHYSICAL INTERPRETATION

8000 LAKE MEAD PARKWAY
HENDERSON, NEVADA

PREPARED FOR
PES ENVIRONMENTAL





Response
(nT)

LEGEND

A-1	Anomaly as Discussed in Report
BM	Buried Metallic Object
SM	Surface Metallic Object
■	Staked Survey Extents

25 0 25 50 75
(feet)

Note: Nevada State Plane 1983, NAD83 (Conus), East Zone (2701), US Feet

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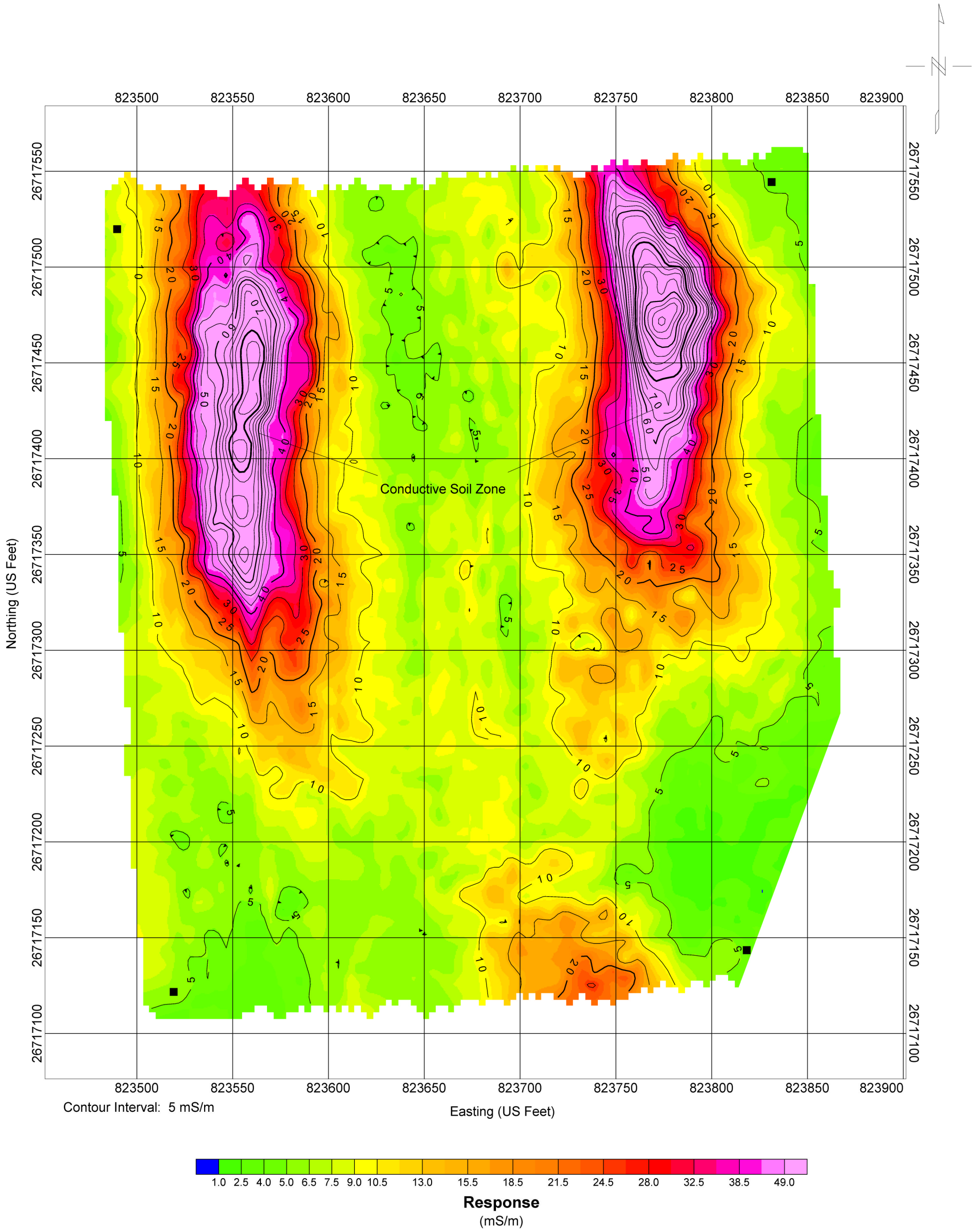
FIGURE 2

