

**SITE ASSESSMENT REPORT and  
REMEDIAL ACTION PLAN  
Countryside Executive Golf Course  
2506 Countryside Boulevard  
Clearwater, Pinellas County, Florida  
HSA Project No. 6015982-00  
December 2005**

**SITE ASSESSMENT REPORT and REMEDIAL ACTION PLAN**  
**Countryside Executive Golf Course**  
**2506 Countryside Boulevard**  
**Clearwater, Pinellas County, Florida**

*Prepared for:*

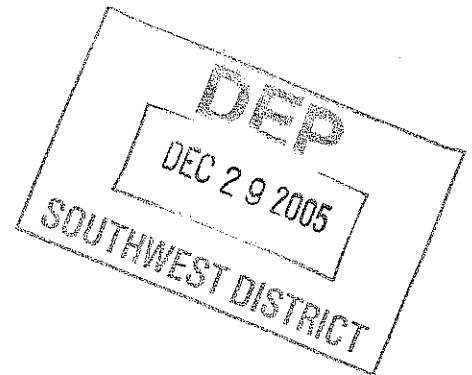
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HSA Project No. 601-5928-00

December 2005






## PROFESSIONAL ENGINEER CERTIFICATION

Site Assessment Report and  
Remedial Action Plan for:

Countryside Executive Golf Course  
Countryside Boulevard  
Clearwater, Pinellas County, Florida  
HSA Project Number: 601-5928-00

In accordance with Chapter 471, Florida Statutes, I hereby certify that, to the best of my knowledge, all engineering plans, specifications, and calculations included herein are in accordance with standard and appropriate engineering practices.

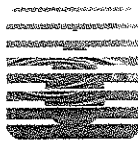
  
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## 1.0 INTRODUCTION

The Countryside Executive Golf Course located in Clearwater, Florida is to be converted to a residential area. The proper application of herbicides and/or pesticides, commonly containing arsenic and selected chlorinated herbicides/pesticides, can result in impacts above default regulatory levels for residential soils, as well as potential impacts to groundwater. Land Assessment Services, Inc. (LAS) and HSA Engineers and Scientists (HSA) conducted site assessment activities to determine the extent of potential impacts. In addition, a remedial action plan was developed to address any detected impacts. Both activities were conducted considering the requirements set forth in Chapter 62-780 Florida Administrative Code (FAC).

Investigations were initiated to assess the horizontal and vertical extent of soil and groundwater impacts, if any. The Site Assessment and Remedial activities were designed to:

1. Identify the contaminant source area(s) and the chemical(s) present at the site based on an understanding of site conditions, and operational history of the subject property;
2. Delineate the degree and extent of contamination;
3. Determine factors affecting contaminant migration patterns in relation to receptors; and
4. Collect data in order to present remedial alternatives and to design a remedial strategy to address any detected impacts.

### 1.1 Site Location

The subject site consists of approximately 44 acres that is currently used as an 18-hole executive golf course. The site is located in Clearwater, Pinellas County, Florida in Section 30 and 31 of Township 28 South, Range 16 East. The physical address is 2506 Countryside Boulevard, Clearwater, Florida. A site location map is given on **Figure 1**.

### 1.2 Land Use

The site is being operated as an 18-hole executive golf course. The site contains an approximately 8,548 square foot (ft<sup>2</sup>) clubhouse with a restaurant and lounge, an asphalt-paved parking lot, a snack pavilion, a golf cart shack, and a golf course maintenance facility. The maintenance facility is located on the northeast side of the property.

Land use surrounding the subject property includes residential development to the west, southwest, south, and southeast. Commercial businesses including CVS Pharmacy, Psychic Reader, and the North Belcher Professional Center are located northwest of the subject site. The Florida Auto Exchange, St. Michael Catholic Church, and Casa Miguel are located north of the



site. Various commercial businesses are located east of the subject site. The Countryside Professional Center and Woodgate Park are located southeast of the subject site. City of Clearwater lift stations are located to the east and south of the subject site.

Two ponds are located at the subject site. The nearest off-site surface water body is a pond in the Village on the Green residential development located approximately 200 feet west of the subject site.

### 1.3 Site History

According to Ms. Cindy Churchward, the property owner's daughter, the subject site was developed for use as a golf course in the mid-1970's. Prior to development, the subject site was reportedly wooded and undeveloped. The subject site has remained a golf course since its development.

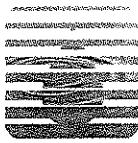
Three Aboveground Storage Tanks (ASTs) are maintained on-site. One 500-gallon diesel AST and one 500-gallon gasoline AST are located to the west of the maintenance facility and one 250-gallon waste oil AST is located to the east of the maintenance facility. A site plan depicting pertinent site features is included as **Figure 2**. Typical operations of the maintenance personnel include maintaining the equipment, grounds keeping, including mowing, and applying pesticides and herbicides. Chemical mixing operations occur on the east side of the maintenance facility in the vicinity of the waste oil AST. Sprayers and other equipment are typically cleaned and washed down on the east side of the maintenance facility. Two sinks, interior and exterior, are affixed to the east wall of the maintenance facility and drain onto the ground.

### 1.4 Well Survey

Four water wells exist at the subject site. Irrigation wells are located on the east side of the maintenance facility and southwest of the clubhouse near the first green. The wells are utilized for on-site irrigation activities. A well location map is included as **Figure 3**.

Two public supply wells are also located at the subject site. The supply wells are maintained by the City of Clearwater and are located at the north and south ends of the property, respectively (see **Figure 3**). In total, four potable wells were identified within ¼ of a mile of the subject site and two irrigation wells were located within ¼ of a mile of the site. Two additional potable wells were identified between ¼ and ½ of a mile of the site. A summary of the well survey data is included as **Table 1** and copies of the well survey reports are included as **Appendix A**.

