

## **PART 3: RESPONSIVENESS SUMMARY**

## Part 3: Responsiveness Summary

The Responsiveness Summary serves the dual purpose of: (1) presenting stakeholder concerns about the Site and preferences regarding the Site and the remedial alternatives; and (2) explaining how those stakeholder concerns and preferences are addressed in the preferences factored in to the remedy selection process.

Comments were received from the public during the Public Meeting held on December 7, 2006, at the Sierra Middle School on East Spruce Avenue in Las Cruces, New Mexico. Responses to each comment are provided in the following paragraphs.

**Comment:** I'd like to know why you're going to take 14 years to clean it up?

**Response:** Calculations on the flow of ground water in the Las Cruces area show that about 14 years will be required to extract the contaminated ground water from the aquifer.

**Comment:** My question is the mailings that I've got in the past is drilling wells around different spots has been tested. Well, do all these wells go into the tank there off of I-25? And if so, why has that not been tested? I haven't seen anything on that.

**Response:** The tank referred to in the comment is the Upper Griggs Reservoir. The only well associated with the Griggs and Walnut Ground Water Plume Site that provides water to the Upper Griggs Reservoir is CLC Well No. 21. Other clean wells in the area also supply water to the Upper Griggs Reservoir. The water in the Upper Griggs Reservoir is tested by the City for compliance with the Safe Drinking Water Act.

**Comment:** I wasn't planning on speaking, but, Mr. Williams, would you, for the benefit of the couple of people who this may be their first time here, tell us how did the water become contaminated in the first place and how was it found.

**Response:** The original source of the PCE is uncertain. The data collected from the soil vapor and ground water at the Site suggests that the PCE was released at the ground surface at several locations in the area of the plume and migrated through the unsaturated zone to the ground water. The contamination was originally identified by NMED during the investigation of fuel-related releases associated with Underground Storage Tanks in the area. In routine sampling for the fuel-related constituents, PCE was also detected at some locations. Those detections alerted NMED and EPA to look further into the distribution of PCE.

**Comment:** I want to know when you clean up this water situation, are you going to clean up the

air, too? Because they say with the swamp coolers that we do get contaminated air. Is this possible?

**Response:** The potential for PCE contamination to occur in the air associated with swamp cooler operation was considered in the Remedial Investigation. The ATSDR also evaluated the risk of inhalation of PCE in air from swamp coolers. Because the concentrations in the taps are negligible (nondetectable in tap samples) and the water that is distributed to the homes meet drinking water standards, there is no risk associated with inhalation of water vapor.

The treatment process associated with the selected remedy is air stripping of the contaminated ground water removed from the aquifer. During this treatment process, monitoring to evaluate the magnitude of emissions from the process will be performed. Preliminary calculations indicate any emissions will be negligible, but if the actual measured concentrations are high enough to warrant attention, a component will be added to the system to capture those emissions.

Stakeholder Comments and Lead Agency Responses (see Appendix C for State and Local Concurrence Letters)

Technical and Legal Issues (none)

# APPENDIX A

## RAGS D Tables



**Table A1-1**  
**SELECTION OF EXPOSURE PATHWAYS**  
Griggs and Walnut Ground Water Plume Site

| Scenario<br>Timeframe | Medium      | Exposure<br>Medium              | Exposure<br>Point               | Receptor<br>Population                                                               | Receptor<br>Age | Exposure<br>Route                | Type of<br>Analysis | Rationale for Selection or Exclusion<br>of Exposure Pathway                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------|-------------|---------------------------------|---------------------------------|--------------------------------------------------------------------------------------|-----------------|----------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Current/Future        | Groundwater | Groundwater                     | Tap Water                       | Resident                                                                             | Adult           | Ingestion, Dermal,<br>Inhalation | Qual                | Residents obtain potable water from the municipal water supply. Currently, volatile chemical concentrations are below MCLs due to the municipality's well management program. Radioactivity is naturally-occurring in groundwater above MCLs and is being addressed under the Safe Drinking Water Act. Future concentrations may exceed MCLs if additional wells are installed in the Rio Grande Alluvium or if existing wells become impacted by ground water migration and the well management program is not continued. |
|                       |             |                                 |                                 |                                                                                      | Child           | Ingestion, Dermal,<br>Inhalation | Qual                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                       |             | Indoor Air<br>(Vapor Intrusion) | Indoor Air<br>(Vapor Intrusion) | Resident, Industrial<br>Worker, Recreational<br>Center User, Boxing<br>Facility User | Adult           | Inhalation                       | Quant               | Residents could potentially be exposed to volatile chemicals in groundwater through inhalation of indoor air from soil vapor intrusion.                                                                                                                                                                                                                                                                                                                                                                                    |
|                       |             |                                 |                                 |                                                                                      | Child           | Inhalation                       | Quant               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                       |             |                                 |                                 |                                                                                      | Adult/Child     | Inhalation                       | Quant               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                       |             | Indoor Air (Swamp<br>Cooler)    | Indoor Air (Swamp<br>Cooler)    | Resident                                                                             | Adult           | Inhalation                       | Qual                | Residents use the municipal water supply in swamp coolers. ATSDR quantified this pathway and concluded insignificant risk with current municipal water at the MCLs (ATSDR, 2005). Future concentrations may exceed MCLs if additional wells are installed in the Rio Grande Alluvium or if existing wells become impacted by ground water migration and the well management program is not continued.                                                                                                                      |
|                       |             |                                 |                                 |                                                                                      | Child           | Inhalation                       | Qual                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                       |             | Irrigation Water                | Homegrown Produce               | Resident                                                                             | Adult           | Ingestion                        | Qual                | The municipal water supply is used for irrigating homegrown produce, flower gardens, lawns, and city parks. Volatile chemical concentrations are currently below MCLs, and PCE does not bioaccumulate in plants. Therefore, exposures are insignificant (ATSDR, 2005).                                                                                                                                                                                                                                                     |
|                       |             |                                 |                                 |                                                                                      | Child           | Ingestion                        | Qual                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                       |             | Groundwater                     | Tap Water, Process<br>Water     | Industrial/Commercial<br>Worker                                                      | Adult           | Ingestion, Dermal,<br>Inhalation | Qual                | Industrial and commercial facilities use the municipal water supply for potable and process water. However, volatile chemical concentrations are currently below MCLs. Radioactivity is naturally-occurring in groundwater above MCLs and is being addressed under the Safe Drinking Water Act. Future concentrations may exceed MCLs if additional wells are installed in the Rio Grande Alluvium or if existing wells become impacted by ground water migration and the well management program is not continued.        |

**Note:**

Qual - Qualitative Analysis

Quant - Quantitative Analysis

**Table A1-2.1**  
**OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**  
 Griggs and Walnut Ground Water Plume Site

|                                                                                                            |
|------------------------------------------------------------------------------------------------------------|
| Scenario Timeframe: Current/Future<br>Medium: Groundwater<br>Exposure Medium: Indoor Air (Vapor Intrusion) |
|------------------------------------------------------------------------------------------------------------|

| Exposure Point               | CAS Number | Chemical                  | Minimum Concentration Qualifier | Maximum Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening (1) | Background Value (2) | Screening Toxicity Value (N/C) (3) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or Deletion (4) |
|------------------------------|------------|---------------------------|---------------------------------|---------------------------------|-------|-----------------------------------|---------------------|---------------------------|--------------------------------------|----------------------|------------------------------------|--------------------------|---------------------------|-----------|-----------------------------------------|
| Indoor Air (Vapor Intrusion) |            |                           |                                 |                                 |       |                                   |                     |                           |                                      |                      |                                    |                          |                           |           |                                         |
| Property A                   | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 34                              | 460                             | ppbv  | Property A - South                | 9 / 9               | 10 - 10                   | 460                                  | NA                   | 120 C                              | NA                       | --                        | Yes       | ASL                                     |
| Property B                   | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 25                              | 644                             | ppbv  | Property B - East                 | 8 / 8               | 10 - 10                   | 644                                  | NA                   | 120 C                              | NA                       | --                        | Yes       | ASL                                     |
| Property C                   | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 165                             | 578                             | ppbv  | Property C - North                | 7 / 7               | 10 - 20                   | 578                                  | NA                   | 120 C                              | NA                       | --                        | Yes       | ASL                                     |
| Property D                   | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 107                             | 443                             | ppbv  | Property D - West                 | 8 / 8               | 10 - 10                   | 443                                  | NA                   | 120 C                              | NA                       | --                        | Yes       | ASL                                     |
| Property E                   | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 57                              | 248                             | ppbv  | Property E - East and South       | 8 / 8               | 10 - 10                   | 248                                  | NA                   | 120 C                              | NA                       | --                        | Yes       | ASL                                     |
| Property F                   | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 84                              | 411                             | ppbv  | Property F - West                 | 4 / 4               | 10 - 10                   | 411                                  | NA                   | 120 C                              | NA                       | --                        | Yes       | ASL                                     |
| Property G                   | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 126                             | 228                             | ppbv  | Property G - South                | 3 / 3               | 10 - 10                   | 228                                  | NA                   | 120 C                              | NA                       | --                        | Yes       | ASL                                     |

(1) Maximum concentration is used for screening.

(2) Background level is not available

(3) EPA draft generic screening levels for deep soil vapor concentration for indoor air vapor intrusion, based on a residential scenario, a target excess lifetime cancer risk (ELCR) of  $1 \times 10^{-6}$  (EPA, 2002).

(4) Rationale Codes

Selection Reason: Above Screening Level (ASL)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/  
To Be Considered

C = Carcinogenic

NA = Not available

ppbv = parts per billion by volume

Table A1-2.2  
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Indoor Air (Vapor Intrusion)

| Exposure Point                                      | CAS Number | Chemical                  | Minimum Concentration Qualifier | Maximum Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening (1) | Background Value (2) | Screening Toxicity Value (N/C) (3) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or Deletion (4) |
|-----------------------------------------------------|------------|---------------------------|---------------------------------|---------------------------------|-------|-----------------------------------|---------------------|---------------------------|--------------------------------------|----------------------|------------------------------------|--------------------------|---------------------------|-----------|-----------------------------------------|
| Indoor Air (Vapor Intrusion)<br>PAL Boxing Facility | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 29                              | 206                             | ppbv  | Boxing Fac. W                     | 8 / 8               | 10 - 10                   | 206                                  | NA                   | 120 C                              | NA                       | --                        | Yes       | ASL                                     |

- (1) Maximum concentration is used for screening.  
(2) Background level is not available  
(3) EPA draft generic screening levels for deep soil vapor concentration for indoor air vapor intrusion, based on a residential scenario, a target excess lifetime cancer risk (ELCR) of  $1 \times 10^{-6}$  (EPA, 2002).  
(4) Rationale Codes  
Selection Reason: Above Screening Level (ASL)

COPC = Chemical of Potential Concern  
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/  
To Be Considered  
  
C = Carcinogenic  
NA = Not available  
ppbv = parts per billion by volume

### Table A1-2.3

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Indoor Air (Vapor Intrusion)

| Exposure Point                                                  | CAS Number | Chemical                  | Minimum Concentration Qualifier | Maximum Concentration Qualifier | Units | Location of Maximum Concentration             | Detection Frequency | Range of Detection Limits | Concentration Used for Screening (1) | Background Value (2) | Screening Toxicity Value (N/C) (3) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or Deletion (4) |
|-----------------------------------------------------------------|------------|---------------------------|---------------------------------|---------------------------------|-------|-----------------------------------------------|---------------------|---------------------------|--------------------------------------|----------------------|------------------------------------|--------------------------|---------------------------|-----------|-----------------------------------------|
| Indoor Air (Vapor Intrusion)<br>Meerscheidt Recreational Center | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 21 X                            | 21 X                            | ppbv  | Meerscheidt N, Meerscheidt SE, Meerscheidt So | 3 / 6               | 10 - 10                   | 21                                   | NA                   | 120 C                              | NA                       | --                        | No        | BSL                                     |

- |     |                                                                                                                                                                                                                   |                                                     |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| (1) | Maximum concentration is used for screening.                                                                                                                                                                      | Qualifier: X=Biased high due to matrix interference |
| (2) | Background level is not available                                                                                                                                                                                 |                                                     |
| (3) | EPA draft generic screening levels for deep soil vapor concentration for indoor air vapor intrusion, based on a residential scenario, a target excess lifetime cancer risk (ELCR) of $1 \times 10^6$ (EPA, 2002). |                                                     |
| (4) | Rationale Codes                                                                                                                                                                                                   | Deletion Reason: Below Screening Level (BSL)        |

COPC = Chemical of Potential Concern  
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/  
To Be Considered

