FUGRO

FUGRO ENVIRONMENTAL, INC.

11009 Osgood
San Antonio, Texas 78233
Tel: (210) 655-9516
Fax: (210) 655-9519

June 21, 1995
Report No. 0553-2003

San Antonio Housing Authority
818 South Flores St.
San Antonio, Texas 78295

Attention: Mr. Oscar Cervantes

REMEDIAL SITE INVESTIGATION
SAN ANTONIO HOUSING AUTHORITY - 10 ACRE SITE
1901 SOUTH SAN MARCOS STREET
SAN ANTONIO, TEXAS

Fugro Environmental, Inc., is pleased to present the results of the Remedial Site Investigation (RSI) conducted at the San Antonio Housing Authority 10 acre site in San Antonio, Texas. The objectives of this investigation were to 1) characterize and delineate the vertical and horizontal extent of coal ash waste at the site, 2) characterize the soil quality in the first foot of soil for human exposure concerns, and 3) to characterize and delineate the extent of semi-volatile hydrocarbon concentrations in the groundwater at the site.

The results of this investigation may be used to conduct a human health-based risk assessment of the site and may provide a technical basis for future site closure under 30 TAC Section 335 Subchapter S. This investigation was performed in accordance with the scope of services outlined in our Proposal No. 0553-2003, dated March 17, 1995.

We appreciate the opportunity to provide environmental consulting services to San Antonio Housing Authority on this project. If you have any questions concerning this report, or if we can assist you in any other matter, please contact us at (210) 655-9516.

Sincerely,
FUGRO ENVIRONMENTAL, INC.

John Kjellberg
Environmental Scientist

Michael J. Lewis, P.E.
Environmental Manager

Copies Submitted: (2)
jk(52003rpt)

FUGRO

TABLE OF CONTENTS

CONTENTS (continued)

TABLES

PLATES

APPENDICES

EXECUTIVE SUMMARY

Fugro has performed a Remedial Site Investigation at the San Antonio Housing Authority 10 Acre Site located at 1901 South San Marcos Street in San Antonio, Texas. The objectives of this investigation were to 1) characterize and delineate the vertical and horizontal extent of coal ash waste at the site, 2) characterize the soil in the first foot of soil for human exposure concerns, and 3) to characterize and delineate the extent of semi-volatile hydrocarbon concentrations present in the groundwater. The hydrocarbons and other constituents present in the soil and groundwater were derived from coal ash waste deposited at the site.

Twelve exploratory soil borings were drilled to identify the extent of coal ash waste in the subsurface. Samples of the coal ash waste and shallow soil at the site were collected for chemical analysis. Five groundwater monitoring wells were also installed to collect groundwater samples for chemical analysis.

Results of the laboratory analyses of soil samples collected during this investigation indicated the presence of several semi-volatile hydrocarbon constituents in the shallow soils and coal ash waste. These semi-volatile hydrocarbon constituents include Isopropyltoluene, Naphthalene, Acenaphthene, Anthracene, Benzo {a} anthracene, Benzo {a} pyrene, Benzo {b} fluoranthene, Benzo {g,h,i} perylene, Benzo {k} fluoranthene, Chrysene, Dibenz {a,h} anthracene, Dibenzofuran, Fluoranthene, Fluorene, Ideno {1,2,3-c,d} pyrene, Phenanthrene, and Pyrene. Results of the laboratory analyses of groundwater samples collected during this investigation identified similar semi-volatile hydrocarbon constituents in the groundwater sample collected from monitoring well MW-3. The semi-volatile hydrocarbons detected in the soil and groundwater at the site are polycyclic aromatic hydrocarbons typically associated with coal, coal tar, and coal combustion products.

Based on the laboratory data, the groundwater beneath the site appears to have been impacted by waste materials deposited on site. The extent of semi-volatile hydrocarbons in the groundwater appears to be confined to the area around MW-3. Groundwater elevation data collected at the site indicates that the direction of groundwater flow in generally to the east-northeast toward San Pedro Creek.