AREA A
TOTAL MAGNETIC FIELD RESPONSE

8000 LAKE MEAD PARKWAY
HENDERSON, NEVADA

PREPARED FOR PES



LEGEND

■ Staked Survey Extents

Note: Nevada State Plane 1983, NAD83 (Conus), East Zone (2701), US Feet

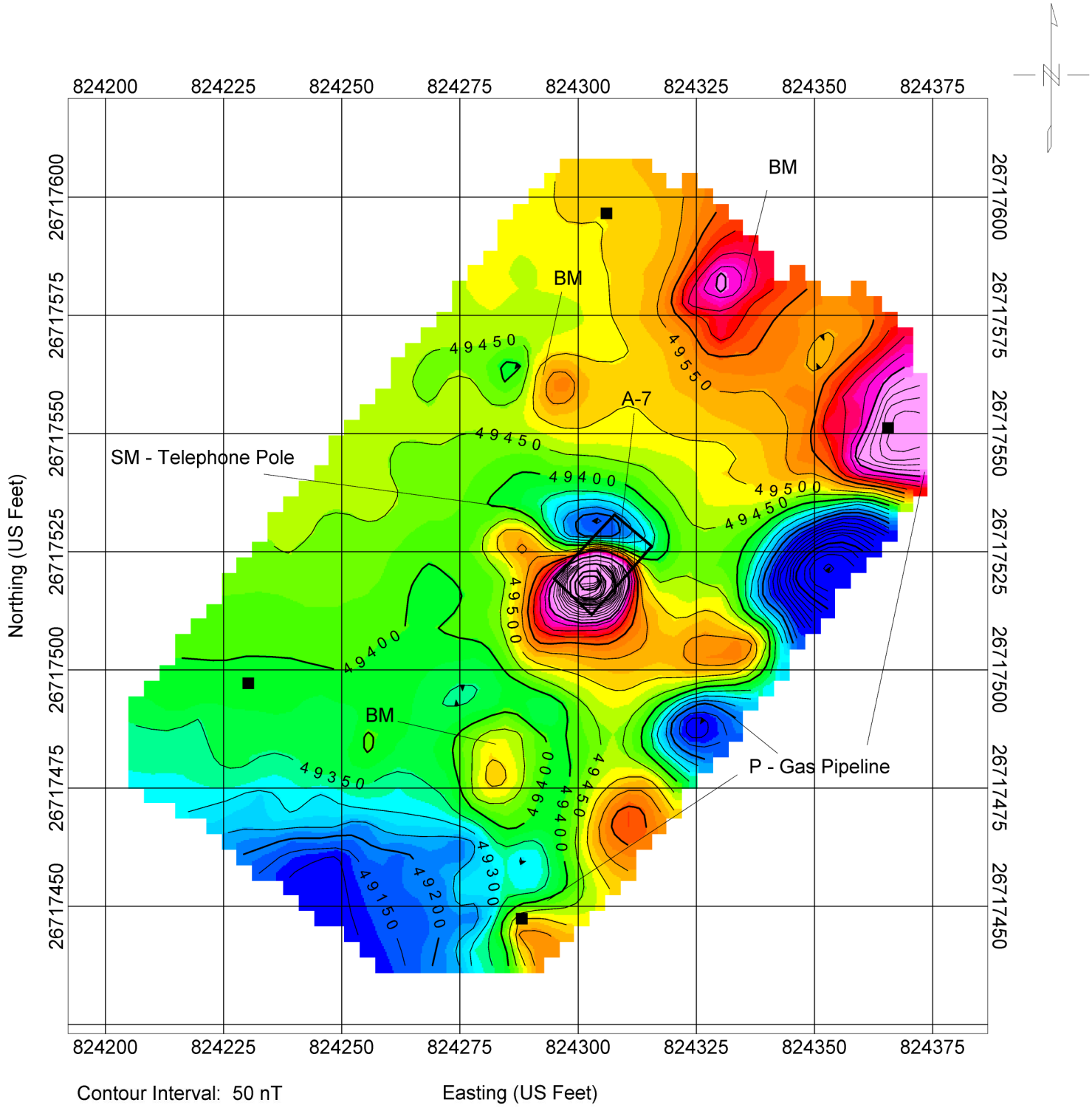
GEOVision geophysical services

FIGURE 3

AREA A
EM-31 CONDUCTIVITY RESPONSE

8000 LAKE MEAD PARKWAY
HENDERSON, NEVADA