As mentioned, four wells (two irrigation and two potable) exist on the subject property. The wells are all cased to a depth of at least 90 feet bls and extend more than 250 feet bls. The irrigation wells are located near hole #1 and the maintenance facility, respectively. The potable wells are located at the south end of the site and the northeastern portion of the site, respectively.



## 1.5 Regional Hydrogeology

Groundwater in Pinellas County occurs under both non-artesian and artesian conditions. Non artesian conditions occur in the surficial aquifer. The surficial aquifer primarily consists of permeable units within deposits of Pliocene to Recent age. The lithologic units consist of unconsolidated layers of fine-to medium-grained sand with varying degrees of silt and shell that grade downward into sandy clay or marl with interbedded clay. Surficial aquifer sediments below the Pinellas Ridge area of Pinellas County extend to a depth of less than 10 to 50 feet below grade. The top of the water saturated zone reflects a subdued replica of the surface topography, ranging from near sea level along the coast to approximately 80 feet above sea level in the central portion of the Pinellas Ridge area. The depth to water in the hilly uplands area is encountered from 3 feet below grade up to 10 feet below grade. Flow direction in the area of the site is to the east except near streams where water flows laterally to the channels. Fluctuations in the water table generally are lowest in the dry spring months up through June and recover in the wet summer months to the annual high in September and October. This fluctuation usually varies within a 4-foot range.

Underlying the sands of the surficial aquifer are sandy clays and marls of the Hawthorne Group of middle to early Miocene age. These sandy clays and marls comprise the upper confining unit of the Florida aquifer system. In some areas in northern Pinellas County the sediments of this confining layer are absent and the Floridan system is under water table conditions. Throughout the remainder of the county, these sediments, which range in thickness from less than 25 feet in the northern areas to greater than 150 feet in the southern areas, effectively restrict vertical movement of water between the surficial sands and the underlying Floridan system.

Below this confining unit is a thick sequence of carbonates and evaporites. The upper 1,000 to 2,000 feet comprise the principle potable water bearing aquifer in this region and is known as the Upper Floridan aquifer (UFA). The UFA is composed of a thick, stratified sequence of limestone and dolomite and include, in descending order, hydrologically connected permeable beds of the lower Hawthorn Group, Ocala, Avon Park, and Lake City Limestones. Thickness of the UFA sediments is approximately 1200 feet and is encountered at an approximate depth of 40 to 90 feet below grade in the Pinellas Ridge area. Underlying the Floridan aquifer is the lower confining bed that generally occurs in the Lake City Limestone where persistent intergranular anhydrite and gypsum occur thus restricting the porosity.

The potentiometric surface is relatively flat throughout Pinellas County, and is about 10 feet above sea level in the northeastern and southern parts of the county and about five feet above sea level in the central areas. The potentiometric surface is slightly higher at points in the north-central, west-central, and extreme southern parts of the county. Water moves radially from these high points to the natural discharge areas in the bays and in the Gulf. The average depth to water measured throughout the subject site during this investigation was approximately 3 feet bts. ~~to~~



## 2.0 SUMMARY OF ASSESSMENT ACTIVITIES

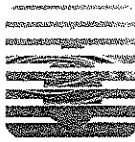
Between August 2004 and September 2005, assessment activities were conducted. Assessment activities were conducted that included soil and groundwater testing completed by either LAS or HSA. A summary of the assessment activities completed to date is presented below.

### 2.1 Initial Site Characterization

#### 2.1.1 Sampling Plan for Initial Site Characterization

The initial site characterization was conducted by LAS in August 2004. The sampling activities included the following:

- Advance four shallow hand auger borings (HA-1 through HA-4) in the vicinity of the two fuel ASTs located west of the maintenance facility to the water table with on-site vapor analysis with an Organic Vapor Analyzer (OVA). Soil sampling locations plans are included as **Figures 4A, 4B, and 4C**.
- Gather ten composite shallow soil samples (CSS-1 through CSS-10) from the maintenance facility area and representative locations throughout the golf course (**Figures 4A, 4B, and 4C**). The samples were composited from land surface to approximately 2 feet below land surface (bls). The samples were submitted to a fixed laboratory for the analysis for the presence of arsenic by Environmental Protection Agency (EPA) Method 6010. pesticides/herbicides
- Install three temporary shallow groundwater monitoring wells with a truck-mounted drill rig to a total depth of 12 feet bls. Temporary wells were constructed with 10-feet of well screen and casing blank to land surface east of the maintenance facility (TW-1), adjacent to the fuel ASTs (TW-2) and northwest of the maintenance facility (TW-3). A summary of monitoring well construction details is included as **Table 2** and monitoring well completion reports are included as **Appendix B**. Groundwater sampling location plans are included as **Figures 5A and 5B**. Groundwater samples from temporary monitoring well TW-1 were gathered for fixed laboratory analysis for the presence of volatile organic compounds (VOCs) by EPA Method 8260, chlorinated pesticides by EPA Method 8081, organophosphorus pesticides by EPA Method 8141, chlorinated herbicides by EPA Method 8151, arsenic by EPA Method 6010, and Petroleum Range Organics (PROs) by EPA Method 8015M. Groundwater samples from temporary monitoring wells TW-2 and TW-3 were gathered for fixed laboratory analysis for the presence of VOCs by EPA Method 8260, Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8310, and PRO by EPA Method 8015M.