We understand that SAHA plans to propose site closure under 30 TAC Section 335, Subchapter S. Closure under Risk Reduction Standard No. 3 requires the owner/operator to accomplish certain investigative actions and submit a report to TNRCC prior to initiating clean up activities. The reports and proposed clean up plan must be approved by TNRCC prior to commencement of remedial activities. The required investigative actions include (1) site assessment report, (2) a baseline risk assessment for the site, and (3) a workplan to implement a selected set of corrective measures or controls. Deed recordation, possible land use restrictions, and post closure care are required for closure under Standard No. 3.

1.0 INTRODUCTION

This report presents the results of the Remedial Site Investigation (RSI) performed by Fugro Environmental, Inc. (Fugro) at the San Antonio Housing Authority 10 acre site (subject property) located at 1901 South San Marcos Street in San Antonio, Texas. The RSI was conducted between April 20 and May 3, 1995. The objectives of this investigation were to 1) characterize and delineate the vertical and horizontal extent of coal ash waste at the site, 2) characterize the soil in the first foot of soil for human exposure concerns, and 3) to characterize and delineate the extent of semi-volatile hydrocarbon constituents present in the groundwater.

To accomplish the project objectives, Fugro completed the following tasks:

- Selected drilling and sampling locations based on information obtained from our previous site investigation (Fugro Report No. 0542-0289, January 1995).
- Drilled twelve exploratory soil borings to delineate the vertical and horizontal extent of coal ash waste at the site.
- Transmitted selected samples of soil and coal ash waste to an independent laboratory for analysis of volatile and semi-volatile organic compounds.
- Collected soil samples from the top 1-foot of soil at selected locations across the site, and transmitted the samples to an independent laboratory for analysis of volatile and semi-volatile organic compounds, and selected metals.
- Installed groundwater monitoring wells and collected groundwater samples for laboratory analysis. Groundwater samples were analytically characterized for volatile and semi-volatile organic compounds and for selected metals.

The results of this investigation may be used in a future human health-based risk assessment to provide a technical basis for site closure in accordance with 30 TAC, Section 335, Subchapter S.

1.1 Site Background

The subject property is a 10.01 acre tract of land located at 1901 South San Marcos Street in San Antonio, Texas (Plate 1). The tract is located adjacent to the Union Stock Yards, and was formerly the location of a meat packing facility from 1889 to circa 1960. The tract is currently considered to be undeveloped; however, two existing water wells completed in the Edwards Aquifer and several remnant building foundations are present at the site.

1.2 Previous Study

In January 1995, Fugro Environmental, Inc. performed a Phase II ESA at the subject site. The assessment was conducted in order to assess the presence of volatile and semi-volatile organic compounds in coal ash waste encountered in a geotechnical boring at the site. The coal ash waste in the subsurface was suspected to have been produced as a by-product of coal-fired boilers which were in operation at the site in the past. The waste was most likely landfilled in low areas across the site and subsequently covered with inert fill material.

The Phase II assessment included the drilling and sampling of five soil borings and the conversion of three of the borings into groundwater monitoring wells. Results of the laboratory analyses identified the presence of several semi-volatile organic compounds in the soils and shallow groundwater on the northeastern portion of the property. The semi-volatile organic compounds identified in the soil and groundwater were polycyclic aromatic hydrocarbons typically associated with coal, coal tar, and coal combustion products.

1.3 Report Organization

This report is organized into seven sections. Section 1.0 presents introductory information about the project and the general scope of work. Section 2.0 documents procedures and protocols used to collect the soil, coal ash, and groundwater samples. Section 3.0 presents the general geologic, hydrogeologic, and soil conditions at the site. Section 4.0 presents the analytical program and results and identifies the areas of affected soil and groundwater. Section 5.0 presents our findings and conclusions. Section 6.0 discusses requirements necessary for closure of the site under 30 TAC, Section 335, Subchapter S. Limitations to our investigation are presented in Section 7.0. Additional tables and plates follow the text. Boring logs, well reports, survey data, laboratory reports, and supporting documentation are included as appendices.

2.0 FIELD INVESTIGATION

The field investigation activities included the advancement of four shallow hand auger borings (B-21 through B-24), the drilling and sampling of twenty additional soil borings (B-9 through B-20 and B-25 through B-32), and the conversion of five of the soil borings into groundwater monitoring wells (MW-4 through MW-8). Selected soil and groundwater samples from the soil borings and wells were collected for laboratory analysis. Details of the field investigation activities are presented below.