C = Carcinogenic  
NA = Not available  
ppbv = parts per billion by volume

**Table A1-2.4**  
**OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**  
 Griggs and Walnut Ground Water Plume Site

|                                    |
|------------------------------------|
| Scenario Timeframe: Current/Future |
| Medium: Groundwater                |
| Exposure Medium: Groundwater       |

| Exposure Point                                                                                                                | CAS Number | Chemical                  | Minimum Concentration Qualifier | Maximum Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening (1) | Background Value (2) | Screening Toxicity Value (N/C) (3) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or Deletion (4) |
|-------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------|---------------------------------|---------------------------------|-------|-----------------------------------|---------------------|---------------------------|--------------------------------------|----------------------|------------------------------------|--------------------------|---------------------------|-----------|-----------------------------------------|
| Tap Water<br>(Upper Griggs Reservoir [UGRES] and CLC Wells excluding CLC Wells blended in the UGRES and CLC Wells 18 and 19). | 12587-46-1 | ALPHA, GROSS              | 2.2                             | 21.1                            | pCi/L | CLC20                             | 14 / 15             | 1 - 1                     | 21.1                                 | NA                   | 15 MCL                             | NA                       | --                        | No        | RAD                                     |
|                                                                                                                               | 7440-61-1  | URANIUM, TOTAL            | 1                               | 132                             | UG/L  | CLC24                             | 65 / 66             | 1 - 1                     | 132                                  | NA                   | 30 MCL                             | NA                       | --                        | No        | RAD                                     |
|                                                                                                                               | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 0.67                            | 3.2                             | UG/L  | UGRES                             | 46 / 62             | 0.5 - 0.5                 | 3.2                                  | NA                   | 5 MCL                              | NA                       | --                        | No        | BSL                                     |
|                                                                                                                               | 79-01-6    | TRICHLOROETHYLENE (TCE)   | 0.1 L,J                         | 0.1 L,J                         | UG/L  | CLC24                             | 1 / 1               | 0.5 - 0.5                 | 0.1                                  | NA                   | 5 MCL                              | NA                       | --                        | No        | BSL                                     |

(1) Maximum concentration is used for screening.

Qualifier: L,J = Result is between the MDL and the CRQL and is estimated because of outlying quality control parameters.

COPC = Chemical of Potential Concern

(2) Background level is not available

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/

(3) Federal Maximum Contaminant Levels (EPA, 2002).

To Be Considered

(4) Rationale Codes

Deletion Reason: Below Screening Level (BSL)

MCL = Maximum Contaminant Level

Naturally-occurring radioactive chemicals will be addressed under the Safe Drinking Water Act (RAD).

NA = Not available

**Table A1-2.5**  
**OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**  
 Griggs and Walnut Ground Water Plume Site

|                                                                                           |
|-------------------------------------------------------------------------------------------|
| Scenario Timeframe: Current/Future<br>Medium: Groundwater<br>Exposure Medium: Groundwater |
|-------------------------------------------------------------------------------------------|

| Exposure Point                       | CAS Number | Chemical           | Minimum Concentration Qualifier | Maximum Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening (1) | Background Value (2) | Screening Toxicity Value (N/C) (3) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or Deletion (4) |
|--------------------------------------|------------|--------------------|---------------------------------|---------------------------------|-------|-----------------------------------|---------------------|---------------------------|--------------------------------------|----------------------|------------------------------------|--------------------------|---------------------------|-----------|-----------------------------------------|
| Tap Water<br>Private Well (LRG-3139) | 107-06-2   | 1,2-DICHLOROETHANE | 1.1                             | 1.1                             | UG/L  | LRG-3191                          | 1 / 2               | 0.5 - 0.5                 | 1.1                                  | NA                   | 5 MCL                              | NA                       | --                        | No        | BSL                                     |

- (1) Maximum concentration is used for screening.  
 (2) Background level is not available  
 (3) Federal Maximum Contaminant Levels (EPA, 2002).  
 (4) Rationale Codes

Deletion Reason: Below Screening Level (BSL)

COPC = Chemical of Potential Concern  
 ARAR/TBC = Applicable or Relevant and Appropriate Requirement/  
 To Be Considered

MCL = Maximum Contaminant Level  
 NA = Not available

**Table A1-2.6**  
**OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**  
Griggs and Walnut Ground Water Plume Site

|                                                                                           |
|-------------------------------------------------------------------------------------------|
| Scenario Timeframe: Current/Future<br>Medium: Groundwater<br>Exposure Medium: Groundwater |
|-------------------------------------------------------------------------------------------|

| Exposure Point                                                                     | CAS Number | Chemical                  | Minimum Concentration Qualifier | Maximum Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening (1) | Background Value (2) | Screening Toxicity Value (N/C) (3) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or Deletion (4) |
|------------------------------------------------------------------------------------|------------|---------------------------|---------------------------------|---------------------------------|-------|-----------------------------------|---------------------|---------------------------|--------------------------------------|----------------------|------------------------------------|--------------------------|---------------------------|-----------|-----------------------------------------|
| 5 Wells blended into the Upper Griggs Reservoir (CLC Wells 10, 21, 29, 32, and 60) | 12587-46-1 | ALPHA, GROSS              | 2.4                             | 5.6                             | pCi/L | CLC21                             | 4 / 4               | 1 - 1                     | 5.6                                  | NA                   | 15 MCL                             | NA                       | --                        | No        | BSL, RAD                                |
|                                                                                    | 7440-61-1  | URANIUM, TOTAL            | 3                               | 50                              | UG/L  | CLC10                             | 28 / 28             | 1 - 1                     | 50                                   | NA                   | 30 MCL                             | NA                       | --                        | No        | RAD                                     |
|                                                                                    | 1634-04-4  | tert-BUTYL METHYL ETHER   | 0.38 L,J                        | 0.38 L,J                        | UG/L  | CLC21                             | 1 / 5               | 0.5 - 0.5                 | 0.38                                 | NA                   | 6.2 C/R6                           | NA                       | --                        | No        | BSL                                     |
|                                                                                    | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 1.61                            | 4.9                             | UG/L  | CLC21                             | 28 / 36             | 0.5 - 0.5                 | 4.9                                  | NA                   | 5 MCL                              | NA                       | --                        | No        | BSL                                     |

(1) Maximum concentration is used for screening.

Qualifier: L,J = Result is between the MDL and the CRQL and is estimated because of outlying quality control parameters.

COPC = Chemical of Potential Concern

(2) Background level is not available

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/  
To Be Considered

(3) Federal Maximum Contaminant Levels (EPA, 2002).

EPA Region 6 MSSL (Tap Water) (EPA R6, 2005).

(4) Rationale Codes

Deletion Reason: Below Screening Level (BSL)

Naturally-occurring radioactive chemicals will be addressed under the Safe Drinking Water Act (RAD).

MCL = Maximum Contaminant Level

C = Carcinogenic

NA = Not available

**Table A1-2.7**  
**OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**  
 Griggs and Walnut Ground Water Plume Site

|                                                                                           |
|-------------------------------------------------------------------------------------------|
| Scenario Timeframe: Current/Future<br>Medium: Groundwater<br>Exposure Medium: Groundwater |
|-------------------------------------------------------------------------------------------|

| Exposure Point      | CAS Number | Chemical                  | Minimum Concentration Qualifier | Maximum Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening (1) | Background Value (2) | Screening Toxicity Value (N/C) (3) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or Deletion (4) |
|---------------------|------------|---------------------------|---------------------------------|---------------------------------|-------|-----------------------------------|---------------------|---------------------------|--------------------------------------|----------------------|------------------------------------|--------------------------|---------------------------|-----------|-----------------------------------------|
| CLC Wells 18 and 19 | 12587-46-1 | ALPHA, GROSS              | 10.8                            | 10.8                            | pCi/L | CLC19                             | 1 / 1               | 1 - 1                     | 10.8                                 | NA                   | 15 MCL                             | NA                       | --                        | No        | BSL, RAD                                |
|                     | 7440-61-1  | URANIUM, TOTAL            | 51                              | 54                              | UG/L  | CLC19                             | 2 / 2               | 1 - 1                     | 54                                   | NA                   | 30 MCL                             | NA                       | --                        | No        | RAD                                     |
|                     | 127-18-4   | TETRACHLOROETHYLENE (PCE) | 2                               | 45                              | UG/L  | CLC18                             | 19 / 20             | 0.5 - 1.3                 | 45                                   | NA                   | 5 MCL                              | NA                       | --                        | Yes       | ASL                                     |
|                     | 79-01-6    | TRICHLOROETHYLENE (TCE)   | 0.63 L,J                        | 0.63 L,J                        | UG/L  | CLC18                             | 1 / 1               | 1.3 - 1.3                 | 0.63                                 | NA                   | 5 MCL                              | NA                       | --                        | No        | BSL                                     |

(1) Maximum concentration is used for screening.

Qualifier: L,J = Result is between the MDL and the CRQL and is estimated because of outlying quality control parameters.

COPC = Chemical of Potential Concern

(2) Background level is not available

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/

(3) Federal Maximum Contaminant Levels (EPA, 2002).

To Be Considered

(4) Rationale Codes

Selection Reason: Above Screening Level (ASL)

MCL = Maximum Contaminant Level

Deletion Reason: Below Screening Level (BSL)

NA = Not available

Naturally-occurring radioactive chemicals will be addressed under the Safe Drinking Water Act (RAD).