### 2.1.2 Results for Initial Site Characterization

The results of the field OVA analysis did not identify elevated readings at any of the locations sampled. Field OVA testing logs are included in **Appendix C**. The results of the arsenic soil sampling conducted throughout the subject site identified levels of arsenic at seven (7) of the ten (10) locations sampled that exceeded the default residential Soil Cleanup Target Levels (SCTLs) per Chapter 62-777 FAC. A summary of initial site characterization data is included in **Table 3**. Complete soil laboratory analytical results are included in **Appendix D**.

The results of the initial groundwater investigation identified the presence of arsenic at temporary monitoring well TW-1 at a concentration of 470 micrograms per liter (ug/L) in excess of its Groundwater Cleanup Target Level (GCTL) of 10 ug/L as established in Chapter 62-777, Florida Administrative Code (FAC). No other target analytes were detected above applicable regulatory levels. A summary of initial groundwater quality analytical results is included in **Table 3**. Completed groundwater sampling data sheets are included as **Appendix E** and complete groundwater laboratory analytical results are included as **Appendix F**.

Based upon the initial site characterization activities, it was apparent that arsenic was the only chemical of concern at the site. Arsenic was identified at elevated levels throughout the subject site in shallow soils and in shallow groundwater. The highest concentrations in soil and groundwater were detected in the vicinity of the maintenance facility.

## 2.2 Additional Arsenic Characterization

From October 2004 through November 2005, additional soil and groundwater assessment activities were performed at the subject site. These assessment activities were conducted to further assess the soil and groundwater arsenic impacts identified during the initial site characterization.

### 2.2.1 Soil Arsenic Characterization

Between October 2004 and November 2005, soil sampling was conducted throughout the subject site to determine the extent of arsenic soil impacts and whether an arsenic soil source area exists.

#### 2.2.1.1 Sampling Plan for Soil Arsenic Characterization

On October 1, and October 4, through October 7, 2004, LAS collected soil samples CSS-11a through CSS-16b and CSS-17a through CSS-41b from soil borings advanced in the northwest portion of the site, from the golf course maintenance area, and representative locations throughout the site. Two samples were collected from each soil boring at two-foot intervals to a depth of four feet bls [0-2 feet bls (labeled "a") and 2-4 feet bls (labeled "b")]. The soil borings were advanced to a depth of four feet bls using a stainless steel hand auger. All soil samples



were analyzed for the presence of arsenic by EPA Method 6010. Soil boring location maps are included as **Figures 4A, 4B, and 4C**.

LAS also collected soil samples P1a through P6h from six proposed stormwater ponds/excavation areas across the site. Eight samples were collected from each boring at two foot intervals (labeled "a" through "h"), down to 16 ft bls using a split-spoon sampler. All soil samples were analyzed for the presence of arsenic by EPA Method 6010 (**Figures 4A, 4B, and 4C**).

On November 15, 2004, and November 16, 2004, LAS collected soil samples CSS-42a through CSS-51b from ten boring locations located west and south of the maintenance facility. Two samples were collected from each soil boring at two-foot intervals to a depth of four feet bls. All of the samples were analyzed for the presence of arsenic by EPA Method 6010 (**Figures 4A, 4B, and 4C**).

HSA collected soil samples from soil borings SS-1 through SS-10. Soil samples SS-1a through SS-10a were collected from land surface to 6 inches bls, SS-1c through SS-10c were collected from 6 inches bls to 2 feet bls, and SS-1e through SS-10e were collected from 2 to 4 feet bls. Initially, all shallow soil samples were analyzed for the presence of arsenic by EPA Method 6010.

#### **2.2.1.2 Results of Soil Arsenic Characterization**

A summary of the arsenic soil analytical results is included as **Table 4**. Complete soil laboratory analytical results are included in **Appendix D**. The arsenic concentrations in on-site soils were highly variable with concentrations ranging from below laboratory reporting limits to 48 mg/kg. The highest concentrations of arsenic were detected in the vicinity of the maintenance facility [CSS-33a (48 mg/kg)] and southeast of the maintenance facility near the cart path [CSS-31a (25 mg/kg), and SS-6a (20.9 mg/kg)].

HSA reviewed all of the existing soil analytical data in order to determine the location of potential "hot spots" or variation in concentrations throughout the site. Based upon this review, it appears that significant variation is present in the sample results that would be expected from historical application of pesticides. Although highly variable between sample depths and over short distances, the analytical data for the entire site does not show significant variability from one portion of the site to another, suggesting that the arsenic impacts are a result of proper and routine herbicide/pesticide application.



## 2.2.2 Groundwater Arsenic Characterization

### 2.2.2.1 Sampling Plan for Groundwater Arsenic Characterization

LAS installed a total of ten additional temporary shallow groundwater monitoring wells TW-4 through TW-13. Temporary monitoring well locations are shown on **Figures 5A and 5B**. A summary of monitoring well construction details is included as **Table 2** and monitoring well construction reports are included in **Appendix C**. Groundwater samples were collected from TW-1 through TW-7 on October 6, 2004, and October 7, 2004 and from TW-1 through TW-5 and TW-8 through TW-13 on November 15, 2005, and November 16, 2005. All of the groundwater samples were analyzed for the presence of arsenic by EPA Method 6010.

On July 5, 2005, HSA personnel oversaw the installation of deep monitoring well DW-1. On August 16, 2005, HSA installed four shallow monitoring wells, MW-1 through MW-4 (**Figure 5A and 5B**). A summary of monitoring well construction details is included as **Table 2** and monitoring well construction reports are included in **Appendix C**. Monitoring well DW-1 was sampled on July 14, August 1, August 26, and November 7, 2005. Monitoring wells MW-1 through MW-4 were sampled following installation on August 26, 2005. Monitoring wells MW-2, MW-3, and MW-4 were also sampled on November 7, 2005. All of the groundwater samples were analyzed for the presence of arsenic by EPA Method 6010 or 6020.