2.1 Soil Boring and Well Locations

Fugro developed a strategy to assess the character and extent of coal ash waste and associated contaminants in the soils and groundwater at the site. The strategy included drilling both shallow hand auger borings and deeper soil borings to obtain soil samples, and to delineate the vertical and horizontal extent of coal ash waste in the subsurface. Groundwater monitoring were installed to obtain groundwater samples, and to determine the local gradient and direction of groundwater flow. Borings B-1 through B-8 and monitoring wells MW-1, MW-2, and MW-3 were completed during the previous geotechnical and environmental studies at the site. The locations of all soil borings and monitoring wells are presented on Plate 2.

To obtain samples of coal ash waste at the site, borings B-9, B-10, and B-11 were drilled adjacent to previous borings in which coal ash waste was encountered. Samples of the coal ash waste from these borings were collected and transmitted to MBA Laboratories for chemical analysis.

Borings B-12 through B-20 and borings B-25 through B-27 were drilled at selected locations on the northeastern portion of the property. The borings were placed around the area of known coal ash waste to delineate the vertical and horizontal extent of the coal ash waste in the subsurface. During the investigation, coal ash waste was encountered in borings B-14, B-17, B-18, and B-20.

In order to assess the potential exposure of humans to chemical constituents, four shallow borings were advanced by hand auger on the northeastern portion of the property. Boring B-21 was located within the defined coal ash waste area, and borings B-22, B-23, and B-24 were located outside the defined coal ash waste area. Soil samples were collected within the top 1-foot of soil in each of the borings.

Borings B-28 through B-32 were converted into groundwater monitoring wells. Three of the wells (MW-4, MW-5, and MW-6) were placed downgradient from the area of coal ash waste along the eastern property boundary. Monitoring well MW-7 was placed approximately 50 feet south and crossgradient from the area of coal ash waste, and the MW-8 was placed approximately 50 feet west of the area of coal ash waste in the upgradient direction.

2.2 Drilling Techniques

Fugro supervised the environmental drilling performed on April 20 and 21, 1995 by Core Terra, Inc. Borings B-12 through B-20 and borings B-25 through B-27 were drilled using 5.5 inch diameter, continuous flight, solid stem augers. Each of the borings were completed to a depth of 15 feet below ground surface (bgs).

Borings B-9, B-10, and B-11 and monitoring wells MW-4 through MW-8 were drilled using 9 inch outside diameter, continuous flight, hollow stem augers. The soil borings were completed to depths ranging from 4 to 8 feet bgs, and the monitoring wells were completed to depths ranging from 22 to 27 feet bgs.

2.3 Soil Sample Collection

Soil samples were collected using a 2-foot long split spoon sampler simultaneously advanced with the augers. The sampler was set approximately 4 inches ahead of the lead bit so that an undisturbed soil sample could be obtained. Soil samples were classified in the field by a Fugro geologist using the United Soil Classification System. The soil samples were placed in laboratory-supplied containers and stored on ice for subsequent analytical testing. All soil cuttings were placed in sealed drums and were temporarily stored on site pending disposal. All borings were plugged to the surface with cement grout upon completion. Soil descriptions are presented on the boring logs in Appendix A.

Soil samples were selected for analysis from a depth of 5 feet in boring B-9, from a depth of 7 feet in boring B-10, and at a depth of 3 feet in boring B-11. Soil samples from borings B-21 through B-24 were collected within the top 1-foot of soil. All soil samples collected during the investigation were placed in sterile glass sample containers provided by the laboratory, stored on ice, and transmitted to MBA Laboratories for chemical analysis.

2.4 Decontamination Procedures

In order to reduce the potential for cross-contamination between samples, the sampling equipment was cleaned with a trisodium phosphate detergent solution and rinsed with distilled water before each use. Additionally, all augers and down-hole equipment were cleaned between each soil boring using a high pressure steam cleaner. The cleaning water was containerized and temporarily stored on site pending disposal.

2.5 Monitoring Well Installation

Soil borings B-28 through B-32 were converted into monitoring wells MW-4 through MW-8, respectively. The borings were drilled to completion depths ranging from 22 to 27 feet below ground surface and were terminated at the upper contact with the underlying Navarro Formation which is Cretaceous in age. The completion depths and screened intervals were determined in the field by a Fugro geologist. The well screens were placed from the base of the borehole to a depth

between 3 and 10 feet bgs. All monitoring wells were constructed to allow monitoring of the uppermost permeable water bearing unit.