**Table A1-2.8**  
**OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater

| Exposure Point      | CAS Number | Chemical                            | Minimum Concentration Qualifier | Maximum Concentration Qualifier (1) | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration Used for Screening (1) | Background Value (2) | Screening Toxicity Value (N/C) (3) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or Deletion (4) |
|---------------------|------------|-------------------------------------|---------------------------------|-------------------------------------|-------|-----------------------------------|---------------------|---------------------------|--------------------------------------|----------------------|------------------------------------|--------------------------|---------------------------|-----------|-----------------------------------------|
| Rio Grande Alluvium | 75-35-4    | 1,1-DICHLOROETHENE                  | 0.1 L,J                         | 0.1 L,J                             | UG/L  | GWMW06                            | 1 / 79              | 0.0749 - 2.5              | 0.1                                  | NA                   | 7 MCL                              | NA                       | --                        | No        | FOD, BSL                                |
|                     | 95-63-6    | 1,2,4-TRIMETHYLBENZENE              | 0.12 J                          | 0.27 J                              | UG/L  | GWMW11                            | 2 / 2               | 0.0461 - 0.0461           | 0.27                                 | NA                   | 12 N/R6                            | NA                       | --                        | No        | BSL                                     |
|                     | 107-06-2   | 1,2-DICHLOROETHANE                  | 0.1 L,J                         | 1.7                                 | UG/L  | MW-1                              | 3 / 79              | 0.0866 - 2.5              | 1.7                                  | NA                   | 5 MCL                              | NA                       | --                        | No        | FOD, BSL                                |
|                     | 108-67-8   | 1,3,5-TRIMETHYLBENZENE (MESITYLENE) | 0.06 J                          | 0.06 J                              | UG/L  | GWMW11                            | 1 / 2               | 0.0595 - 0.0595           | 0.06                                 | NA                   | 12 N/R6                            | NA                       | --                        | No        | BSL                                     |
|                     | 67-64-1    | ACETONE                             | 1.49                            | 48 B                                | UG/L  | GWMW06                            | 3 / 79              | 0.471 - 25                | 48                                   | NA                   | 5,475 N/R6                         | NA                       | --                        | No        | FOD, BSL                                |
|                     | 71-43-2    | BENZENE                             | 0.12 L,J                        | 22 J                                | UG/L  | MW-1                              | 44 / 79             | 0.0622 - 2.5              | 22                                   | NA                   | 5 MCL                              | NA                       | --                        | Yes       | ASL                                     |
|                     | 75-25-2    | BROMOFORM                           | 0.59                            | 23 J,v                              | UG/L  | GWMW04                            | 42 / 79             | 0.0832 - 2.5              | 23                                   | NA                   | 80 MCL                             | NA                       | --                        | No        | BSL                                     |
|                     | 7440-70-2  | CALCIUM                             | 12.7                            | 194                                 | mg/L  | MW-SF1                            | 11 / 11             | 0.2 - 0.2                 | 194                                  | NA                   | NA                                 | NA                       | --                        | No        | NUT                                     |
|                     | 75-15-0    | CARBON DISULFIDE                    | 0.24 L,J                        | 0.44 L,J                            | UG/L  | GWMW09                            | 2 / 77              | 0.5 - 2.5                 | 0.44                                 | NA                   | 1,043 N/R6                         | NA                       | --                        | No        | FOD, BSL                                |
|                     | 67-66-3    | CHLOROFORM                          | 0.87 J                          | 11 J,v                              | UG/L  | GWMW03                            | 16 / 79             | 0.0871 - 2.5              | 11                                   | NA                   | 80 MCL                             | NA                       | --                        | No        | BSL                                     |
|                     | 74-87-3    | CHLOROMETHANE                       | 0.15 L,J                        | 0.15 L,J                            | UG/L  | GWMW11                            | 1 / 79              | 0.0406 - 2.5              | 0.15                                 | NA                   | 2.1 C/R6                           | NA                       | --                        | No        | FOD, BSL                                |
|                     | 156-59-2   | cis-1,2-DICHLOROETHYLENE            | 0.1 L,J                         | 0.21 L,J                            | UG/L  | GWMW01                            | 3 / 79              | 0.0575 - 2.5              | 0.21                                 | NA                   | 70 MCL                             | NA                       | --                        | No        | FOD, BSL                                |
|                     | 10061-01-5 | cis-1,3-DICHLOROPROPENE             | 0.41 L,J                        | 0.41 L,J                            | UG/L  | GWMW03                            | 1 / 79              | 0.0703 - 2.5              | 0.41                                 | NA                   | 0.40 C/R6                          | NA                       | --                        | No        | FOD                                     |
|                     | 110-82-7   | CYCLOHEXANE                         | 0.11 L,J                        | 0.59                                | UG/L  | MW-1                              | 13 / 77             | 0.5 - 2.5                 | 0.59                                 | NA                   | 12,514 N/R6                        | NA                       | --                        | No        | BSL                                     |
|                     | 75-71-8    | DICHLORODIFLUOROMETHANE             | 0.1 L,J                         | 1.5 J                               | UG/L  | MW-SF10                           | 9 / 79              | 0.0536 - 2.5              | 1.5                                  | NA                   | 395 N/R6                           | NA                       | --                        | No        | BSL                                     |
|                     | 100-41-4   | ETHYLBENZENE                        | 0.11 L,J                        | 1.2 J                               | UG/L  | MW-1                              | 2 / 79              | 0.0558 - 2.5              | 1.2                                  | NA                   | 700 MCL                            | NA                       | --                        | No        | FOD, BSL                                |
|                     | 98-82-8    | ISOPROPYLBENZENE (CUMENE)           | 0.25 L,J                        | 0.25 L,J                            | UG/L  | MW-1                              | 1 / 79              | 0.0495 - 2.5              | 0.25                                 | NA                   | 658 N/R6                           | NA                       | --                        | No        | FOD, BSL                                |
|                     | 7439-95-4  | MAGNESIUM                           | 7.09                            | 43                                  | mg/L  | GWMW01                            | 9 / 11              | 0.05 - 0.05               | 43                                   | NA                   | NA                                 | NA                       | --                        | No        | NUT                                     |
|                     | 78-93-3    | METHYL ETHYL KETONE (2-BUTANONE)    | 1 L,J                           | 23                                  | UG/L  | GWMW06                            | 15 / 79             | 0.286 - 25                | 23                                   | NA                   | 7,065 N/R6                         | NA                       | --                        | No        | BSL                                     |
|                     | 95-47-6    | O-XYLENE (1,2-DIMETHYLBENZENE)      | 0.07 J                          | 0.07 J                              | UG/L  | GWMW11                            | 1 / 2               | 0.0603 - 0.0603           | 0.07                                 | NA                   | 10,000 MCL                         | NA                       | --                        | No        | BSL                                     |
|                     | 1634-04-4  | tert-BUTYL METHYL ETHER             | 0.12 L,J                        | 130 J,^                             | UG/L  | GWMW08                            | 6 / 79              | 0.057 - 5                 | 130                                  | NA                   | 6.2 C/R6                           | NA                       | --                        | Yes       | ASL                                     |
|                     | 127-18-4   | TETRACHLOROETHYLENE(PCE)            | 0.09 J                          | 25                                  | UG/L  | MW-SF1                            | 53 / 79             | 0.0771 - 2.5              | 25                                   | NA                   | 5 MCL                              | NA                       | --                        | Yes       | ASL                                     |
|                     | 108-88-3   | TOLUENE                             | 0.22 J                          | 95 J                                | UG/L  | GWMW09                            | 49 / 79             | 0.0566 - 4.2              | 95                                   | NA                   | 1,000 MCL                          | NA                       | --                        | No        | BSL                                     |
|                     | 156-60-5   | trans-1,2-DICHLOROETHENE            | 0.17 L,J                        | 0.17 L,J                            | UG/L  | GWMW10                            | 1 / 79              | 0.0726 - 2.5              | 0.17                                 | NA                   | 100 MCL                            | NA                       | --                        | No        | FOD, BSL                                |
|                     | 79-01-6    | TRICHLOROETHYLENE (TCE)             | 0.13 L,J                        | 2.8                                 | UG/L  | GWMW01                            | 25 / 79             | 0.0714 - 2.5              | 2.8                                  | NA                   | 5 MCL                              | NA                       | --                        | No        | BSL                                     |
|                     | 75-69-4    | TRICHLOROFLUOROMETHANE              | 0.14 L,J                        | 0.17 L,J                            | UG/L  | MW-3                              | 2 / 79              | 0.0648 - 2.5              | 0.17                                 | NA                   | 1,288 N/R6                         | NA                       | --                        | No        | FOD, BSL                                |
|                     | 1330-20-7  | XYLENES, TOTAL                      | 0.15 L,J                        | 0.21 L,J                            | UG/L  | GWMW07                            | 2 / 77              | 0.5 - 2.5                 | 0.21                                 | NA                   | 10,000 MCL                         | NA                       | --                        | No        | FOD, BSL                                |

(1) Maximum concentration is used for screening.

Qualifier: B = Indicates that this result may be biased high because of laboratory or field contamination.

J = Estimated. This qualifier indicates that the analyte was detected, but the reported concentration should be considered estimated.

J,^ = Indicates that this result is an estimated concentration and may be biased high due to QA/QC issues. Actual concentration may be lower than the concentration reported.

J,v = Indicates that this result is an estimated concentration and may be biased low due to QA/QC issues. Actual concentration may be higher than the concentration reported.

L,J = Indicates that the reported concentration is below the CRQL and should be considered an estimated value.

(2) Background level is not available

(3) Federal Maximum Contaminant Levels (MCL; EPA, 2002).

When MCL is not available, EPA Region 6 Medium-Specific Screening Levels (MSSL) for Tap Water adjusted by HQ=1 (EPA R6, 2005) is used.

(4) Rationale Codes

Selection Reason: Above Screening Level (ASL)

Deletion Reason: Below Screening Level (BSL)

Essential Nutrient (NUT)

Frequency of Detection (FOD)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

MCL = Maximum Contaminant Level

NA = Not available

R6 = EPA Region 6 MSSL

C = Carcinogenic

N = Non-Carcinogenic

**Table A1-3.1 RME**  
**MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY**  
 Griggs and Walnut Ground Water Plume Site

|                                               |
|-----------------------------------------------|
| Scenario Timeframe: Current/Future            |
| Medium: Groundwater                           |
| Exposure Medium: Indoor Air (Vapor Intrusion) |

| Exposure Point               | Chemical<br>of<br>Potential<br>Concern | Units | Arithmetic<br>Mean | 95% UCL<br>(N/T/NP/G) | Maximum<br>Concentration<br>(Qualifier) | Exposure Point Concentration |       |           |           |
|------------------------------|----------------------------------------|-------|--------------------|-----------------------|-----------------------------------------|------------------------------|-------|-----------|-----------|
|                              |                                        |       |                    |                       |                                         | Value                        | Units | Statistic | Rationale |
| Indoor Air (Vapor Intrusion) |                                        |       |                    |                       |                                         |                              |       |           |           |
| Property A                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 157                | --                    | 460 =                                   | 460                          | ppbv  | Maximum   | (1)       |
| Property B                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 236                | --                    | 644 =                                   | 644                          | ppbv  | Maximum   | (1)       |
| Property C                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 313                | --                    | 578 =                                   | 578                          | ppbv  | Maximum   | (1)       |
| Property D                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 207                | --                    | 443 =                                   | 443                          | ppbv  | Maximum   | (1)       |
| Property E                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 167                | --                    | 248 =                                   | 248                          | ppbv  | Maximum   | (1)       |
| Property F                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 282                | --                    | 411 =                                   | 411                          | ppbv  | Maximum   | (1)       |
| Property G                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 174                | --                    | 228 =                                   | 228                          | ppbv  | Maximum   | (1)       |
| PAL Boxing Facility          | TETRACHLOROETHYLENE (PCE)              | ppbv  | 88.9               | --                    | 206 =                                   | 206                          | ppbv  | Maximum   | (1)       |

(1) Maximum detected concentration was used as the Upper-Bound Case EPC.

ppbv = parts per billion by volume

**Table A1-3.1 CTE**  
**MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY**  
 Griggs and Walnut Ground Water Plume Site

|                                                                                                            |
|------------------------------------------------------------------------------------------------------------|
| Scenario Timeframe: Current/Future<br>Medium: Groundwater<br>Exposure Medium: Indoor Air (Vapor Intrusion) |
|------------------------------------------------------------------------------------------------------------|

| Exposure Point               | Chemical<br>of<br>Potential<br>Concern | Units | Arithmetic<br>Mean | 95% UCL<br>(N/T/NP/G) | Maximum<br>Concentration<br>(Qualifier) | Exposure Point Concentration |       |           |           |
|------------------------------|----------------------------------------|-------|--------------------|-----------------------|-----------------------------------------|------------------------------|-------|-----------|-----------|
|                              |                                        |       |                    |                       |                                         | Value                        | Units | Statistic | Rationale |
| Indoor Air (Vapor Intrusion) |                                        |       |                    |                       |                                         |                              |       |           |           |
| Property A                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 157                | --                    | 460 =                                   | 157                          | ppbv  | Mean      | (1)       |
| Property B                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 236                | --                    | 644 =                                   | 236                          | ppbv  | Mean      | (1)       |
| Property C                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 313                | --                    | 578 =                                   | 313                          | ppbv  | Mean      | (1)       |
| Property D                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 207                | --                    | 443 =                                   | 207                          | ppbv  | Mean      | (1)       |
| Property E                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 167                | --                    | 248 =                                   | 167                          | ppbv  | Mean      | (1)       |
| Property F                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 282                | --                    | 411 =                                   | 282                          | ppbv  | Mean      | (1)       |
| Property G                   | TETRACHLOROETHYLENE (PCE)              | ppbv  | 174                | --                    | 228 =                                   | 174                          | ppbv  | Mean      | (1)       |

(1) Average concentration was used as the EPC.

ppbv = parts per billion by volume

**Table A1-3 - Supplement A**  
**Parameters Used in the Johnson and Ettinger Model, Residential Land Use**  
*Griggs and Walnut Groundwater Plume Site*  
*Las Cruces, NM*