PREPARED FOR PES



LEGEND

A-7	Anomaly as Discussed in Report
P	Interpreted Pipe/Underground Utility
BM	Buried Metallic Object
SM	Surface Metallic Object
■	Staked Survey Extents

Note: Nevada State Plane 1983, NAD83 (Conus), East Zone (2701), US Feet

25 0
(feet)

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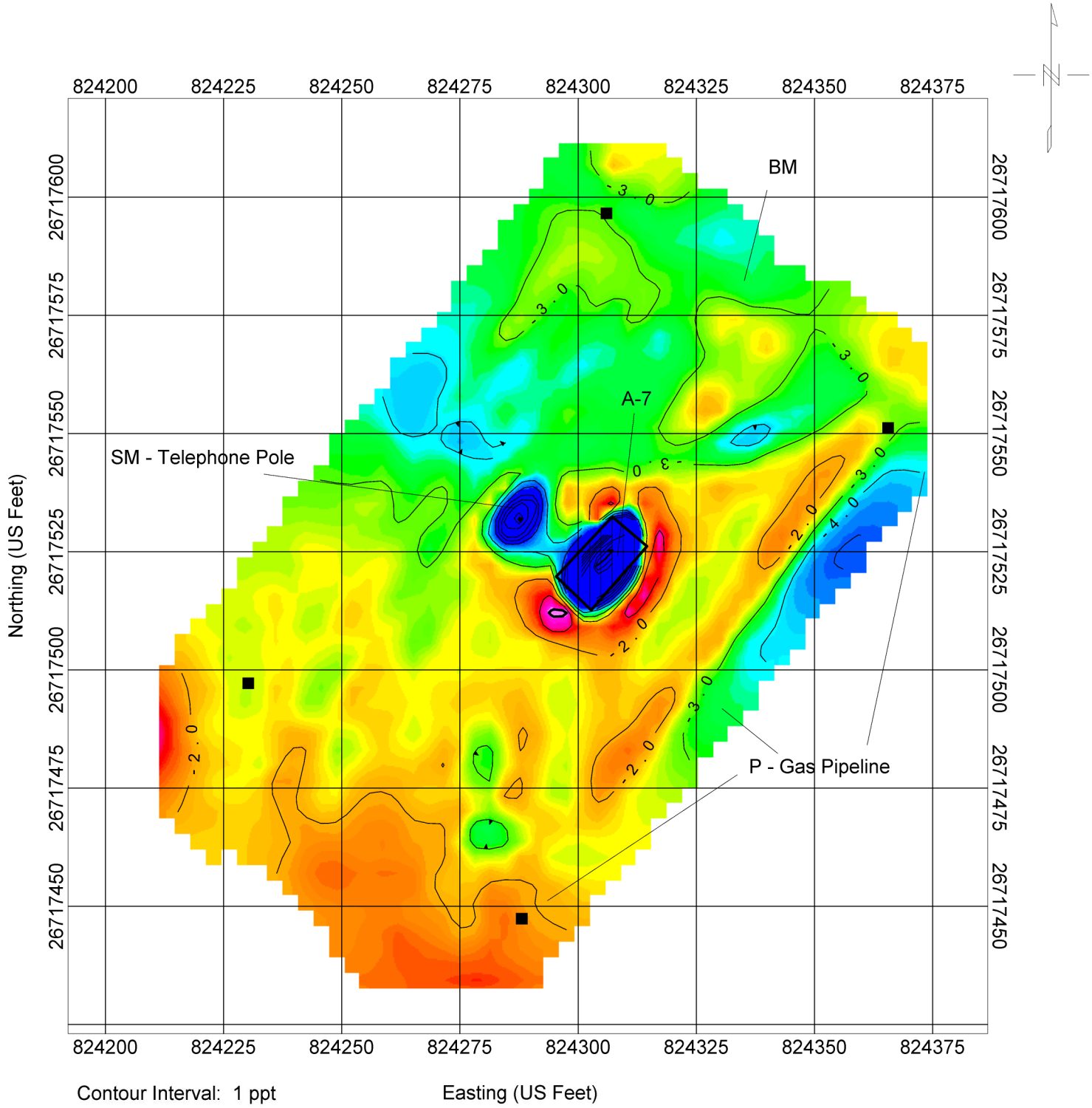
FIGURE 4