### 2.2.2.2 Results of Groundwater Arsenic Characterization

A summary of the groundwater arsenic analytical data is included as **Table 5**. Complete groundwater laboratory analytical results are included in **Appendix F**. At the fifteen shallow groundwater monitoring wells (TW-1 through TW-13 and MW-1 through MW-4) arsenic was detected above the laboratory reporting limits at all of the wells with the exception of TW-10. The most recent groundwater analytical results reported arsenic concentrations above the Groundwater Cleanup Target Level (GCTL) of 10 ug/L as established in Chapter 62-777, FAC at nine of the seventeen shallow wells sampled.

The highest concentration of arsenic detected at the site was identified in the immediate vicinity of the maintenance facility. The highest concentrations of arsenic in groundwater were detected at monitoring wells TW-5 (540 ug/L) and TW-1 (180 ug/L). Elevated levels of arsenic were also detected at monitoring well MW-2 (130 ug/L) located in the central portion of the site. During the most recent sampling groundwater arsenic concentrations reported for the deep monitoring well DW-1 were below the laboratory reporting limit of 2.8 ug/L.

## 2.3 Assessment Summary

Based on current data, two primary concerns exist at the subject site. First, shallow soil and groundwater arsenic impacts are present in the vicinity of the maintenance facility. Based upon



data gathered from soil and groundwater samples located in the immediate vicinity of the maintenance facility, the arsenic concentrations of 50 mg/kg in soil and 540 ug/L in groundwater appear to be associated with discharges during storage and mixing of arsenic-based herbicides. The location of this potential discharge area is in the vicinity of the herbicide/pesticide storage and mixing areas.

Second, shallow arsenic soil and groundwater impacts are present throughout the site at concentrations exceeding the default GCTL. The concentrations of arsenic in soil exceed the residential and commercial/industrial direct exposure SCTLs as established in Chapter 62-777, FAC. Groundwater concentrations (on average) are slightly above the GCTL of 10 ug/L as established in Chapter 62-777, FAC. Furthermore the groundwater arsenic concentration at monitoring well DW-1 (<2.8 ug/L) is below the GCTL of 10 ug/L suggesting that vertical migration of arsenic impacts is not occurring.

### 3.0 CONCEPTUAL MODEL

Based upon a review of available data regarding soil and groundwater quality at the site, it appears that a surface discharge of arsenic occurred in the vicinity of the maintenance facility. The discharge appears to be a result of the historic mishandling and/or improper disposal of herbicides/pesticides utilized as part of golf course maintenance activities. Upon release, the arsenic impacted shallow soils in the vicinity of the maintenance facility and was transported vertically into the shallow groundwater through rainwater infiltration. In addition, soil and groundwater impacts exist throughout the majority of the subject site that do not appear to be associated with a release, but are likely to be a result of the proper and routine application of pesticides associated with golf course maintenance activities.

HSA's preliminary conceptualized plan for arsenic remediation includes excavation of arsenic-impacted soils in the vicinity of the maintenance facility. Following excavation, groundwater quality in the vicinity of the maintenance facility is expected to improve as a result of excavation activities.

With regard to arsenic impacts throughout the remainder of the site, these impacts appear to be the result of the proper application of herbicides/pesticides. Based on conversations with the Department in Tallahassee, soil impacted by properly applied pesticides is not regulated by the Department. Although not necessarily regulated, it is our understanding that a property owner can voluntarily agree to remediate a site under the authority of the Department in order to receive a No Further Action with Controls from the Department, as would be available under Chapter 62-780 FAC. Based on discussions with the property owner regarding planned use of the subject site, it was apparent that engineering/institutional controls (such as those presented in the Department's *Institutional Controls Procedures Guidance*, dated August 2002) are an option at this site.



The planned future use of the subject site is development of residential townhomes. Because of the widespread nature of the impacts associated with proper chemical application, remediation of on-site soil and groundwater is not practical. Rather, HSA proposes the use of engineering/institutional controls following redevelopment in order to limit the potential for exposure to arsenic impacted groundwater and/or soil on-site.

#### 4.0 REMEDIAL PLAN

In order to resolve the impacts identified beneath the subject site, HSA has developed the following remedial plan.

##### 4.1 Maintenance Facility

As presented above, arsenic-impacted soils exist in the of the maintenance facility located on the subject property. HSA proposes the excavation of the arsenic-impacted soil throughout the maintenance facility area. In order to determine an appropriate remedial target concentration for arsenic soil impacts in the vicinity of the maintenance facility, the 95% Upper Confidence Limit (UCL) in the mean for the area of exposure was calculate in the maintenance area and over the remainder of the subject site using PRO-UCL software. The data sets and results of the calculations are included in **Appendix G**. The results indicated lognormal distributions for both data sets and a 95% UCL of 14.5 mg/kg for the maintenance area and 4.9 mg/kg for the remainder of the site. As such, the target soil concentration for excavation in the vicinity of the maintenance facility will be 4.9 mg/kg. An area approximately 120 feet by 70 feet is recommended for excavation. This soil will be excavated and stockpiled prior to transport for off-site disposal. The proposed extent of excavation is depicted in **Figure 6**. Soil excavation will be completed to the surface of the existing water table (expected to be approximately 3 to 5 feet bls). The goal of the soil removal activities will be to remove arsenic-impacted soil that is associated with a suspected discharge in the vicinity of the maintenance facility. Because surrounding soils are impacted with arsenic as a result of routine herbicide/pesticide application, a target remedial level of 4.9 mg/kg was developed by calculating the 95% UCL for arsenic over the remainder of the site.