| Symbol       | Parameter                                           | Description                                                                                                                                                                                            | Selected Value | Units                            | Sources                                                                                                        |
|--------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------|----------------------------------------------------------------------------------------------------------------|
| $T_s$        | Average Soil Temperature                            |                                                                                                                                                                                                        | 20             | °C                               | Based on Figure 8 from the User's Guide (USEPA, 2004)                                                          |
| $L_F$        | Depth Below Grade to Bottom of Enclosed Space Floor | This is the depth from soil surface to the bottom of the floor in contact with soil                                                                                                                    | 15             | cm                               | Represents 6 inch thick concrete slab. Considered representative of structures at the residential development. |
| $L_t$        | Depth Below Grade to Top of Contamination           | This is the depth from soil surface to the top of VOC-contaminated soil. It represents the depth of a VOC contaminant source in soil, or the "dry zone" between the surface and VOC contaminant source | 152            | cm                               | Based on the depth of shallow soil gas sampling (5 feet).                                                      |
| $h_A$        | Thickness of Soil Stratum A                         |                                                                                                                                                                                                        | 152            | cm                               | Thickness of soil stratum A is assumed consistent with average depth to top of soil contamination.             |
| $h_B$        | Thickness of Soil Stratum B                         |                                                                                                                                                                                                        | NA             | cm                               | Not Used                                                                                                       |
| $h_C$        | Thickness of Soil Stratum C                         |                                                                                                                                                                                                        | NA             | cm                               | Not Used                                                                                                       |
|              | Soil Stratum A SCS Soil Type                        | Used to estimate soil vapor permeability                                                                                                                                                               | LS             | unitless                         | Assumed to be loamy sand, based on soil classification results the U.S. Geological Survey.                     |
| $k_v$        | User-defined Effective Soil Vapor Permeability      | A parameter associated with convective transport of vapors within the zone of influence of a building. It is related to the size and shape of connected soil pores                                     | 1.00E-07       | cm <sup>2</sup>                  | Soil permeability consistent with a sand. Represents a drainage layer underneath the foundation.               |
| $\rho_b^A$   | Stratum A Soil Dry Bulk Density                     |                                                                                                                                                                                                        | NA             | g/cm <sup>3</sup>                | Not used - conversion to soil gas concentration not required.                                                  |
| $n^A$        | Stratum A Total Soil Porosity                       | Used with water-filled porosity to calculate air-filled porosity                                                                                                                                       | 0.39           | unitless                         | Default porosity provided in the model (USEPA, 2004).                                                          |
| $\theta_w^A$ | Stratum A Soil Water-filled porosity                | Used with total porosity to calculate air-filled porosity                                                                                                                                              | 0.076          | cm <sup>3</sup> /cm <sup>3</sup> | Default moisture content provided in the model (USEPA, 2004).                                                  |
| $\rho_b^B$   | Stratum B Soil Dry Bulk Density                     |                                                                                                                                                                                                        | NA             | g/cm <sup>3</sup>                | Not Used                                                                                                       |
| $n^B$        | Stratum B Total Soil Porosity                       | Used with water-filled porosity to calculate air-filled porosity (see below)                                                                                                                           | NA             | unitless                         | Not Used                                                                                                       |
| $\theta_w^B$ | Stratum B Soil Water-filled porosity                | Used with total porosity to calculate air-filled porosity                                                                                                                                              | NA             | cm <sup>3</sup> /cm <sup>3</sup> | Not Used                                                                                                       |
| $\rho_b^C$   | Stratum C Soil Dry Bulk Density                     |                                                                                                                                                                                                        | NA             | g/cm <sup>3</sup>                | Not Used                                                                                                       |
| $n^C$        | Stratum C Total Soil Porosity                       | Used with water-filled porosity to calculate air-filled porosity (see below)                                                                                                                           | NA             | unitless                         | Not Used                                                                                                       |

**Table A1-3 - Supplement A**  
**Parameters Used in the Johnson and Ettinger Model, Residential Land Use**  
*Griggs and Walnut Groundwater Plume Site*  
*Las Cruces, NM*

| Symbol          | Parameter                                 | Description                                                                                                                                                                                                                                                                                                                                               | Selected Value | Units                            | Sources                                                                                                                                                                                                                                                                                       |
|-----------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\theta_{wl}^C$ | Stratum C Soil Water-filled porosity      | Used with total porosity to calculate air-filled porosity (see below)                                                                                                                                                                                                                                                                                     | NA             | cm <sup>3</sup> /cm <sup>3</sup> | Not Used                                                                                                                                                                                                                                                                                      |
| $L_{crack}$     | Enclosed Space Floor Thickness            |                                                                                                                                                                                                                                                                                                                                                           | 15             | cm                               | Represents 6 inch thick concrete slab                                                                                                                                                                                                                                                         |
| $\Delta p$      | Soil-Building Pressure Differential       |                                                                                                                                                                                                                                                                                                                                                           | 40             | g/cm-s <sup>2</sup>              | Default in the User's Guide (USEPA, 2004).                                                                                                                                                                                                                                                    |
| $L_B$           | Enclosed Space Floor Length               |                                                                                                                                                                                                                                                                                                                                                           | 1180           | cm                               | Length and width is based on the assumption of a 1,500 square foot home                                                                                                                                                                                                                       |
| $W_B$           | Enclosed Space Floor Width                |                                                                                                                                                                                                                                                                                                                                                           | 1180           | cm                               |                                                                                                                                                                                                                                                                                               |
| $H_B$           | Enclosed Space Height                     |                                                                                                                                                                                                                                                                                                                                                           | 244            | cm                               | Indoor ceiling is assumed to be 8 feet                                                                                                                                                                                                                                                        |
| $w$             | Floor-Wall Seam Crack Width               | This assumed to be a gap present at the junction between the floor and the foundation perimeter. This gap is due to building design or concrete shrinkage. It represents the route for soil gas intrusion into a building. The crack-to-total area ratio (used to calculate vapor flow into the building) is proportional to the value of this parameter. | 0.5            | cm                               | Crack width and vapor permeability estimate produces a $Q_{soil}/Q_{building}$ ratio consistent with values published in the literature (Johnson, 2002). Calculated soil gas flow into structures ( $Q_{soil}$ ) of 9.7 L/min is higher than USEPA's default value for $Q_{soil}$ of 5 L/min. |
| ER              | Indoor air exchange rate                  | Building ventilation rate, expressed in units of air changes per hour (ACH)                                                                                                                                                                                                                                                                               | 0.25           | (1/h)                            | USEPA, 2004                                                                                                                                                                                                                                                                                   |
| $AT_C$          | Averaging Time for Carcinogens            |                                                                                                                                                                                                                                                                                                                                                           | NA             | hrs                              | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                                                                     |
| $AT_{NC}$       | Averaging Time for Noncarcinogens         |                                                                                                                                                                                                                                                                                                                                                           | NA             | hrs                              | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                                                                     |
| ED              | Exposure Duration                         |                                                                                                                                                                                                                                                                                                                                                           | NA             | hrs                              | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                                                                     |
| EF              | Exposure Frequency                        |                                                                                                                                                                                                                                                                                                                                                           | NA             | days/yr                          | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                                                                     |
| TR              | Target Risk for Carcinogens               | Used to calculate risk-based concentration                                                                                                                                                                                                                                                                                                                | NA             | unitless                         | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                                                                     |
| THQ             | Target Hazard Quotient for Noncarcinogens | Used to calculate risk-based concentration                                                                                                                                                                                                                                                                                                                | NA             | days/yr                          | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                                                                     |

**Table A1-3 - Supplement B**  
**Parameters Used in the Johnson and Ettinger Model, Non-Residential Land Use (PAL)**  
*Griggs and Walnut Groundwater Plume Site*  
*Las Cruces, NM*

| Symbol       | Parameter                                           | Description                                                                                                                                                                                            | Selected Value | Units                            | Sources                                                                                                        |
|--------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------|----------------------------------------------------------------------------------------------------------------|
| $T_s$        | Average Soil Temperature                            |                                                                                                                                                                                                        | 20             | °C                               | Based on Figure 8 from the User's Guide (USEPA, 2004)                                                          |
| $L_F$        | Depth Below Grade to Bottom of Enclosed Space Floor | This is the depth from soil surface to the bottom of the floor in contact with soil                                                                                                                    | 15             | cm                               | Represents 6 inch thick concrete slab. Considered representative of structures at the residential development. |
| $L_t$        | Depth Below Grade to Top of Contamination           | This is the depth from soil surface to the top of VOC-contaminated soil. It represents the depth of a VOC contaminant source in soil, or the "dry zone" between the surface and VOC contaminant source | 152            | cm                               | Based on the depth of shallow soil gas sampling (5 feet).                                                      |
| $h_A$        | Thickness of Soil Stratum A                         |                                                                                                                                                                                                        | 152            | cm                               | Thickness of soil stratum A is assumed consistent with average depth to top of soil contamination.             |
| $h_B$        | Thickness of Soil Stratum B                         |                                                                                                                                                                                                        | NA             | cm                               | Not Used                                                                                                       |
| $h_C$        | Thickness of Soil Stratum C                         |                                                                                                                                                                                                        | NA             | cm                               | Not Used                                                                                                       |
|              | Soil Stratum A SCS Soil Type                        | Used to estimate soil vapor permeability                                                                                                                                                               | LS             | unitless                         | Assumed to be loamy sand, based on soil classification results the U.S. Geological Survey.                     |
| $k_v$        | User-defined Effective Soil Vapor Permeability      | A parameter associated with convective transport of vapors within the zone of influence of a building. It is related to the size and shape of connected soil pores                                     | 1.00E-07       | cm <sup>2</sup>                  | Soil permeability consistent with a sand. Represents a drainage layer underneath the foundation.               |
| $\rho_b^A$   | Stratum A Soil Dry Bulk Density                     |                                                                                                                                                                                                        | NA             | g/cm <sup>3</sup>                | Not used - conversion to soil gas concentration not required.                                                  |
| $n^A$        | Stratum A Total Soil Porosity                       | Used with water-filled porosity to calculate air-filled porosity (see below)                                                                                                                           | 0.39           | unitless                         | Default porosity provided in the model (USEPA, 2004).                                                          |
| $\theta_w^A$ | Stratum A Soil Water-filled porosity                | Used with total porosity to calculate air-filled porosity                                                                                                                                              | 0.076          | cm <sup>3</sup> /cm <sup>3</sup> | Default moisture content provided in the model (USEPA, 2004).                                                  |
| $\rho_b^B$   | Stratum B Soil Dry Bulk Density                     |                                                                                                                                                                                                        | NA             | g/cm <sup>3</sup>                | Not Used                                                                                                       |
| $n^B$        | Stratum B Total Soil Porosity                       | Used with water-filled porosity to calculate air-filled porosity (see below)                                                                                                                           | NA             | unitless                         | Not Used                                                                                                       |
| $\theta_w^B$ | Stratum B Soil Water-filled porosity                | Used with total porosity to calculate air-filled porosity                                                                                                                                              | NA             | cm <sup>3</sup> /cm <sup>3</sup> | Not Used                                                                                                       |
| $\rho_b^C$   | Stratum C Soil Dry Bulk Density                     |                                                                                                                                                                                                        | NA             | g/cm <sup>3</sup>                | Not Used                                                                                                       |
| $n^C$        | Stratum C Total Soil Porosity                       | Used with water-filled porosity to calculate air-filled porosity (see below)                                                                                                                           | NA             | unitless                         | Not Used                                                                                                       |

**Table A1-3 - Supplement B**  
**Parameters Used in the Johnson and Ettinger Model, Non-Residential Land Use (PAL)**  
*Griggs and Walnut Groundwater Plume Site*  
*Las Cruces, NM*

| Symbol        | Parameter                                 | Description                                                                                                                                                                                                                                                                                                                                               | Selected Value | Units                            | Sources                                                                                                                                                                                                                                       |
|---------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\theta_{wC}$ | Stratum C Soil Water-filled porosity      | Used with total porosity to calculate air-filled porosity (see below)                                                                                                                                                                                                                                                                                     | NA             | cm <sup>3</sup> /cm <sup>3</sup> | Not Used                                                                                                                                                                                                                                      |
| $L_{crack}$   | Enclosed Space Floor Thickness            |                                                                                                                                                                                                                                                                                                                                                           | 15             | cm                               | Represents 6 inch thick concrete slab.                                                                                                                                                                                                        |
| $\Delta_P$    | Soil-Building Pressure Differential       |                                                                                                                                                                                                                                                                                                                                                           | 40             | g/cm-s <sup>2</sup>              | Default in the User's Guide (USEPA, 2004).                                                                                                                                                                                                    |
| $L_B$         | Enclosed Space Floor Length               |                                                                                                                                                                                                                                                                                                                                                           | 3048           | cm                               | Length and width is based on the assumption of a 10,000 square foot building                                                                                                                                                                  |
| $W_B$         | Enclosed Space Floor Width                |                                                                                                                                                                                                                                                                                                                                                           | 3048           | cm                               |                                                                                                                                                                                                                                               |
| $H_B$         | Enclosed Space Height                     |                                                                                                                                                                                                                                                                                                                                                           | 366            | cm                               | Indoor ceiling is assumed to be 12 feet.                                                                                                                                                                                                      |
| $w$           | Floor-Wall Seam Crack Width               | This assumed to be a gap present at the junction between the floor and the foundation perimeter. This gap is due to building design or concrete shrinkage. It represents the route for soil gas intrusion into a building. The crack-to-total area ratio (used to calculate vapor flow into the building) is proportional to the value of this parameter. | 0.5            | cm                               | Crack width and vapor permeability produce a $Q_{soil}$ of 25 L/min. It is uncertain if these assumptions overstate or understate vapor intrusion. Soil vapor flow has been reported only for residences, not commercial/municipal buildings. |
| ER            | Indoor air exchange rate                  | Building ventilation rate, expressed in units of air changes per hour (ACH)                                                                                                                                                                                                                                                                               | 0.8            | (1/h)                            | Estimated using outside air requirements presented in ASHRAE, 2001.                                                                                                                                                                           |
| $AT_C$        | Averaging Time for Carcinogens            |                                                                                                                                                                                                                                                                                                                                                           | NA             | yrs                              | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                     |
| $AT_{NC}$     | Averaging Time for Noncarcinogens         |                                                                                                                                                                                                                                                                                                                                                           | NA             | yrs                              | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                     |
| ED            | Exposure Duration                         |                                                                                                                                                                                                                                                                                                                                                           | NA             | yrs                              | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                     |
| EF            | Exposure Frequency                        |                                                                                                                                                                                                                                                                                                                                                           | NA             | days/yr                          | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                     |
| TR            | Target Risk for Carcinogens               | Used to calculate risk-based concentration                                                                                                                                                                                                                                                                                                                | NA             | unitless                         | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                     |
| THQ           | Target Hazard Quotient for Noncarcinogens | Used to calculate risk-based concentration                                                                                                                                                                                                                                                                                                                | NA             | days/yr                          | Not Used. Exposure parameters presented in Table 4.1 RME.                                                                                                                                                                                     |