AREA B
TOTAL MAGNETIC FIELD RESPONSE

8000 LAKE MEAD PARKWAY
HENDERSON, NEVADA

PREPARED FOR PES



LEGEND

A-7	Anomaly as Discussed in Report
P	Interpreted Pipe/Underground Utility
BM	Buried Metallic Object
SM	Surface Metallic Object
■	Staked Survey Extents

Note: Nevada State Plane 1983, NAD83 (Conus), East Zone (2701), US Feet

25 0 (feet)

GEOVision geophysical services

FIGURE 5

AREA B
EM-31 IN-PHASE RESPONSE

8000 LAKE MEAD PARKWAY
HENDERSON, NEVADA

PREPARED FOR PES

GEOPHYSICAL TECHNIQUES FOR SHALLOW ENVIRONMENTAL INVESTIGATIONS

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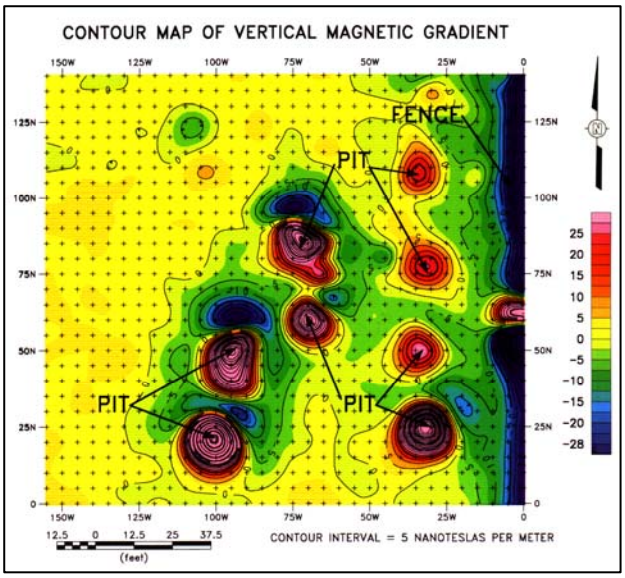
MAGNETIC METHOD