##### 4.2 Site-wide Impacts

Based on the historical sampling data, groundwater elevation data, and the recent arsenic soil sampling data, it appears that the presence of arsenic-impacted soil and groundwater beneath the majority of the subject site is a result of routine herbicide/pesticide application in accordance with label recommendations. In general, soil concentrations ranged from below reportable levels to 48 mg/kg across the site. Groundwater arsenic concentrations ranged from below detectable levels to 540 ug/L. As discussed above, the highest concentrations of arsenic in soil and groundwater were detected in the vicinity of the maintenance facility. The highest soil and



groundwater concentrations detected over the remainder of the site were located at soil sample CSS-31 (25 mg/kg) and at monitoring well MW-2 (130 ug/L), respectively.

Although these site-wide impacts do not appear to be a result of a discharge, HSA recommends the voluntary use of engineering/institutional controls to limit the potential for exposure to future on-site residents. This will be accomplished by restricting the use of on-site shallow groundwater following site redevelopment. In addition, as part of the site redevelopment plan, two feet of clean fill material will be placed in all areas that are planned for exposed shallow soils (i.e., common areas, landscaped areas, and yards). **Figure 7** includes a site plan depicting the locations of areas that will be exposed following site redevelopment.

## 5.0 PROPOSED EXCAVATION MONITORING

HSA personnel will oversee all excavation activities and confirm appropriate soil disposal off-site. Limited soil sampling is proposed in the area of the maintenance facility in order to ensure that target remedial levels are met following excavation.

### 5.1 Maintenance Facility

HSA personnel will oversee the excavation activities. Following excavation, confirmatory soil sampling will be conducted in the vicinity of the maintenance facility. Post excavation sampling will include four composite sidewall samples. The composite samples will be collected by gathering up to five aliquots of soil from the sidewall limits of the excavation at varying depths. The soil samples will be submitted to a certified laboratory for analysis for the presence of arsenic by EPA Method 6010 or 6020. Following receipt of analytical data and disposal documentation, a Source Removal Report will be prepared and submitted to the Department.

*Also need Bottom sample*

### 5.2 Site-wide Impacts

As part of the site redevelopment activities, at least two feet of clean fill will be placed in all areas that will be exposed following development. Prior to placement of the fill material, up to twenty representative samples will be gathered for laboratory confirmation analysis. The samples will be gathered directly from delivery vehicles once the soil arrives on-site. The samples will be analyzed for total arsenic by EPA Method 6010 or 6020. Target rehabilitation levels will be the default Residential SCTL of 2.1 mg/kg as set forth in Chapter 62-777, FAC. Once analytical results are received, HSA personnel will monitor the placement of the clean fill material in exposed areas.

It is anticipated that clean fill placement will occur following the majority of site redevelopment activities to prevent any possible mixing of soil. That is, the placement of clean fill will be the final step of the earthmoving process. The areas that will require clean backfill are depicted in **Figure 7**. It is expected that the majority of the roadways will be completed and clean soil will



be placed in unfinished areas to prevent vehicle traffic from causing cross-contamination. HSA will oversee placement of the clean backfill placement in designated areas. The material will be carefully placed so as to avoid mixing with the underlying soil.

As part of the redevelopment plans, several stormwater detention areas will be constructed. At each of these locations (see Figure 7), surface water sampling will be conducted to determine arsenic quality of the surface water. Each surface water sample will be analyzed for the presence of arsenic by EPA Method 6010 or 6020. If the Freshwater Surface Water Criteria (FSWC) of 50 ug/L for arsenic is exceeded at any of the surface water locations, the use of an engineering/institutional control to limit exposure to surface water will be recommended.

The results of the confirmation sampling in the maintenance facility area and documentation of clean fill placement will be included in the Source Removal Report. In addition, a proposal for the specified engineering/institutional controls and locations will also be included.

## 6.0 CONCLUSION

HSA has completed site assessment activities at the Countryside Executive Golf Course in Clearwater, Florida. The results of the assessment identified arsenic soil and groundwater impacts above Regulatory levels throughout the subject site. The highest soil and groundwater arsenic concentrations were identified in the vicinity of the maintenance facility located in the east-central portion of the site. Based upon the relative magnitude of the soil and groundwater impacts and the proximity of these impacts to locations historically utilized for the handling and storage of herbicides/pesticides, it appears that a surface discharge of arsenic occurred in the past. With regard to arsenic soil and impacts located throughout the remainder of the site, these impacts appear to be the result of proper and routine application of herbicides/pesticides and as such do not appear to be regulated under Chapter 62-780, FAC. Nevertheless, the owner wishes to voluntarily agree to remediate this site under the authority of the Department in order to receive a No Further Action with Controls from the Department, as would be available under Chapter 62-780 FAC.

In order to remediate arsenic impacts that were the result of a discharge in the vicinity of the maintenance facility, HSA proposes excavation and off-site disposal of arsenic-impacted soil. Following soil removal activities, associated groundwater impacts are expected to attenuate with time as a result of the cessation of arsenic mass flux from the unsaturated zone.

In order to resolve site-wide arsenic impacts that are a result of proper and routine herbicide/pesticide application, HSA recommends the use of engineering/institutional controls to limit exposure of future on-site residents. Specifically, 2 feet of clean fill will be placed in all areas that will be exposed following site redevelopment and a restriction will be placed on the use of on-site shallow groundwater.



Following completion of soil removal activities and confirmatory site-wide sampling, HSA will prepare a Source Removal Report. The report will include a summary of soil removal activities along with the results of site-wide soil and surface water testing. The Source Removal Report will also specify the types of engineering/institutional controls that will be required to limit future exposure to on-site residents.