All of the monitoring wells were constructed with 2 inch inside diameter, flush threaded Schedule 40 PVC pipe. Each well contained a 15 to 20 foot section of 0.010 inch, factory slotted pipe and a 2 to 7 foot section of riser. The borehole annulus around each screened section was filled with clean, graded silica sand to a maximum of 2 feet above the screened interval. A 2-foot thick bentonite seal was placed and hydrated above the sand interval and the remaining space filled to within 2 feet of the surface with cement grout mixture. Each well was completed at grade with a 4x4 ft. concrete pad, locking cap, and water-tight manhole cover according to TNRCC standards.

All wells at the site were drilled by Core Terra, Inc. of Corpus Christi. Core Terra is a licensed water well driller in the State of Texas. Well reports were prepared for all wells installed during this investigation and filed with the TNRCC. Copies of the well reports are included in Appendix B.

2.6 Groundwater Sample Collection

Each of the five monitoring wells were developed by the purge and bail method after completion of drilling operations using a disposable Teflon bailer. The wells were developed to remove fine particles from the well screen, the sand pack, and the surrounding formation. A minimum of ten well volumes of water were removed from each well. The wells were allowed to recharge to near static conditions for approximately 24 hours before groundwater samples were collected.

Groundwater samples were collected from previously existing monitoring wells MW-1, MW-2, and MW-3, and from newly installed monitoring wells MW-4 through MW-8 on May 5, 1995. A minimum of three well volumes from each well was removed prior to sampling. The groundwater samples were placed in sterile glass sample containers provided by the laboratory, stored on ice, and transmitted to MBA Laboratories for chemical analysis. Purging and sampling of groundwater was conducted in accordance with TNRCC guidelines. The purge and sampling water was containerized and temporarily stored at the site pending disposal.

2.7 Surveying of Soil Boring and Well Locations

Bain Medina Bain, Inc. (BMB) of San Antonio, Texas surveyed each soil boring and monitoring well location on the property. Both vertical and horizontal coordinates for the soil boring and monitoring well locations were established to the nearest 0.01 feet. Horizontal and vertical reference was established using an off-site benchmark identified on the survey. BMB is a registered surveyor with the State of Texas.

3.0 SITE GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

This section includes an overview of general geologic, hydrogeologic, and soil conditions in the vicinity of the subject property.

3.1 Site Geology

The subject property is located in central Bexar County, Texas, approximately 9 miles south of the Balcones Escarpment. The Balcones Escarpment is an inactive fault scarp which separates two physiographic provinces; the Edwards Plateau to the north and the Gulf Coastal Plain to the south. The Edwards Plateau is comprised of Cretaceous Age limestone units created by marine depositional processes about 65 million years ago. The coastal plain consists of a series of sedimentary depositional plains created by fluvial and deltaic processes during the last three million years. The coastal plain is underlain by older sedimentary formations that thicken seaward forming sedimentary wedges.

According to the Geologic Atlas of Texas (San Antonio Sheet), the subject property lies on an outcrop of the Navarro Group. This sedimentary unit is the youngest of the Cretaceous age sediments, and consists of chalk and chalky marl. The formation generally thickens eastward forming a sedimentary wedge. The Navarro Group is approximately 580 feet in thickness, and is underlain by older Cretaceous Age sediments. A site specific stratigraphic column is presented on Plate 3.

3.2 Site Hydrogeology

The subject property is located over the Artesian Zone of the Edwards Aquifer at an elevation of approximately 620 to 635 feet above mean sea level. Wells in this area are known to exhibit an artesian effect as a result of hydrostatic pressure in the aquifer. According to well records for wells drilled in the vicinity of the subject property, the top of the Edwards Aquifer in this area is approximately 820 feet bgs. Static water level in wells penetrating the Edwards Aquifer in this area may rise above the ground surface creating a flowing artesian well. Groundwater flow in the Edwards Aquifer is toward the southeast.

Regional groundwater flow in Bexar County is generally to the southeast. Shallow groundwater flow generally follows the local topography, but may be influenced by localized subsurface conditions. Based on the topography in the vicinity of the subject property, shallow groundwater may be expected to flow east toward San Pedro Creek.