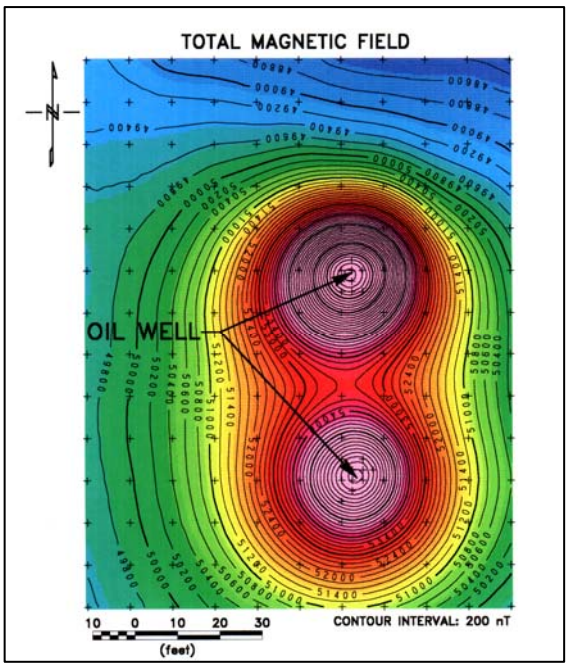
The magnetic method generally involves the measurement of the earth's magnetic field intensity or vertical gradient of the earth's magnetic field. Anomalies in the earth's magnetic field are caused by induced or remanent magnetism. Induced magnetic anomalies are the result of secondary magnetization induced in a ferrous body by the earth's magnetic field. The shape and amplitude of an induced magnetic anomaly is a function of the orientation, geometry, size, depth, and magnetic susceptibility of the body as well as the intensity and inclination of the earth's magnetic field in the survey area. The magnetic method is an effective way to search for small metallic objects, such as buried ordnance and drums, because magnetic anomalies have spatial dimensions much larger than those of the objects themselves. Typically, a single buried drum can be detected to a depth of about 10 feet. Larger metallic objects can often be located to greater depths. Induced magnetic anomalies over buried objects such as drums, pipes, tanks, and buried metallic debris generally exhibit an asymmetrical, south up/north down signature (positive response south of the object and negative response to the north).

Geometrics G858 Cesium Magnetic Gradiometer

Magnetic data is typically acquired along a grid with results being presented as color-enhanced contour maps generated by the Geosoft™ Mapping System or OASIS montaj. The approximate location and depth of magnetic objects can be calculated using the Geosoft™ UXO System.



Magnetic Survey to Locate Pits Containing Buried Metallic Containers



Magnetic Survey to Locate Abandoned Oil Wells

Magnetic surveys are typically conducted to:

- Locate abandoned steel well casings
- Locate buried tanks and pipes
- Locate pits and trenches containing buried metallic debris
- Detect buried unexploded ordnance (UXO)
- Map old waste sites and landfill boundaries
- Clear drilling locations
- Map basement faults and geology
- Investigate archaeological sites

1124 Olympic Drive, Corona, California 92881, ph. 951-549-1234, fx. 951-549-123 www.geovision.com

ELECTROMAGNETIC METHODS

Electromagnetic (EM) methods typically applied to shallow environmental investigations include frequency domain EM methods, such as EM induction and EM utility location methods, time domain electromagnetic (TDEM) metal detection methods, and ground penetrating radar (GPR) methods.

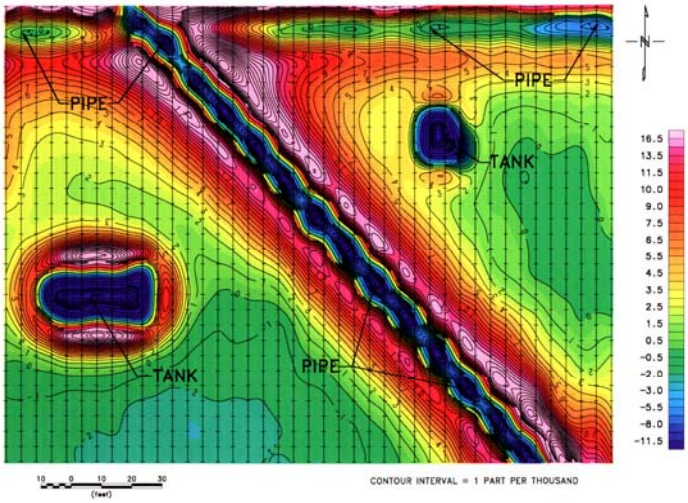
EM Induction Method

EM induction surveys are often conducted using the Geonics EM-31 terrain conductivity meter (EM-31). The EM-31 consists of a transmitter coil mounted at one end and a receiver coil mounted at the other end of a 3.7-meter long plastic boom. Electrical conductivity and in-phase component field strength are measured and stored along with line and station numbers in a digital data logger. In-phase component measurements generally only respond to buried metallic objects; whereas conductivity measurements also respond to conductivity variations caused by changes in soil type, moisture or salinity and the presence of nonmetallic bulk wastes. The EM-31 must pass over or immediately adjacent to a buried metallic object to detect it. Typical EM-31 anomalies over small, buried metallic objects consist of a negative response centered over the object and a lower amplitude positive response to the sides of the object. When the instrument boom is oriented parallel to long, linear conductors such as pipelines a strong positive response is observed. The EM-31 can explore to depths of about 6 meters, but is most sensitive to materials about 1 meter below ground surface. Single buried drums can typically be detected to depths of about 5 feet.