## TABLES

<p>Table 1</p> <p>Summary of Potable Well Survey Data</p> <p>Countryside Executive Golf Course, Clearwater, Florida</p> <p>HSA Project Number 6015982-00</p>									
Well ID	Type	Name	ID	Distance	Depth	Casing Depth	Withdrawal	Status	
7	Irrigation	Countryside Golf Course	2	On-site	265	90	20,100	Active	
27	PWS	Clearwater Water System	Production well #58	On-site	276	91	205,000	Active	
26	PWS	Clearwater Water System	Production well #57	On-site	306			Inactive	
1	Irrigation	Countryside Golf Course	1	On-site	281	90	20,100	Active	
19	PWS	Skylark Mobile Home Park		0.21 NE				Active	
10	PWS	Clearwater Water System	Production well #56	0.23 SW	199	88	240,000	Active	
28	PWS	Clearwater Water System	Production well #63	0.32 NW	220	74	210,000	Active	
29	PWS	Clearwater Water System	Production well #64	0.47 NW	297			Plugged	

Notes:

PWS-Public Water Supply

Blank cells indicate no data available

Well ID-as provided in the FirstSearch Technology Corporation Report

Table 2

**Summary of Monitoring Well Construction Details**  
**Countryside Executive Golf Course, Clearwater, Florida**  
**HSA Project Number 6015982-00**

Well ID	Installation Method	Installed By	Total Depth (ft bls)	Screened Interval (ft bls)	Well Diameter (in)	Comments
TW-1	HSA	LAS	11.83	1.83-11.83	2	
TW-2	HSA	LAS	11.84	1.84-11.84	2	Bent
TW-3	HSA	LAS	11.04	1.04-11.04	2	
TW-4	HSA	LAS	11.97	1.97-11.97	2	Bent, could be broken below surface
TW-5	HSA	LAS	11.79	1.79-11.79	2	
TW-6	HSA	LAS	12	2-12	2	
TW-7	HSA	LAS	12.1	2.1-12.1	2	Bent
TW-8	HSA	LAS	12.03	2.03-12.03	2	
TW-9	HSA	LAS	12.14	2.14-12.14	2	Broken at surface, no above surface riser.
TW-10	HSA	LAS	12.05	2.05-12.05	2	Bent
TW-11	HSA	LAS	12.11	2.11-12.11	2	Bent and broken and surface.
TW-12	HSA	LAS	11.93	1.93-11.93	2	Bent, may be broke below surface.
TW-13	HSA	LAS	12.25	2.25-12.25	2	
DW-1	DP	HSA	30	25-30	1	
MW-1	HSA	HSA	12	2-12	2	Broken at surface.
MW-2	HSA	HSA	12	2-12	2	
MW-3	HSA	HSA	15	5-15	2	
MW-4	HSA	HSA	15	5-15	2	

## Notes:

HSA: Hollow stem auger.

ft bl: feet below land surface.

LAS: Land Assessment Services, Inc.

HSA: HSA Engineers and Scientists

in: Inches

**Table 3**  
**Summary of Initial Site Characterization Data**  
**Countryside Executive Golf Course, Clearwater, Florida**  
**HSA Project Number 6015982-00**

EISA Project Number 6015982-00												
Sample ID	Date	Depth (ft bls)	VOC's					Chlorinated Pesticides	Organophosphorus Pesticides	Chlorinated Herbicides	PAH's	Petroleum Range Organics
			Arsenic	Benzene	Ethylbenzene	MTBE	1,1,2-trichloro- 1,2,2- trifluoroethane					
Soil Analytical Data												
HA-1	8/26/2004	2	-	-	-	-	-	-	-	-	-	-
HA-2	8/26/2004	2	-	-	-	-	-	-	-	-	-	-
HA-3	8/26/2004	2	-	-	-	-	-	-	-	-	-	-
HA-4	8/26/2004	2	-	-	-	-	-	-	-	-	-	-
CSS-1	8/26/2004	0-2	2.1	-	-	-	-	-	-	-	-	-
CSS-2	8/26/2004	0-2	1.6	-	-	-	-	-	-	-	-	-
CSS-3	8/26/2004	0-2	1.2	-	-	-	-	-	-	-	-	-
CSS-4	8/26/2004	0-2	8.6	-	-	-	-	-	-	-	-	-
CSS-5	8/26/2004	0-2	3.1	-	-	-	-	-	-	-	-	-
CSS-6	8/26/2004	0-2	2.7	-	-	-	-	-	-	-	-	-
CSS-7	8/26/2004	0-2	9	-	-	-	-	-	-	-	-	-
CSS-8	8/26/2004	0-2	8.3	-	-	-	-	-	-	-	-	-
CSS-9	8/26/2004	0-2	3.2	-	-	-	-	-	-	-	-	-
CSS-10	8/26/2004	0-2	5.1	-	-	-	-	-	-	-	-	-
Groundwater Analytical Data												
TW-1	8/26/2004	0-2	470	<0.2	1.8	<0.2	0.421	ug/L	ug/L	ug/L	ug/L	mg/L
TW-2	8/26/2004	0-2	-	0.401	<0.2	0.431	<0.2	ND	ND	ND	-	0.64
TW-3	8/26/2004	0-2	-	<0.2	1.8	<0.2	0.381	-	-	-	ND	0.81
											ND	0.0661

**Notes:**

- ft bls - feet below land surface
- ppm - parts per million
- OVA - Organic Vapor Analyzer
- mg/kg - milligrams per kilogram
- ug/L - micrograms per liter
- mg/L - milligrams per liter
- VOCs - volatile organic compounds
- PAHs - polycyclic aromatic hydrocarbons
- Compound not analyzed for specific analyte
- NR - No Response
- ND - Not Detected
- I - Analyte detected below quantitation limits
- MTBE - methyl tert-butyl ether
- Bold indicates that the default Residential SCTL of 2.1 mg/kg was exceeded.