During our investigation, shallow groundwater at the site was encountered in the soil borings at depths ranging from 7 to 21 feet bgs. Groundwater elevation data collected from the monitoring wells during this assessment indicated the direction of shallow groundwater flow at the subject property is generally to the east-northeast with a gradient of 0.05 ft/ft. A groundwater contour map of the site showing the depth to groundwater and direction of groundwater flow is illustrated on Plate 4.

3.3 Site Soil Classification

According to the USDA Soil Survey for Bexar County, Texas, the subject property lies on the Lewisville silty clay soil classification. The Lewisville soil consists of moderately deep, dark-colored, nearly level alluvial sediments which occur mainly on terraces bordering the San Antonio and Medina Rivers and their main tributaries.

In a representative profile, the surface layer of Lewisville soil is very dark grayish-brown to brown silty clay about 24 inches thick. The subsurface layer is brown silty clay and is about 20 inches thick. The underlying material is reddish-yellow silty clay. Beneath this layer, there may be deep beds of water-rounded limestone gravel. Lewisville soils have slow or medium surface drainage and medium internal drainage. Permeability is slow to moderate, and the capacity to hold water is good.

The soils encountered during the advancement of the soil borings at the northeast portion of the subject property were not representative of the Lewisville soil. The soils in this area had been altered by grading and filling, and consisted of gravel, brick, fill material, and coal ash waste. The underlying material consisted of gravelly sands and clay.

4.0 SOIL AND GROUNDWATER QUALITY CHARACTERIZATION

This section presents results of laboratory analyses for soil and groundwater samples collected during this investigation. Soil and groundwater quality conditions at the subject site were characterized by chemical analysis and provide the technical basis for assessing the presence of affected media at the site.

A total of seven soil samples and nine groundwater samples were collected and transmitted to MBA Laboratories in Houston, Texas for chemical analysis. Chain-of-custody documentation and standard EPA sampling practices were followed at all times during this investigation. Laboratory reports and chain-of-custody forms are included in Appendix C.

4.1 Soil Analytical Results

Tables 1a, 1b, and 1c summarize the results of the soil analyses performed during this investigation. A detailed summary of our findings is presented below.

Shallow Soil Samples. Boring B-21 was advanced inside the defined coal ash waste area, and borings B-22, B-23, and B-24 were advanced outside the defined coal ash waste area. Soil samples were selected from the top 1-foot of soil in each of the borings. All samples were analyzed for volatile and semi-volatile organic compounds, and for beryllium, cadmium, chromium, copper, lead, nickel, and zinc.

Results of the laboratory analyses identified several semi-volatile organic compounds typically associated with coal combustion products in the samples selected from borings B-21, B-22, and B-24. These semi-volatile organic compounds included Isopropyltoluene, Naphthalene, Acenaphthene, Anthracene, Benzo {a} anthracene, Benzo {a} pyrene, Benzo {b} fluoranthene, Benzo {g,h,i} perylene, Benzo {k} fluoranthene, Chrysene, Dibenz {a,h} anthracene, Dibenzofuran, Fluoranthene, Fluorene, Ideno {1,2,3-c,d} pyrene, Phenanthrene, and Pyrene. No volatile or semi-volatile organic compounds were identified in the soil sample selected from boring B-23. The results of the laboratory analyses also indicated that the concentrations of beryllium, chromium, copper, lead, and zinc in the sample collected from boring B-21 were above concentrations encountered during the previous Phase II investigation. The concentrations of metals in the soil samples collected from borings B-22, B-23, and B-24 were comparable to the previously encountered metal concentrations.

Samples of Coal Ash Waste. Borings B-9, B-10 and B-11 were drilled adjacent to previous borings B-4, B-7, and B-6, respectively. Soil samples were selected within the coal ash waste from a depth of 5 feet in boring B-9, from a depth of 7 feet in boring B-10, and from a depth of 3 feet in boring B-11. Each of the soil samples selected from these borings were analyzed for semi-volatile organic compounds.