Geonics EM-31 Terrain Conductivity Meter

EM-31 surveys are typically conducted to:

- Locate buried tanks and pipes
- Locate pits and trenches containing metallic and/or nonmetallic debris
- Delineate landfill boundaries
- Delineate oil production sumps and mud pits
- Map conductive soil and groundwater contamination
- Map soil salinity in agricultural areas
- Characterize shallow subsurface hydrogeology
  - Map buried channel deposits
  - Locate sand and gravel deposits
  - Locate conductive fault and fracture zones



Geonics EM-31 Survey to Locate Underground Storage Tanks

EM Utility Location Methods

EM utility locators; such as the Metrotech 810, Metrotech 9890 and Radiodetection RD400, are designed to accurately trace metallic pipes and utility cables and clear drilling/excavation locations. These utility locators consist of a separate transmitter and a receiver. The transmitter emits a radio frequency EM field that induces secondary fields in nearby metallic pipes and cables. The receiver detects these fields and is used to accurately locate and trace the pipes, often to distances over 200 feet from the transmitter. Many of the utility locators have a passive 60Hz mode to locate live electrical lines. Modern utility locators are also capable of providing rough depth estimates of the pipes.

Metrotech EM Utility Locator

APPENDIX C

January 14, 1980 Letter and Drawing
Stauffer Chemical Company, Henderson, Nevada

Stauffer Chemical Company
636 California St./San Francisco, CA 94108/Tel. (415) 544-9000/Cable "Stauffer"

REPLY TO:
P.O. Box 3050, Rincon Annex
San Francisco, California 94119

January 14, 1980

Mr. W. Marvin Tebeau
Division of Environmental Protection
State of Nevada
Dept. of Conservation and Natural Resources
Capital Complex
Carson City, NV 89710

Dear Mr. Tebeau:

Enclosed is a drawing showing how we propose to close the BHC pile at our Henderson plant. The drawing shows its present outline along with the final grade plan. We plan to smooth the surface and apply a six inch compacted clay barrier which is keyed into the natural slope. Over this we would apply a two foot cover of compacted native soil. A toe line errosion barrier is provided.

Preliminary tests have shown that, with the native soil and with the rainfall of the area, the moisture will penetrate about two feet. It will then wick back to the surface and evaporate with very little water getting into the ground water. This is rather well substantiated by BHC analysis of the water in the test holes we have drilled in the area. BHC values are non-detectable to low levels even with no protective cover on the BHC pile. The addition of a clay barrier layer will add an additional margin.

Would you have this plan reviewed to see if there are any deficiencies? We would like to get this completed as quickly as we can.

If there are any questions, please call me.