**Table A1-3 - Supplement C****MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY***Griggs and Walnut Groundwater Plume Site**Las Cruces, NM*

| Exposure Point Concentration (RME) - Maximum |                        |                        |                                      |                                                       |                                                       |
|----------------------------------------------|------------------------|------------------------|--------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| Exposure Point                               | PCE in Soil Gas (ppbv) | PCE in Soil Gas (ug/L) | PCE in Soil Gas (ug/m <sup>3</sup> ) | Modeled Indoor Air Concentration (ug/m <sup>3</sup> ) | Modeled Indoor Air Concentration (mg/m <sup>3</sup> ) |
| Property A                                   | 460                    | 3.17                   | 3,173                                | 8.41                                                  | 0.00841                                               |
| Property B                                   | 644                    | 4.44                   | 4,442                                | 11.77                                                 | 0.01177                                               |
| Property C                                   | 578                    | 3.99                   | 3,987                                | 10.56                                                 | 0.01056                                               |
| Property D                                   | 443                    | 3.06                   | 3,056                                | 8.10                                                  | 0.00810                                               |
| Property E                                   | 248                    | 1.71                   | 1,711                                | 4.53                                                  | 0.00453                                               |
| Property F                                   | 411                    | 2.84                   | 2,835                                | 7.51                                                  | 0.00751                                               |
| Property G                                   | 228                    | 1.57                   | 1,573                                | 4.17                                                  | 0.00417                                               |

| Exposure Point Concentration (CTE) - Average |                        |                        |                                      |                                                       |                                                       |
|----------------------------------------------|------------------------|------------------------|--------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| Exposure Point                               | PCE in Soil Gas (ppbv) | PCE in Soil Gas (ug/L) | PCE in Soil Gas (ug/m <sup>3</sup> ) | Modeled Indoor Air Concentration (ug/m <sup>3</sup> ) | Modeled Indoor Air Concentration (mg/m <sup>3</sup> ) |
| Property A                                   | 157                    | 1.08                   | 1,083                                | 2.87                                                  | 0.00287                                               |
| Property B                                   | 236                    | 1.62                   | 1,624                                | 4.30                                                  | 0.00430                                               |
| Property C                                   | 313                    | 2.16                   | 2,158                                | 5.72                                                  | 0.00572                                               |
| Property D                                   | 207                    | 1.42                   | 1,425                                | 3.77                                                  | 0.00377                                               |
| Property E                                   | 167                    | 1.15                   | 1,155                                | 3.06                                                  | 0.00306                                               |
| Property F                                   | 282                    | 1.94                   | 1,944                                | 5.15                                                  | 0.00515                                               |
| Property G                                   | 174                    | 1.20                   | 1,200                                | 3.18                                                  | 0.00318                                               |

**Notes:**

Attenuation Factor from  
Johnson and Ettinger Model  
(Residential)

2.65E-03

Molecular Weight (MW) -  
PCE

165.83

Molar Volume (MV) @ 20  
oC and 1 atm

24

Unit Conversion Equations:

PCE (ug/L) = PCE (ppbv) x MW (g/mol) / MV (L/mol) / 1000

PCE (ug/m<sup>3</sup>) = PCE (ug/L) x 1000 (L/m<sup>3</sup>)PCE (mg/m<sup>3</sup>) = PCE (ug/m<sup>3</sup>) / 1000 (mg/ug)

PCE - perchloroethylene



**Table A1-3 - Supplement D**  
**MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY**  
*Griggs and Walnut Groundwater Plume Site*  
*Las Cruces, NM*

| Exposure Point Concentration (RME) - Maximum |                        |                        |                                      |                                                       |                                                       |
|----------------------------------------------|------------------------|------------------------|--------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| Exposure Point                               | PCE in Soil Gas (ppbv) | PCE in Soil Gas (ug/L) | PCE in Soil Gas (ug/m <sup>3</sup> ) | Modeled Indoor Air Concentration (ug/m <sup>3</sup> ) | Modeled Indoor Air Concentration (mg/m <sup>3</sup> ) |
| PAL Boxing Facility                          | 206                    | 1.42                   | 1,421                                | 0.49                                                  | 0.00049                                               |

**Notes:**

Attenuation Factor from  
Johnson and Ettinger Model  
(Residential) 3.43E-04

Molecular Weight (MW) -  
PCE 165.83  
Molar Volume (MV) @ 20  
oC and 1 atm 24

Unit Conversion Equations:  
PCE (ug/L) = PCE (ppbv) x MW (g/mol) / MV (L/mol) / 1000  
PCE (ug/m<sup>3</sup>) = PCE (ug/L) x 1000 (L/m<sup>3</sup>)  
PCE (mg/m<sup>3</sup>) = PCE (ug/m<sup>3</sup>) / 1000 (mg/ug)

PCE - perchloroethylene

**Table A1-4.1 RME**  
**VALUES USED FOR DAILY INTAKE CALCULATIONS**  
**REASONABLE MAXIMUM EXPOSURE**  
Griggs and Walnut Ground Water Plume Site

|                                               |
|-----------------------------------------------|
| Scenario Timeframe: Current/Future            |
| Medium: Groundwater                           |
| Exposure Medium: Indoor Air (Vapor Intrusion) |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point                  | Parameter Code | Parameter Definition          | Value             | Units                | Rationale/ Reference | Intake Equation/ Model Name                                                                                                                                                                                                                                   |
|----------------|---------------------|--------------|---------------------------------|----------------|-------------------------------|-------------------|----------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inhalation     | Resident            | Adult        | Indoor Air<br>(Vapor Intrusion) | CA             | Chemical Concentration in Air | See Table 3.1.RME | mg/m <sup>3</sup>    | See Table 3.1.RME    | $CDI (mg/kg-day) =$<br>$CA \times IN \times EF \times ED \times 1/BW \times 1/AT$<br>CA calculated using Johnson and Ettinger Model based on measured soil vapor concentrations.                                                                              |
|                |                     |              |                                 | IN             | Inhalation Rate               | 20                | m <sup>3</sup> /day  | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | EF             | Exposure Frequency            | 350               | days/year            | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | ED             | Exposure Duration             | 24                | years                | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | BW             | Body Weight                   | 70                | kg                   | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | AT-N           | Averaging Time (Non-Cancer)   | 8,760             | days                 | EPA, 1989            |                                                                                                                                                                                                                                                               |
|                |                     | Child        | Indoor Air<br>(Vapor Intrusion) | CA             | Chemical Concentration in Air | See Table 3.1.RME | mg/m <sup>3</sup>    | See Table 3.1.RME    | $CDI (mg/kg-day) =$<br>$CA \times IN \times EF \times ED \times 1/BW \times 1/AT$<br>CA calculated using Johnson and Ettinger Model based on measured soil vapor concentrations.                                                                              |
|                |                     |              |                                 | IN             | Inhalation Rate               | 10                | m <sup>3</sup> /day  | EPA R6 (1)           |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | EF             | Exposure Frequency            | 350               | days/year            | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | ED             | Exposure Duration             | 6                 | years                | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | BW             | Body Weight                   | 15                | kg                   | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | AT-N           | Averaging Time (Non-Cancer)   | 2,190             | days                 | EPA, 1989            |                                                                                                                                                                                                                                                               |
|                |                     | Child/Adult  | Indoor Air<br>(Vapor Intrusion) | CA             | Chemical Concentration in Air | See Table 3.1.RME | mg/m <sup>3</sup>    | See Table 3.1.RME    | $CDI (mg/kg-day) =$<br>$CA \times IN-Adj \times EF \times 1/AT$<br>CA calculated using Johnson and Ettinger Model based on measured soil vapor concentrations.<br><br>$IN-Adj (m^3-year/kg-day) =$<br>$(ED-C \times IN-C / BW-C) + (ED-A \times IN-A / BW-A)$ |
|                |                     |              |                                 | IN-A           | Inhalation Rate, Adult        | 20                | m <sup>3</sup> /day  | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | IN-C           | Inhalation Rate, Child        | 10                | m <sup>3</sup> /day  | EPA R6 (1)           |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | IN-Adj         | Inhalation Rate, Age-adjusted | 10.9              | m <sup>3</sup> /hour | calculated           |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | EF             | Exposure Frequency            | 350               | days/year            | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | ED-A           | Exposure Duration, Adult      | 24                | years                | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | ED-C           | Exposure Duration, Child      | 6                 | years                | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | BW-A           | Body Weight, Adult            | 70                | kg                   | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | BW-C           | Body Weight, Child            | 15                | kg                   | EPA, 1991            |                                                                                                                                                                                                                                                               |
|                |                     |              |                                 | AT-C           | Averaging Time (Cancer)       | 25,550            | days                 | EPA, 1989            |                                                                                                                                                                                                                                                               |

**Table A1-4.1 RME**  
**VALUES USED FOR DAILY INTAKE CALCULATIONS**  
**REASONABLE MAXIMUM EXPOSURE**  
Griggs and Walnut Ground Water Plume Site

|                                               |
|-----------------------------------------------|
| Scenario Timeframe: Current/Future            |
| Medium: Groundwater                           |
| Exposure Medium: Indoor Air (Vapor Intrusion) |

| Exposure Route        | Receptor Population                        | Receptor Age | Exposure Point                  | Parameter Code | Parameter Definition          | Value             | Units                         | Rationale/ Reference | Intake Equation/ Model Name                                                                                                                                                 |
|-----------------------|--------------------------------------------|--------------|---------------------------------|----------------|-------------------------------|-------------------|-------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inhalation<br>(cont.) | Industrial Worker<br>(PAL Boxing Facility) | Adult        | Indoor Air<br>(Vapor Intrusion) | CA             | Chemical Concentration in Air | See Table 3.1.RME | mg/m <sup>3</sup>             | See Table 3.1.RME    | $CDI (mg/kg-day) = CA \times IN \times EF \times ED \times 1/BW \times 1/AT$<br>CA calculated using Johnson and Ettinger Model based on measured soil vapor concentrations. |
|                       |                                            |              |                                 | IN             | Inhalation Rate               | 20                | m <sup>3</sup> /8 hr work day | EPA, 1991            |                                                                                                                                                                             |
|                       |                                            |              |                                 | EF             | Exposure Frequency            | 250               | days/year                     | EPA, 1991            |                                                                                                                                                                             |
|                       |                                            |              |                                 | ED             | Exposure Duration             | 25                | years                         | EPA, 1991            |                                                                                                                                                                             |
|                       |                                            |              |                                 | BW             | Body Weight                   | 70                | kg                            | EPA, 1991            |                                                                                                                                                                             |
|                       |                                            |              |                                 | AT-N           | Averaging Time (Non-Cancer)   | 9,125             | days                          | EPA, 1989            |                                                                                                                                                                             |
|                       | Recreational User<br>(PAL Boxing Facility) | Adolescent   | Indoor Air<br>(Vapor Intrusion) | AT-C           | Averaging Time (Cancer)       | 25,550            | days                          | EPA, 1989            | $CDI (mg/kg-day) = CA \times IN \times EF \times ED \times 1/BW \times 1/AT$<br>CA calculated using Johnson and Ettinger Model based on measured soil vapor concentrations. |
|                       |                                            |              |                                 | CA             | Chemical Concentration in Air | See Table 3.1.RME | mg/m <sup>3</sup>             | See Table 3.1.RME    |                                                                                                                                                                             |
|                       |                                            |              |                                 | IN             | Inhalation Rate               | 20                | m <sup>3</sup> /day           | EPA, 1991            |                                                                                                                                                                             |
|                       |                                            |              |                                 | EF             | Exposure Frequency            | 120               | days/year                     | (2)                  |                                                                                                                                                                             |
|                       |                                            |              |                                 | ET             | Exposure Time                 | 4                 | hours/day                     | (2)                  |                                                                                                                                                                             |
|                       |                                            |              |                                 | ED             | Exposure Duration             | 12                | years                         | (2)                  |                                                                                                                                                                             |
|                       |                                            |              |                                 | BW             | Body Weight                   | 45                | kg                            | (3)                  |                                                                                                                                                                             |
|                       |                                            |              |                                 | AT-N           | Averaging Time (Non-Cancer)   | 4,380             | days                          | EPA, 1989            |                                                                                                                                                                             |
|                       |                                            |              |                                 | AT-C           | Averaging Time (Cancer)       | 25,550            | days                          | EPA, 1989            |                                                                                                                                                                             |

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

(1) EPA Region 6, Undated: Memorandum, Central Tendency and RME Exposure Parameters.