**Table 4**  
**Summary of Arsenic Soil Analytical Data**  
**Countryside Executive Golf Course, Clearwater, Florida**  
**HAS Project Number 6015982-00**

Depth (ft)	Sample ID									
	CSS-1	CSS-2	CSS-3	CSS-4	CSS-5	CSS-6	CSS-7	CSS-8	CSS-9	CSS-10
0 - 2.0' (a)	8/26/2004 2.1	8/26/2004 1.6	8/26/2004 1.2	8/26/2004 8.6	8/26/2004 3.1	8/26/2004 2.7	8/26/2004 9.0	8/26/2004 8.3	8/26/2004 3.2	8/26/2004 5.1
Depth (ft)	Sample ID									
	CSS-11	CSS-12	CSS-13	CSS-14	CSS-15	CSS-16	CSS-17	CSS-18	CSS-19	CSS-20
0 - 2.0' (a)	10/4/2004 0.62	10/4/2004 0.9	10/5/2004 1.1	10/5/2004 0.15I	10/5/2004 0.20I	10/5/2004 0.35I	10/5/2004 2.2	10/5/2004 1.0	10/5/2004 1.3	10/1/2004 3.0
2.0' - 4.0' (b)	<0.14	0.35I	0.18I	<0.15	0.94	0.56	3.5	0.72	0.38I	0.44I
Depth (ft)	Sample ID									
	CSS-21	CSS-22	CSS-23	CSS-24	CSS-25	CSS-26	CSS-27	CSS-28	CSS-29	CSS-30
0 - 2.0' (a)	10/5/2004 9.2	10/1/2004 7.2	10/1/2004 1.6	10/1/2004 2.7	10/1/2004 5.9	10/1/2004 7.9	10/1/2004 2.6	10/1/2004 7.2	10/1/2004 9.8	10/1/2004 9.9
2.0' - 4.0' (b)	0.31I	0.69	0.35I	0.45I	3.3	0.23I	1.4	0.30I	0.4I	0.72
Depth (ft)	Sample ID									
	CSS-31	CSS-32	CSS-33	CSS-34	CSS-35	CSS-36	CSS-37	CSS-38	CSS-39	CSS-40
0 - 2' (a)	10/1/2004 25	10/7/2005 3.5	10/7/2005 48	10/7/2005 4.4	10/7/2005 2.8	10/7/2005 1.81	10/7/2005 <0.63	10/7/2005 7.9	10/7/2005 6.8	10/7/2005 13
2' - 4' (b)	0.28I	3.0	<0.8	7.1	5.3	3.9	1.5	1.6I	<0.76	1.5
Depth (ft)	Sample ID									
	CSS-41	CSS-42	CSS-43	CSS-44	CSS-45	CSS-46	CSS-47	CSS-48	CSS-49	CSS-50
0 - 2' (a)	10/7/2005 1.3	11/16/2004 0.29I	11/16/2004 2.3	11/16/2004 1.4	11/16/2004 3.8	11/16/2004 1.4	11/15/2004 1.8	11/15/2004 5.0	11/15/2004 3.5	11/15/2004 3.8
2' - 4' (b)	0.76	0.23I	0.57	0.32I	1.1	3.2	2.4	0.60	0.41I	1.9
Depth (ft)	Sample ID									
	CSS-51	P1	P2	P3	P4	P5	P6			
0 - 2' (a)	11/15/2004 0.80	10/6/2004 <0.72	10/6/2004 <0.63	10/6/2004 <0.76	10/6/2004 <0.90	10/6/2004 <0.75	10/6/2004 0.71I			
2' - 4' (b)	1.7	<0.66	<0.78	<0.67	<0.73	<0.72	<0.73			
4' - 6'		<0.75	<0.75	<0.70	<0.73	<0.71	<0.68			
6' - 8' (d)		<0.65	<0.75	<0.76	<0.74	<0.64	<0.73			
8' - 10' (e)		<0.80	1.1I	<0.72	<0.76	<0.75	<0.68			
10' - 12' (f)		<0.75	<0.78	<0.66	<0.69	<0.66	<0.74			
12' - 14' (g)		<0.75	<0.81	<0.76	<0.67	<0.72	<0.75			
14' - 16' (h)		<0.68	1.2I	<0.67	<0.75	<0.64	<0.70			
Depth (ft)	Sample ID									
	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10
0 - 6" a	7/5/2005 6.15	7/5/2005 17.3	7/5/2005 3.01	7/5/2005 13	7/5/2005 10.8	7/5/2005 20.9	7/5/2005 <0.39I	7/5/2005 4.24	7/5/2005 11.9	7/5/2005 13.1
6" - 2' c	6.26	1.59	<0.396	2.32	1.71	0.588	1.11	0.612	1.74	1.29
2' - 4' e	0.694	1.41	<0.288	5.23	<0.379	0.43	12.7	<0.308	2.2	<0.401

Notes:

ft

feet

mg/kg

units are milligram per kilogram

SCTL

Soil Cleanup Target Level as established in Chapter 62-777, FAC

Bold indicates exceedance of the Residential Direct Exposure SCTL of 2.1 mg/kg

Shade indicates exceedance of the Commercial/Industrial Direct Exposure SCTL of 12 mg/kg