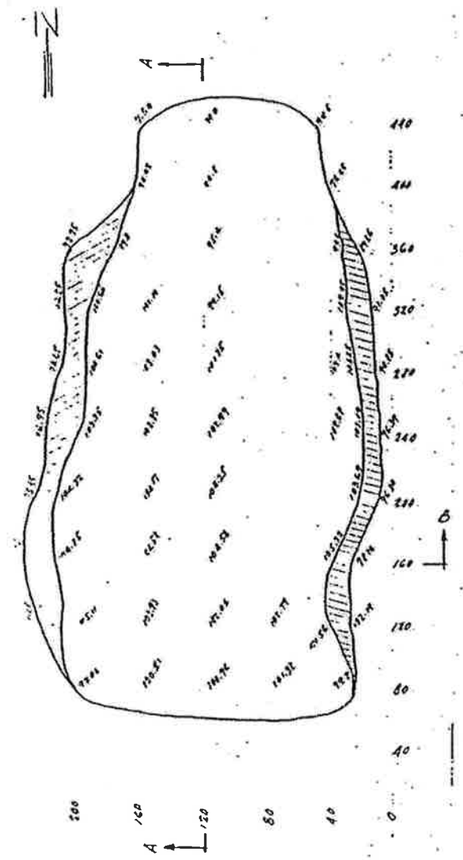
Sincerely,

J. V. Wiseman

J. V. Wiseman
Manager, Environmental Control-West

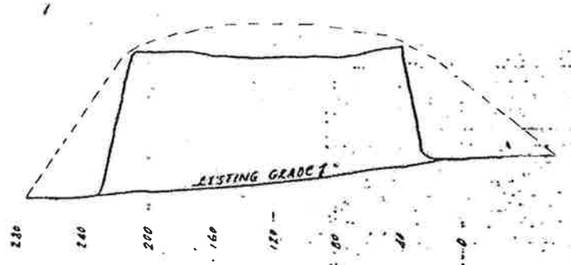
JVW/kak

Attachment

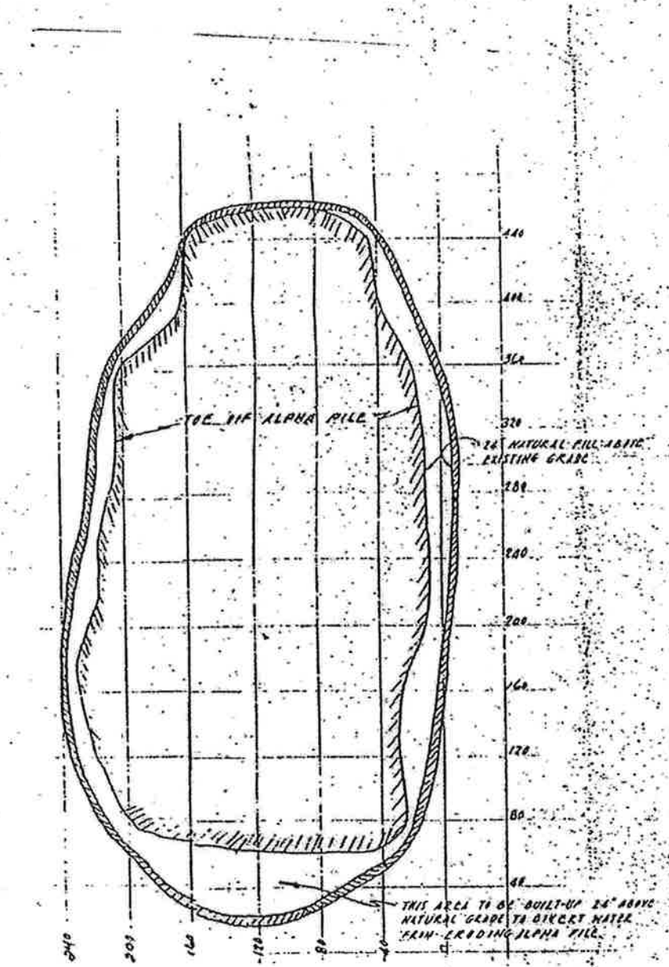


PLAN
EXISTING ALPHA PILE
SCALE 1" = 50'

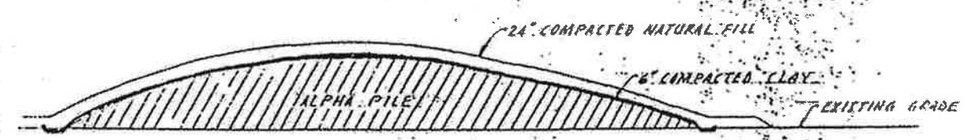
SECTION 'AA' AT 120'
SCALE - HORZ. 1" = 50'
VERT. 1" = 5'



SECTION 'BB' AT 160'
SCALE - HORZ. 1" = 50'
VERT. 1" = 5'



PLAN



SECTION
PROPOSED SEALING OF ALPHA PILE

STAUFFER CHEMICAL COMP
HENDERSON
Stauffer CHEMICALS