(2) Best Professional Judgement.

(3) Recreational use scenario body weight assumption is an averaged value for a child ranging between 6 and 18 years of age.

**Table A1-5.1**  
**NON-CANCER TOXICITY DATA -- ORAL/DERMAL**  
Griggs and Walnut Ground Water Plume Site

| Chemical<br>of Potential<br>Concern | Chronic/<br>Subchronic | Oral RfD |           | Oral Absorption<br>Efficiency for Dermal<br><br>(1) | Absorbed RfD for Dermal (2) |           | Primary<br>Target<br>Organ(s) | Combined<br>Uncertainty/Modifying<br>Factors | RfD:Target Organ(s) |                         |
|-------------------------------------|------------------------|----------|-----------|-----------------------------------------------------|-----------------------------|-----------|-------------------------------|----------------------------------------------|---------------------|-------------------------|
|                                     |                        | Value    | Units     |                                                     | Value                       | Units     |                               |                                              | Source(s)           | Date(s)<br>(MM/DD/YYYY) |
| Benzene                             | Chronic                | 4.0E-03  | mg/kg-day | 1                                                   | 4.0E-03                     | mg/kg-day | Blood                         | 300/1                                        | IRIS                | 3/22/2006               |
| Benzene                             | Subchronic             | 3.0E-03  | mg/kg-day | 1                                                   | 3.0E-03                     | mg/kg-day | Blood, Immune                 | 3000                                         | NCEA                | 7/2/1996                |
| Methyl tertiary butyl ether (MTBE)  | Chronic/Subchronic     | N/A      | N/A       | N/A                                                 | N/A                         | N/A       | N/A                           | N/A                                          | IRIS                | 3/29/2004               |
| Tetrachloroethylene                 | Chronic                | 1.0E-02  | mg/kg-day | 1                                                   | 1.0E-02                     | mg/kg-day | Liver                         | 1000/1                                       | IRIS                | 3/22/2006               |
| Tetrachloroethylene                 | Subchronic             | 1.0E-01  | mg/kg-day | 1                                                   | 1.0E-01                     | mg/kg-day | Liver                         | 100                                          | HEAST               | 7/1/1997                |

Footnote Instructions:

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health  
Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final.  
Section 4.2 and Exhibit 4-1.

(2) See Risk Assessment text for the derivation of the "Absorbed RfD for Dermal"

Definitions: HEAST = Health Effects Assessment Summary Tables  
IRIS = Integrated Risk Information System  
NCEA = National Center for Environmental Assessment

**Table A1-5.2**  
**NON-CANCER TOXICITY DATA -- INHALATION**  
 Griggs and Walnut Ground Water Plume Site

| Chemical<br>of Potential<br>Concern | Chronic/<br>Subchronic | Inhalation RfC |                   | Extrapolated RfD (1) |           | Primary<br>Target<br>Organ(s) | Combined<br>Uncertainty/Modifying<br>Factors | RfC : Target Organ(s) |                         |
|-------------------------------------|------------------------|----------------|-------------------|----------------------|-----------|-------------------------------|----------------------------------------------|-----------------------|-------------------------|
|                                     |                        | Value          | Units             | Value                | Units     |                               |                                              | Source(s)             | Date(s)<br>(MM/DD/YYYY) |
| Benzene                             | Chronic                | 3.0E-02        | mg/m <sup>3</sup> | 8.6E-03              | mg/kg/day | Blood                         | 300/1                                        | IRIS                  | 3/22/2006               |
| Benzene                             | Subchronic             | 6.0E-02        | mg/m <sup>3</sup> | 1.7E-02              | mg/kg/day | Blood                         | 100                                          | NCEA                  | 7/2/1996                |
| Methyl tertiary butyl ether (MTBE)  | Chronic                | 3.0E+00        | mg/m <sup>3</sup> | 8.6E-01              | mg/kg-day | Liver, Kidney                 | 100/1                                        | IRIS                  | 3/22/2006               |
| Tetrachloroethylene                 | Chronic/Subchronic     | 4.0E-01        | mg/m3             | 1.1E-01              | mg/kg-day | Liver, Kidney                 | N/A                                          | NCEA                  | 6/20/1997               |

(1) Inhalation RfC value was converted to a corresponding RfD value,  
 assuming human body weight of 70 kg and inhalation rate of 20 m<sup>3</sup>/day,  
 as follows:

$$\text{RfD [mg/kg/day]} = \text{RfC [mg/m}^3\text{]} \times 20 \text{ [m}^3\text{/day]} / 70 \text{ [kg]}$$

Definitions: IRIS = Integrated Risk Information System  
 NA = Not Available  
 NCEA = National Center for Environmental Assessment

**Table A1-6.1**  
**CANCER TOXICITY DATA -- ORAL/DERMAL**  
 Griggs and Walnut Ground Water Plume Site

| Chemical<br>of Potential<br>Concern | Oral Cancer Slope Factor |                           | Oral Absorption<br>Efficiency for Dermal<br>(1) | Absorbed Cancer Slope Factor<br>for Dermal |                           | Weight of Evidence/<br>Cancer Guideline<br>Description | Oral CSF  |                         |
|-------------------------------------|--------------------------|---------------------------|-------------------------------------------------|--------------------------------------------|---------------------------|--------------------------------------------------------|-----------|-------------------------|
|                                     | Value                    | Units                     |                                                 | Value                                      | Units                     |                                                        | Source(s) | Date(s)<br>(MM/DD/YYYY) |
| Benzene                             | 5.5E-02                  | (mg/kg-day) <sup>-1</sup> | 1                                               | 5.5E-02                                    | (mg/kg-day) <sup>-1</sup> | A                                                      | IRIS      | 3/22/2006               |
| Methyl tertiary butyl ether (MTBE)  | N/A                      | N/A                       | N/A                                             | N/A                                        | N/A                       | N/A                                                    | N/A       | N/A                     |
| Tetrachloroethylene                 | 5.4E-01                  | (mg/kg-day) <sup>-1</sup> | 1                                               | 5.4E-01                                    | (mg/kg-day) <sup>-1</sup> | C - B2                                                 | OSWER     | 6/12/2003               |

(1) Source: Risk Assessment Guidance for Superfund: Volume 1: Human Health  
 Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final.  
 Section 4.2 and Exhibit 4-1.

Definitions: OSWER = Office of Solid Waste and Emergency Response  
 IRIS = Integrated Risk Information System

(2) See Risk Assessment text for derivation of the "Absorbed Cancer Slope Factor for Dermal".

Weight of Evidence definitions:

Group A chemicals (human carcinogens) are agents for which there is sufficient evidence of carcinogenicity based on evidence from epidemiological studies.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

**Table A1-6.2**  
**CANCER TOXICITY DATA -- INHALATION**  
 Griggs and Walnut Ground Water Plume Site

| Chemical<br>of Potential<br>Concern | Unit Risk |                                            | Inhalation Cancer Slope Factor |                                                        | Weight of Evidence/<br>Cancer Guideline<br>Description | Unit Risk : Inhalation CSF |                         |
|-------------------------------------|-----------|--------------------------------------------|--------------------------------|--------------------------------------------------------|--------------------------------------------------------|----------------------------|-------------------------|
|                                     | Value     | Units                                      | Value                          | Units                                                  |                                                        | Source(s)                  | Date(s)<br>(MM/DD/YYYY) |
| Benzene                             | 7.8E-06   | ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup> | 2.7E-02                        | ( $\text{mg}/\text{kg}\cdot\text{day}$ ) <sup>-1</sup> | A                                                      | IRIS                       | 3/22/2006               |
| Methyl tertiary butyl ether (MTBE)  | N/A       | N/A                                        | N/A                            | N/A                                                    | N/A                                                    | N/A                        | N/A                     |
| Tetrachloroethylene                 | 5.9E-06   | ( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup> | 2.1E-02                        | ( $\text{mg}/\text{kg}\cdot\text{day}$ ) <sup>-1</sup> | C - B2                                                 | OSWER                      | 6/12/2003               |

Weight of Evidence definitions:

Group A chemicals (human carcinogens) are agents for which there is sufficient evidence of carcinogenicity based on evidence from epidemiological studies.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Definitions: OSWER = Office of Solid Waste and Emergency Response  
 IRIS = Integrated Risk Information System

**Table A1-7.1 RME**  
**CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Adult

| Medium                 | Exposure Medium | Exposure Point          | Exposure Route   | Chemical of Potential Concern | EPC     |       | Cancer Risk Calculations      |           |               |               |             | Non-Cancer Hazard Calculations |           |         |           |                 |         |
|------------------------|-----------------|-------------------------|------------------|-------------------------------|---------|-------|-------------------------------|-----------|---------------|---------------|-------------|--------------------------------|-----------|---------|-----------|-----------------|---------|
|                        |                 |                         |                  |                               | Value   | Units | Intake/Exposure Concentration |           | CSF/Unit Risk |               | Cancer Risk | Intake/Exposure Concentration  |           | RfD/RfC |           | Hazard Quotient |         |
|                        |                 |                         |                  |                               |         |       | Value                         | Units     | Value         | Units         |             | Value                          | Units     | Value   | Units     |                 |         |
| Ground Water           | Indoor Air      | Indoor Air (Property A) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 8.4E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 2.3E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 2.1E-02         |         |
|                        |                 |                         | Exp. Route Total |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.1E-02 |           |                 |         |
|                        |                 | Exposure Point Total    |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.1E-02 |           |                 |         |
|                        |                 | Exposure Medium Total   |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.1E-02 |           |                 |         |
| Ground Water and Total |                 |                         |                  |                               |         |       |                               | 0.0E+00   |               |               |             |                                |           |         |           |                 | 2.1E-02 |
| Ground Water           | Indoor Air      | Indoor Air (Property B) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 1.2E-02 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 3.2E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 2.9E-02         |         |
|                        |                 |                         | Exp. Route Total |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.9E-02 |           |                 |         |
|                        |                 | Exposure Point Total    |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.9E-02 |           |                 |         |
|                        |                 | Exposure Medium Total   |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.9E-02 |           |                 |         |
| Ground Water and Total |                 |                         |                  |                               |         |       |                               | 0.0E+00   |               |               |             |                                |           |         |           |                 | 2.9E-02 |
| Ground Water           | Indoor Air      | Indoor Air (Property C) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 1.1E-02 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 2.9E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 2.6E-02         |         |
|                        |                 |                         | Exp. Route Total |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.6E-02 |           |                 |         |
|                        |                 | Exposure Point Total    |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.6E-02 |           |                 |         |
|                        |                 | Exposure Medium Total   |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.6E-02 |           |                 |         |
| Ground Water and Total |                 |                         |                  |                               |         |       |                               | 0.0E+00   |               |               |             |                                |           |         |           |                 | 2.6E-02 |
| Ground Water           | Indoor Air      | Indoor Air (Property D) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 8.1E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 2.2E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 2.0E-02         |         |
|                        |                 |                         | Exp. Route Total |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.0E-02 |           |                 |         |
|                        |                 | Exposure Point Total    |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.0E-02 |           |                 |         |
|                        |                 | Exposure Medium Total   |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 2.0E-02 |           |                 |         |
| Ground Water and Total |                 |                         |                  |                               |         |       |                               | 0.0E+00   |               |               |             |                                |           |         |           |                 | 2.0E-02 |
| Ground Water           | Indoor Air      | Indoor Air (Property E) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 4.5E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 1.2E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 1.1E-02         |         |
|                        |                 |                         | Exp. Route Total |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 1.1E-02 |           |                 |         |
|                        |                 | Exposure Point Total    |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 1.1E-02 |           |                 |         |
|                        |                 | Exposure Medium Total   |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 1.1E-02 |           |                 |         |
| Ground Water and Total |                 |                         |                  |                               |         |       |                               | 0.0E+00   |               |               |             |                                |           |         |           |                 | 1.1E-02 |
| Ground Water           | Indoor Air      | Indoor Air (Property F) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 7.5E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 2.0E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 1.9E-02         |         |
|                        |                 |                         | Exp. Route Total |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 1.9E-02 |           |                 |         |
|                        |                 | Exposure Point Total    |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 1.9E-02 |           |                 |         |
|                        |                 | Exposure Medium Total   |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 1.9E-02 |           |                 |         |
| Ground Water and Total |                 |                         |                  |                               |         |       |                               | 0.0E+00   |               |               |             |                                |           |         |           |                 | 1.9E-02 |
| Ground Water           | Indoor Air      | Indoor Air (Property G) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 4.2E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 1.1E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 1.0E-02         |         |
|                        |                 |                         | Exp. Route Total |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 1.0E-02 |           |                 |         |
|                        |                 | Exposure Point Total    |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 1.0E-02 |           |                 |         |
|                        |                 | Exposure Medium Total   |                  |                               |         |       |                               |           | 0.0E+00       |               |             |                                |           | 1.0E-02 |           |                 |         |
| Ground Water and Total |                 |                         |                  |                               |         |       |                               | 0.0E+00   |               |               |             |                                |           |         |           |                 | 1.0E-02 |