Results of the laboratory analyses identified several semi-volatile organic compounds in the soil samples selected from borings B-9 and B-10. These semi-volatile organic compounds included Naphthalene, Acenaphthene, Anthracene, Benzo {a} anthracene, Benzo {a} pyrene, Benzo {b} fluoranthene, Benzo {g,h,i} perylene, Benzo {k} fluoranthene, Chrysene, Dibenz {a,h} anthracene, Di-n-butylphthalate, Fluoranthene, Ideno {1,2,3-c,d} pyrene, Phenanthrene, and Pyrene. Di-n-butylphthalate was the only semi-volatile organic compound identified in the soil sample selected from boring B-11. The semi-volatile organic compounds identified in these samples are polycyclic aromatic hydrocarbons typically associated with coal, coal tar, and coal combustion products.

4.2 Groundwater Analytical Results

Tables 2a and 2b summarize the results of the groundwater analyses performed during this investigation. A detailed summary of our findings is presented below.

Groundwater samples collected from monitoring wells MW-1, MW-2, MW-3, MW-4, and MW-7 were analyzed for semi-volatile organic compounds using EPA Method 8270. **Results** of the laboratory analyses identified **several semi-volatile organic compounds** typically associated with coal combustion products in the groundwater sample collected from MW-3. These semi-volatile organic compounds included Benzo {a} anthracene, Benzo {a} pyrene, Benzo {g,h,i} perylene, Chrysene, Fluoranthene, Ideno {1,2,3-c,d} pyrene, and Pyrene. No semi-volatile organic compounds were identified in the groundwater samples collected from monitoring wells MW-1, MW-2, MW-4 or MW-7.

Groundwater samples collected from monitoring wells MW-5, MW-6, and MW-8 were analyzed for volatile and semi-volatile organic compounds, and for beryllium, cadmium, chromium, copper, lead, nickel, and zinc. Results of the laboratory analyses identified concentrations of zinc in the groundwater sample collected from MW-5, and concentrations of lead and zinc in the groundwater sample collected from MW-6. No detectable concentrations of metals were identified in the groundwater samples collected from MW-8 or the weep hole in the retaining wall. The concentrations of lead and zinc in the samples collected from MW-5 and MW-6 are below the EPA established Maximum Contaminant Levels for those constituents in drinking water. No detectable concentrations of volatile or semi-volatile organic compounds were identified in any of the water samples.

4.3 Delineation of Coal Ash Waste

Based on the soil and coal ash waste profile encountered during the drilling, the horizontal and vertical extent of coal ash waste was delineated to a maximum extent of 15 ft. bgs. Samples for chemical analysis were not collected in any of the borings. The soil cuttings from the borings were visually observed for the presence of coal ash waste. During the drilling activities, **coal ash waste was encountered at various depths in borings B-9, B-10, B-11, B-14, B-17, B-18, and B-20.**

thickness range from 2'-8"

Plate 4 illustrates the approximate horizontal extent of coal ash waste in the subsurface. The total area is estimated to be approximately 42,000 square feet. The thickness of the coal ash waste ranges from a maximum of 8 feet near boring B-11 to 2 feet in boring B-18. The total in-place volume of coal ash is estimated to be approximately 6,000 cubic yards. A stratigraphic cross section through the area of defined coal ash waste is presented on Plate 5.

4.4 Delineation of Affected Groundwater

Based on data obtained during the investigation, the extent of affected groundwater was delineated within the property boundaries. (Semi-volatile) hydrocarbon constituents were encountered in monitoring well MW-3, and appear to be limited to the immediate area containing the coal ash waste. Based on the direction of groundwater flow, downgradient monitoring wells at the property boundary have not been affected. A groundwater contour map showing the depth to groundwater and direction of groundwater flow is presented on Plate 6. Groundwater elevation data collected during the investigation is presented in Table 3.

5.0 FINDINGS AND CONCLUSIONS

Fugro has performed a Remedial Site Investigation at the San Antonio Housing Authority 10 Acre Site located at 1901 South San Marcos Street in San Antonio, Texas. The objective of the investigation was to characterize the presence and extent of semi-volatile hydrocarbon concentrations and other constituents in the soil and shallow groundwater at the site. The hydrocarbon constituents present in the soil and groundwater were derived from coal ash waste deposited at the site.

To accomplish the project objectives, selected soil and groundwater samples were collected at the site for chemical analysis. The following conclusions are based on the data collected during this investigation.