NA=Not Analyzed

BDL=Below Detection Limits

Table 5													
Summary of Arsenic Groundwater Analytical Data													
Countryside Executive Golf Course, Clearwater, Florida													
HSA Project Number 6015982-00													
Type													
TW-1		TW-2		TW-3		TW-4		TW-5		TW-6			
Date	08/27/04	10/07/04	11/16/04	10/06/04	11/15/04	10/06/04	11/15/04	10/07/04	11/16/04	10/07/04	11/16/04	10/07/04	
Arsenic	470	620	180	15	8.2I	100	87	330	540	330	540	8.4	
TW-7		TW-8		TW-9		TW-10		TW-11		TW-12		TW-13	
Date	10/07/04	01/13/05	11/15/04	11/15/04	11/15/04	11/15/04	11/15/04	11/15/04	11/15/04	11/15/04	11/15/04	11/16/04	07/14/05
Arsenic	14	<2.8	3.5I	4.4I	<2.8	13	12	12	12	12	12.4	15.2	<2.8
MW-1		MW-2		MW-3		MW-4							
Date	08/26/05	08/26/05	11/07/05	08/26/05	11/07/05	08/26/05	11/07/05	08/26/05	11/07/05	08/26/05	11/07/05	08/26/05	11/07/05
Arsenic	46.9	119	130	159	5.4	87	<2.8						

Note:

Units given in micrograms per liter (ug/l).

I: Analyte detected below the quantitation limits.

Red indicates result exceeds Groundwater Cleanup Target Level (GCTL) of 10 ug/L as established in Chapter 62-777, Florida Administrative Code

Blue indicates result exceeds Natural Attenuation Default Source Concentration (NADSC) of 100 ug/L as established in Chapter 62-777, FAC.



JOB NO.: 601589200  
 CAD NO.: 589200-01  
 DATE: 11/21/05



4019 E. Fowler Avenue Tampa, Florida 33617

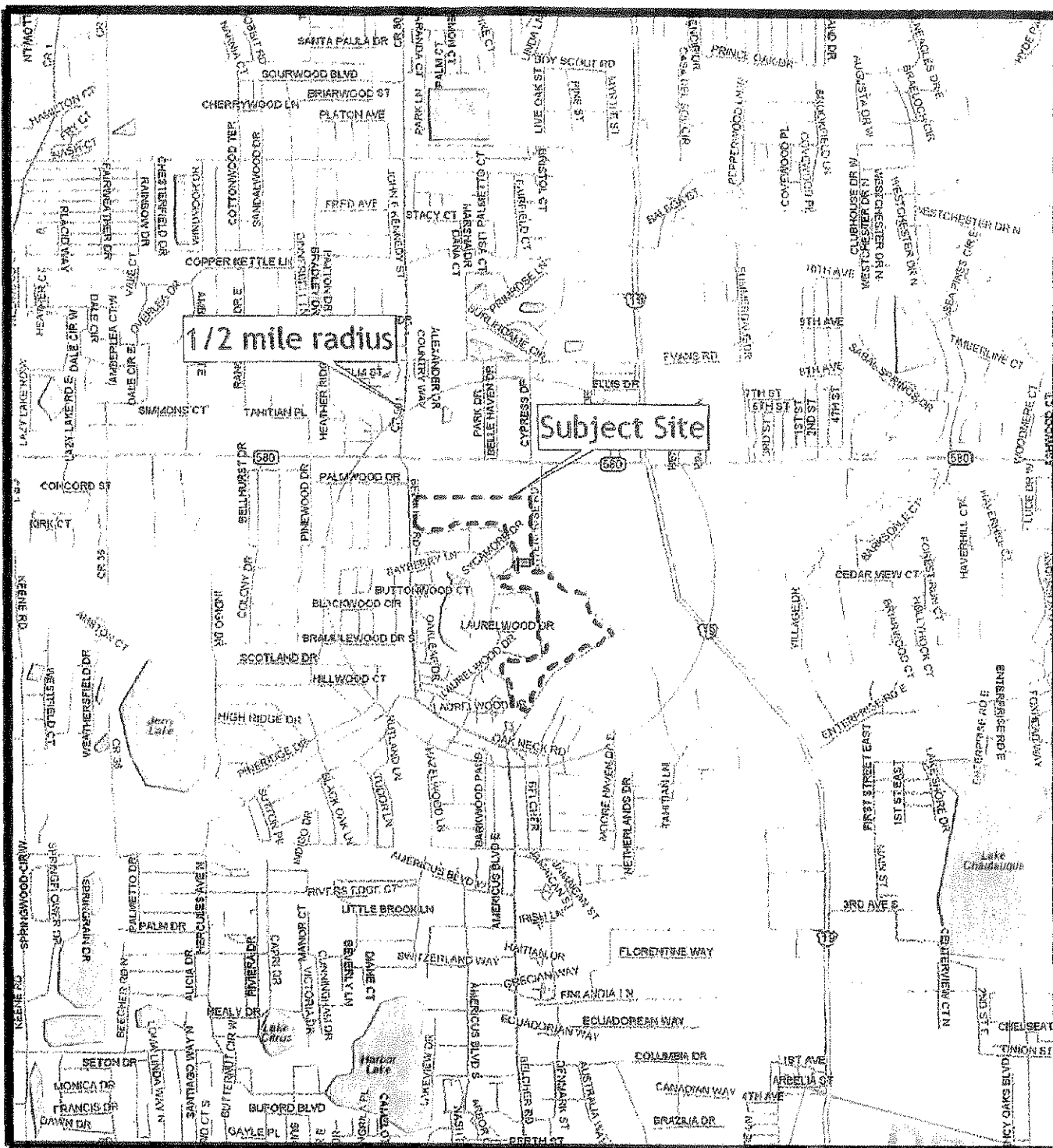
Tel: (813) 971-3882

**COUNTRYSIDE**  
**EXECUTIVE GOLF COURSE**  
 2506 COUNTRYSIDE BOULEVARD  
 CLEARWATER, FLORIDA

SHEET TITLE

SITE LOCATION  
 MAP

FIGURE 1



DEC 29 2005

INVEST DISTRICT