**Table A1-7.1 RME**  
**CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

| Medium                | Exposure Medium | Exposure Point             | Exposure Route   | Chemical of<br>Potential Concern | EPC     |       | Cancer Risk Calculations      |           |               |               |             | Non-Cancer Hazard Calculations |           |         |           |                 |
|-----------------------|-----------------|----------------------------|------------------|----------------------------------|---------|-------|-------------------------------|-----------|---------------|---------------|-------------|--------------------------------|-----------|---------|-----------|-----------------|
|                       |                 |                            |                  |                                  | Value   | Units | Intake/Exposure Concentration |           | CSF/Unit Risk |               | Cancer Risk | Intake/Exposure Concentration  |           | RfD/RfC |           | Hazard Quotient |
|                       |                 |                            |                  |                                  |         |       | Value                         | Units     | Value         | Units         |             | Value                          | Units     | Value   | Units     |                 |
| Ground Water          | Indoor Air      | Indoor Air<br>(Property A) | Inhalation       | TETRACHLOROETHYLENE (PCE)        | 8.4E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 5.4E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 4.9E-02         |
|                       |                 |                            | Exp. Route Total |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 4.9E-02   |         |           |                 |
|                       |                 | Exposure Point Total       |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 4.9E-02   |         |           |                 |
|                       |                 | Exposure Medium Total      |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 4.9E-02   |         |           |                 |
| Ground Waterand Total |                 |                            |                  |                                  |         |       |                               | 0.0E+00   |               |               |             |                                | 4.9E-02   |         |           |                 |
| Ground Water          | Indoor Air      | Indoor Air<br>(Property B) | Inhalation       | TETRACHLOROETHYLENE (PCE)        | 1.2E-02 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 7.5E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 6.8E-02         |
|                       |                 |                            | Exp. Route Total |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 6.8E-02   |         |           |                 |
|                       |                 | Exposure Point Total       |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 6.8E-02   |         |           |                 |
|                       |                 | Exposure Medium Total      |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 6.8E-02   |         |           |                 |
| Ground Waterand Total |                 |                            |                  |                                  |         |       |                               | 0.0E+00   |               |               |             |                                | 6.8E-02   |         |           |                 |
| Ground Water          | Indoor Air      | Indoor Air<br>(Property C) | Inhalation       | TETRACHLOROETHYLENE (PCE)        | 1.1E-02 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 6.8E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 6.1E-02         |
|                       |                 |                            | Exp. Route Total |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 6.1E-02   |         |           |                 |
|                       |                 | Exposure Point Total       |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 6.1E-02   |         |           |                 |
|                       |                 | Exposure Medium Total      |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 6.1E-02   |         |           |                 |
| Ground Waterand Total |                 |                            |                  |                                  |         |       |                               | 0.0E+00   |               |               |             |                                | 6.1E-02   |         |           |                 |
| Ground Water          | Indoor Air      | Indoor Air<br>(Property D) | Inhalation       | TETRACHLOROETHYLENE (PCE)        | 8.1E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 5.2E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 4.7E-02         |
|                       |                 |                            | Exp. Route Total |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 4.7E-02   |         |           |                 |
|                       |                 | Exposure Point Total       |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 4.7E-02   |         |           |                 |
|                       |                 | Exposure Medium Total      |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 4.7E-02   |         |           |                 |
| Ground Waterand Total |                 |                            |                  |                                  |         |       |                               | 0.0E+00   |               |               |             |                                | 4.7E-02   |         |           |                 |
| Ground Water          | Indoor Air      | Indoor Air<br>(Property E) | Inhalation       | TETRACHLOROETHYLENE (PCE)        | 4.5E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 2.9E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 2.6E-02         |
|                       |                 |                            | Exp. Route Total |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 2.6E-02   |         |           |                 |
|                       |                 | Exposure Point Total       |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 2.6E-02   |         |           |                 |
|                       |                 | Exposure Medium Total      |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 2.6E-02   |         |           |                 |
| Ground Waterand Total |                 |                            |                  |                                  |         |       |                               | 0.0E+00   |               |               |             |                                | 2.6E-02   |         |           |                 |
| Ground Water          | Indoor Air      | Indoor Air<br>(Property F) | Inhalation       | TETRACHLOROETHYLENE (PCE)        | 7.5E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 4.8E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 4.4E-02         |
|                       |                 |                            | Exp. Route Total |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 4.4E-02   |         |           |                 |
|                       |                 | Exposure Point Total       |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 4.4E-02   |         |           |                 |
|                       |                 | Exposure Medium Total      |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 4.4E-02   |         |           |                 |
| Ground Waterand Total |                 |                            |                  |                                  |         |       |                               | 0.0E+00   |               |               |             |                                | 4.4E-02   |         |           |                 |
| Ground Water          | Indoor Air      | Indoor Air<br>(Property G) | Inhalation       | TETRACHLOROETHYLENE (PCE)        | 4.2E-03 | mg/m³ | NA                            | mg/kg/day | NA            | 1/(mg/kg-day) | NA          | 2.7E-03                        | mg/kg/day | 1.1E-01 | mg/kg/day | 2.4E-02         |
|                       |                 |                            | Exp. Route Total |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 2.4E-02   |         |           |                 |
|                       |                 | Exposure Point Total       |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 2.4E-02   |         |           |                 |
|                       |                 | Exposure Medium Total      |                  |                                  |         |       |                               |           | 0.0E+00       |               |             |                                | 2.4E-02   |         |           |                 |
| Ground Waterand Total |                 |                            |                  |                                  |         |       |                               | 0.0E+00   |               |               |             |                                | 2.4E-02   |         |           |                 |

**Table A1-7.1 RME**  
**CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Adult/Child

| Medium                | Exposure Medium       | Exposure Point          | Exposure Route   | Chemical of Potential Concern | EPC     |         | Cancer Risk Calculations      |           |               |               |             | Non-Cancer Hazard Calculations |           |         |           |                 |
|-----------------------|-----------------------|-------------------------|------------------|-------------------------------|---------|---------|-------------------------------|-----------|---------------|---------------|-------------|--------------------------------|-----------|---------|-----------|-----------------|
|                       |                       |                         |                  |                               | Value   | Units   | Intake/Exposure Concentration |           | CSF/Unit Risk |               | Cancer Risk | Intake/Exposure Concentration  |           | RfD/RfC |           | Hazard Quotient |
|                       |                       |                         |                  |                               |         |         | Value                         | Units     | Value         | Units         |             | Value                          | Units     | Value   | Units     |                 |
| Ground Water          | Indoor Air            | Indoor Air (Property A) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 8.4E-03 | mg/m³   | 1.2E-03                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 2.6E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |         |                               | 2.6E-05   |               |               |             | 0.0E+00                        |           |         |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |         | 2.6E-05                       |           |               |               | 0.0E+00     |                                |           |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         | 2.6E-05 |                               |           |               | 0.0E+00       |             |                                |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |         |                               |           |               | 2.6E-05       |             |                                |           |         | 0.0E+00   |                 |
| Ground Water          | Indoor Air            | Indoor Air (Property B) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 1.2E-02 | mg/m³   | 1.7E-03                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 3.6E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |         |                               | 3.6E-05   |               |               |             | 0.0E+00                        |           |         |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |         | 3.6E-05                       |           |               |               | 0.0E+00     |                                |           |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         | 3.6E-05 |                               |           |               | 0.0E+00       |             |                                |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |         |                               |           |               | 3.6E-05       |             |                                |           |         | 0.0E+00   |                 |
| Ground Water          | Indoor Air            | Indoor Air (Property C) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 1.1E-02 | mg/m³   | 1.6E-03                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 3.2E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |         |                               | 3.2E-05   |               |               |             | 0.0E+00                        |           |         |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |         | 3.2E-05                       |           |               |               | 0.0E+00     |                                |           |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         | 3.2E-05 |                               |           |               | 0.0E+00       |             |                                |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |         |                               |           |               | 3.2E-05       |             |                                |           |         | 0.0E+00   |                 |
| Ground Water          | Indoor Air            | Indoor Air (Property D) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 8.1E-03 | mg/m³   | 1.2E-03                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 2.5E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |         |                               | 2.5E-05   |               |               |             | 0.0E+00                        |           |         |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |         | 2.5E-05                       |           |               |               | 0.0E+00     |                                |           |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         | 2.5E-05 |                               |           |               | 0.0E+00       |             |                                |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |         |                               |           |               | 2.5E-05       |             |                                |           |         | 0.0E+00   |                 |
| Ground Water          | Indoor Air            | Indoor Air (Property E) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 4.5E-03 | mg/m³   | 6.7E-04                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 1.4E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |         |                               | 1.4E-05   |               |               |             | 0.0E+00                        |           |         |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |         | 1.4E-05                       |           |               |               | 0.0E+00     |                                |           |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         | 1.4E-05 |                               |           |               | 0.0E+00       |             |                                |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |         |                               |           |               | 1.4E-05       |             |                                |           |         | 0.0E+00   |                 |
| Ground Water          | Indoor Air            | Indoor Air (Property F) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 7.5E-03 | mg/m³   | 1.1E-03                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 2.3E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |         |                               | 2.3E-05   |               |               |             | 0.0E+00                        |           |         |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |         | 2.3E-05                       |           |               |               | 0.0E+00     |                                |           |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         | 2.3E-05 |                               |           |               | 0.0E+00       |             |                                |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |         |                               |           |               | 2.3E-05       |             |                                |           |         | 0.0E+00   |                 |
| Ground Water          | Indoor Air            | Indoor Air (Property G) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 4.2E-03 | mg/m³   | 6.2E-04                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 1.3E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |         |                               | 1.3E-05   |               |               |             | 0.0E+00                        |           |         |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |         | 1.3E-05                       |           |               |               | 0.0E+00     |                                |           |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         | 1.3E-05 |                               |           |               | 0.0E+00       |             |                                |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |         |                               |           |               | 1.3E-05       |             |                                |           |         | 0.0E+00   |                 |

**Table A1-7.1 CTE**  
**CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS**  
**CENTRAL TENDENCY EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Adult/Child