- Chemical analysis of groundwater samples collected from monitoring wells MW-5 and MW-6 identified lead and zinc as priority pollutant metals. The concentrations of lead and zinc detected are below the EPA drinking water standard of 5.0 mg/L.

- Several semi-volatile compounds were detected in the groundwater sample collected from monitoring well MW-3. The compounds detected are polycyclic aromatic hydrocarbons (PAH) typically associated with coal, coal tar, and coal combustion products. Only one of the compounds detected (benzo-[a]-pyrene) has an established standard for drinking water; although standards have been proposed for several other PAH compounds (Federal Register, 1992).

- The analytical results for the groundwater sample obtained from monitor well MW-3 indicate benzo {a} pyrene is present in a concentration above the MCL for the EPA drinking water standard. The constituents found in the water sample are the same as those detected in the coal ash waste and associated materials (clinker and unburned coal).

Based on the analytical data, the groundwater in the vicinity of the coal ash waste appears to have been affected by waste materials deposited on site.

6.0 CLOSURE REQUIREMENTS FOR RISK REDUCTION STANDARD NO. 3

The TNRCC is the state agency with regulatory oversight for pollution prevention and pollution remediation. The Commission has promulgated rules establishing the requirements for site cleanup and/or closure. The rules are found in Subchapter S (30 TAC Sections 335.554 - 335.559) of the regulations for Industrial and Municipal Hazardous Waste. The rules provide the following three alternatives for pollution cleanup and site closure.

(1) The site may be cleaned up by removal of all waste materials and affected media to background levels - Risk Reduction Standard No. 1 (RRS 1).

(2) The site may be cleaned up by removal of all waste materials and removal of impacted media to the extent that any residual levels of contaminants do not exceed media specific concentrations (MSC) which are protective of human health and the environment - Risk Reduction Standard No. 2 (RRS 2).

(3) The migration and exposure to the contaminants may be controlled or remediated by the installation of control measures - Risk Reduction Standard No. 3 (RRS 3).

RRS 3 requires the owner/operator to accomplish certain investigative actions and submit a report to TNRCC prior to initiating clean up activities. The reports and proposed clean up plan must be approved by TNRCC prior to commencement of remedial activities. The required investigative activities include the following:

- A Remedial Site Investigation designed to characterize the nature, extent, volume, and rate of movement of contaminants in environmental media.

- A Baseline Risk Assessment designed to identify all likely exposure pathways of contaminant migration and to predict potential health risks to humans from contaminant concentrations at points of exposure. Additionally, the assessment must include a determination of media-specific clean-up levels for affected environmental media which satisfy acceptable health risks.

- A Corrective Measure Study designed to evaluate the ability of alternative remedial actions to achieve permanent, cost-effective control of environmental impacts in accordance with health-based clean-up standards.

- Implementation of closure or remedy per approved specifications, and the submittal of a final report demonstrating completion in accordance with the approved plan.

After approval of closure by the TNRCC, deed recordation is required. Implementation of post-closure care and controls or future land-use restrictions may also be required if deemed necessary by the TNRCC.

7.0 LIMITATIONS

This report has been prepared to aid San Antonio Housing Authority in assessing the shallow subsurface conditions at the San Antonio Housing Authority 10 Acre Site located at 1901 South San Marcos Street in San Antonio, Texas. This report is prepared for the sole benefit of San Antonio Housing Authority and may not be relied upon by any other person or entity without the written authorization of Fugro, Environmental, Inc.

The subsurface investigation was intended to evaluate general shallow subsurface conditions, and was based on limited and selected sampling locations. Significant variations in the subsurface conditions may be present between hole locations or in areas not investigated. Additional study may be necessary to evaluate the extent and magnitude of the soil and groundwater contamination.

During this RSI, Fugro relied on information from previous environmental reports and current analytical laboratory data to base our conclusions. Fugro has assumed, where reasonable to do so, that the information provided is true and accurate. If information to the contrary is discovered, conclusions and recommendations may need to be re-evaluated.

The conclusions and recommendations presented in this report are based on soil and groundwater conditions and contaminants encountered at the time of our study in the areas that were investigated. Soil and groundwater contaminant levels should be expected to vary with location. The scope of this report is limited to matters expressly covered.

Services performed by Fugro were conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the environmental profession currently practicing under similar conditions. No other warranty, either expressed or implied, is made or intended by our proposal, contract, or reports.