| Medium                | Exposure Medium       | Exposure Point          | Exposure Route   | Chemical of Potential Concern | EPC     |       | Cancer Risk Calculations      |           |               |               |             | Non-Cancer Hazard Calculations |           |         |           |                 |
|-----------------------|-----------------------|-------------------------|------------------|-------------------------------|---------|-------|-------------------------------|-----------|---------------|---------------|-------------|--------------------------------|-----------|---------|-----------|-----------------|
|                       |                       |                         |                  |                               | Value   | Units | Intake/Exposure Concentration |           | CSF/Unit Risk |               | Cancer Risk | Intake/Exposure Concentration  |           | RfD/RfC |           | Hazard Quotient |
|                       |                       |                         |                  |                               |         |       | Value                         | Units     | Value         | Units         |             | Value                          | Units     | Value   | Units     |                 |
| Ground Water          | Indoor Air            | Indoor Air (Property A) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 2.9E-03 | mg/m³ | 4.3E-04                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 8.8E-06     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |       |                               |           | 8.8E-06       |               |             | 0.0E+00                        |           |         |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |       |                               | 8.8E-06   |               |               | 0.0E+00     |                                |           |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         |       | 8.8E-06                       |           |               | 0.0E+00       |             |                                |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |       |                               |           |               |               | 8.8E-06     |                                |           |         |           | 0.0E+00         |
| Ground Water          | Indoor Air            | Indoor Air (Property B) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 4.3E-03 | mg/m³ | 6.4E-04                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 1.3E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |       |                               |           |               | 1.3E-05       |             |                                | 0.0E+00   |         |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |       |                               |           | 1.3E-05       |               |             | 0.0E+00                        |           |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         |       |                               | 1.3E-05   |               |               | 0.0E+00     |                                |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |       |                               |           |               |               | 1.3E-05     |                                |           |         |           | 0.0E+00         |
| Ground Water          | Indoor Air            | Indoor Air (Property C) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 5.7E-03 | mg/m³ | 8.5E-04                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 1.8E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |       |                               |           |               |               | 1.8E-05     |                                |           | 0.0E+00 |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |       |                               |           |               | 1.8E-05       |             |                                | 0.0E+00   |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         |       |                               |           | 1.8E-05       |               |             | 0.0E+00                        |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |       |                               |           |               |               | 1.8E-05     |                                |           |         |           | 0.0E+00         |
| Ground Water          | Indoor Air            | Indoor Air (Property D) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 3.8E-03 | mg/m³ | 5.6E-04                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 1.2E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |       |                               |           |               |               | 1.2E-05     |                                |           | 0.0E+00 |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |       |                               |           |               | 1.2E-05       |             |                                | 0.0E+00   |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         |       |                               |           | 1.2E-05       |               |             | 0.0E+00                        |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |       |                               |           |               |               | 1.2E-05     |                                |           |         |           | 0.0E+00         |
| Ground Water          | Indoor Air            | Indoor Air (Property E) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 3.1E-03 | mg/m³ | 4.5E-04                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 9.4E-06     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |       |                               |           |               |               | 9.4E-06     |                                |           | 0.0E+00 |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |       |                               |           |               | 9.4E-06       |             |                                | 0.0E+00   |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         |       |                               |           | 9.4E-06       |               |             | 0.0E+00                        |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |       |                               |           |               |               | 9.4E-06     |                                |           |         |           | 0.0E+00         |
| Ground Water          | Indoor Air            | Indoor Air (Property F) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 5.1E-03 | mg/m³ | 7.6E-04                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 1.6E-05     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |       |                               |           |               |               | 1.6E-05     |                                |           | 0.0E+00 |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |       |                               |           |               | 1.6E-05       |             |                                | 0.0E+00   |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         |       |                               |           | 1.6E-05       |               |             | 0.0E+00                        |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |       |                               |           |               |               | 1.6E-05     |                                |           |         |           | 0.0E+00         |
| Ground Water          | Indoor Air            | Indoor Air (Property G) | Inhalation       | TETRACHLOROETHYLENE (PCE)     | 3.2E-03 | mg/m³ | 4.7E-04                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 9.7E-06     | NA                             | mg/kg/day | NA      | mg/kg/day | NA              |
|                       |                       |                         | Exp. Route Total |                               |         |       |                               |           |               |               | 9.7E-06     |                                |           | 0.0E+00 |           |                 |
|                       |                       | Exposure Point Total    |                  |                               |         |       |                               |           |               | 9.7E-06       |             |                                | 0.0E+00   |         |           |                 |
|                       | Exposure Medium Total |                         |                  |                               |         |       |                               |           | 9.7E-06       |               |             | 0.0E+00                        |           |         |           |                 |
| Ground Waterand Total |                       |                         |                  |                               |         |       |                               |           |               |               | 9.7E-06     |                                |           |         |           | 0.0E+00         |

**Table A1-7.2 RME**  
**CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
 Receptor Population: Industrial Worker  
 Receptor Age: Adult

| Medium       | Exposure Medium | Exposure Point                      | Exposure Route        | Chemical of<br>Potential Concern | EPC     |       | Cancer Risk Calculations      |           |               |               |             | Non-Cancer Hazard Calculations |           |         |           |                 |
|--------------|-----------------|-------------------------------------|-----------------------|----------------------------------|---------|-------|-------------------------------|-----------|---------------|---------------|-------------|--------------------------------|-----------|---------|-----------|-----------------|
|              |                 |                                     |                       |                                  | Value   | Units | Intake/Exposure Concentration |           | CSF/Unit Risk |               | Cancer Risk | Intake/Exposure Concentration  |           | RfD/RfC |           | Hazard Quotient |
|              |                 |                                     |                       |                                  |         |       | Value                         | Units     | Value         | Units         |             | Value                          | Units     | Value   | Units     |                 |
| Ground Water | Indoor Air      | Indoor Air<br>(PAL Boxing Facility) | Inhalation            | TETRACHLOROETHYLENE (PCE)        | 4.9E-04 | mg/m³ | 3.4E-05                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 7.0E-07     | 9.5E-05                        | mg/kg/day | 1.1E-01 | mg/kg/day | 8.6E-04         |
|              |                 |                                     | Exp. Route Total      |                                  |         |       |                               |           |               |               | 7.0E-07     |                                |           |         |           | 8.6E-04         |
|              |                 |                                     | Exposure Point Total  |                                  |         |       |                               |           |               |               | 7.0E-07     |                                |           |         |           | 8.6E-04         |
|              |                 |                                     | Exposure Medium Total |                                  |         |       |                               |           |               |               | 7.0E-07     |                                |           |         |           | 8.6E-04         |
|              |                 | Ground Waterand Total               |                       |                                  |         |       |                               |           |               |               |             |                                |           |         | 7.0E-07   |                 |

**Table A1-7.2 RME**  
**CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
 Receptor Population: Recreator (Boxing Facility User)  
 Receptor Age: Adolescent

| Medium       | Exposure Medium | Exposure Point                      | Exposure Route        | Chemical of<br>Potential Concern | EPC     |                   | Cancer Risk Calculations      |           |               |               |             | Non-Cancer Hazard Calculations |           |         |           |                 |
|--------------|-----------------|-------------------------------------|-----------------------|----------------------------------|---------|-------------------|-------------------------------|-----------|---------------|---------------|-------------|--------------------------------|-----------|---------|-----------|-----------------|
|              |                 |                                     |                       |                                  | Value   | Units             | Intake/Exposure Concentration |           | CSF/Unit Risk |               | Cancer Risk | Intake/Exposure Concentration  |           | RfD/RfC |           | Hazard Quotient |
|              |                 |                                     |                       |                                  |         |                   | Value                         | Units     | Value         | Units         |             | Value                          | Units     | Value   | Units     |                 |
| Ground Water | Indoor Air      | Indoor Air<br>(PAL Boxing Facility) | Inhalation            | TETRACHLOROETHYLENE (PCE)        | 4.9E-04 | mg/m <sup>3</sup> | 2.0E-06                       | mg/kg/day | 2.1E-02       | 1/(mg/kg-day) | 4.2E-08     | 7.6E-06                        | mg/kg/day | 1.1E-01 | mg/kg/day | 6.9E-05         |
|              |                 |                                     | Exp. Route Total      |                                  |         |                   |                               |           |               |               | 4.2E-08     |                                |           |         |           | 6.9E-05         |
|              |                 |                                     | Exposure Point Total  |                                  |         |                   |                               |           |               |               | 4.2E-08     |                                |           |         |           | 6.9E-05         |
|              |                 |                                     | Exposure Medium Total |                                  |         |                   |                               |           |               |               | 4.2E-08     |                                |           |         |           | 6.9E-05         |
|              |                 | Ground Waterand Total               |                       |                                  |         |                   |                               |           |               |               | 4.2E-08     |                                |           |         |           | 6.9E-05         |

**Table A1-9.1 RME**  
**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Adult

| Medium                 | Exposure Medium       | Exposure Point          | Chemical of Potential Concern | Carcinogenic Risk |            |        |                       | Non-Carcinogenic Hazard Quotient |           |            |         |                       |
|------------------------|-----------------------|-------------------------|-------------------------------|-------------------|------------|--------|-----------------------|----------------------------------|-----------|------------|---------|-----------------------|
|                        |                       |                         |                               | Ingestion         | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s)          | Ingestion | Inhalation | Dermal  | Exposure Routes Total |
| Ground Water           | Indoor Air            | Indoor Air (Property A) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA     | NA                    | Liver                            | NA        | 2.1E-02    | NA      | 2.1E-02               |
|                        |                       | Chemical Total          |                               |                   | NA         | NA     | NA                    | 0.0E+00                          |           | NA         | 2.1E-02 | NA                    |
|                        | Exposure Medium Total |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 2.1E-02    | NA      | 2.1E-02               |
| Ground Water and Total |                       |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 2.1E-02    | NA      | 2.1E-02               |
| Ground Water           | Indoor Air            | Indoor Air (Property B) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA     | NA                    | Liver                            | NA        | 2.9E-02    | NA      | 2.9E-02               |
|                        |                       | Chemical Total          |                               |                   | NA         | NA     | NA                    | 0.0E+00                          |           | NA         | 2.9E-02 | NA                    |
|                        | Exposure Medium Total |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 2.9E-02    | NA      | 2.9E-02               |
| Ground Water and Total |                       |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 2.9E-02    | NA      | 2.9E-02               |
| Ground Water           | Indoor Air            | Indoor Air (Property C) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA     | NA                    | Liver                            | NA        | 2.6E-02    | NA      | 2.6E-02               |
|                        |                       | Chemical Total          |                               |                   | NA         | NA     | NA                    | 0.0E+00                          |           | NA         | 2.6E-02 | NA                    |
|                        | Exposure Medium Total |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 2.6E-02    | NA      | 2.6E-02               |
| Ground Water and Total |                       |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 2.6E-02    | NA      | 2.6E-02               |
| Ground Water           | Indoor Air            | Indoor Air (Property D) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA     | NA                    | Liver                            | NA        | 2.0E-02    | NA      | 2.0E-02               |
|                        |                       | Chemical Total          |                               |                   | NA         | NA     | NA                    | 0.0E+00                          |           | NA         | 2.0E-02 | NA                    |
|                        | Exposure Medium Total |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 2.0E-02    | NA      | 2.0E-02               |
| Ground Water and Total |                       |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 2.0E-02    | NA      | 2.0E-02               |
| Ground Water           | Indoor Air            | Indoor Air (Property E) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA     | NA                    | Liver                            | NA        | 1.1E-02    | NA      | 1.1E-02               |
|                        |                       | Chemical Total          |                               |                   | NA         | NA     | NA                    | 0.0E+00                          |           | NA         | 1.1E-02 | NA                    |
|                        | Exposure Medium Total |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 1.1E-02    | NA      | 1.1E-02               |
| Ground Water and Total |                       |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 1.1E-02    | NA      | 1.1E-02               |
| Ground Water           | Indoor Air            | Indoor Air (Property F) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA     | NA                    | Liver                            | NA        | 1.9E-02    | NA      | 1.9E-02               |
|                        |                       | Chemical Total          |                               |                   | NA         | NA     | NA                    | 0.0E+00                          |           | NA         | 1.9E-02 | NA                    |
|                        | Exposure Medium Total |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 1.9E-02    | NA      | 1.9E-02               |
| Ground Water and Total |                       |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 1.9E-02    | NA      | 1.9E-02               |
| Ground Water           | Indoor Air            | Indoor Air (Property G) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA     | NA                    | Liver                            | NA        | 1.0E-02    | NA      | 1.0E-02               |
|                        |                       | Chemical Total          |                               |                   | NA         | NA     | NA                    | 0.0E+00                          |           | NA         | 1.0E-02 | NA                    |
|                        | Exposure Medium Total |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 1.0E-02    | NA      | 1.0E-02               |
| Ground Water and Total |                       |                         |                               | NA                | NA         | NA     | 0.0E+00               |                                  | NA        | 1.0E-02    | NA      | 1.0E-02               |

Total Circulatory HI Across Media = NA

Total Kidney HI Across Media = NA

**Table A1-9.1 RME**  
**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

| Medium                | Exposure Medium       | Exposure Point          | Chemical of Potential Concern | Carcinogenic Risk |            |         |                       | Non-Carcinogenic Hazard Quotient |           |            |         |                       |
|-----------------------|-----------------------|-------------------------|-------------------------------|-------------------|------------|---------|-----------------------|----------------------------------|-----------|------------|---------|-----------------------|
|                       |                       |                         |                               | Ingestion         | Inhalation | Dermal  | Exposure Routes Total | Primary Target Organ(s)          | Ingestion | Inhalation | Dermal  | Exposure Routes Total |
| Ground Water          | Indoor Air            | Indoor Air (Property A) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA      | NA                    | Liver                            | NA        | 4.9E-02    | NA      | 4.9E-02               |
|                       |                       | Chemical Total          |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 4.9E-02    | NA      | 4.9E-02               |
|                       | Exposure Medium Total |                         | NA                            | NA                | NA         | 0.0E+00 |                       | NA                               | 4.9E-02   | NA         | 4.9E-02 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 4.9E-02    | NA      | 4.9E-02               |
| Ground Water          | Indoor Air            | Indoor Air (Property B) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA      | NA                    | Liver                            | NA        | 6.8E-02    | NA      | 6.8E-02               |
|                       |                       | Chemical Total          |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 6.8E-02    | NA      | 6.8E-02               |
|                       | Exposure Medium Total |                         | NA                            | NA                | NA         | 0.0E+00 |                       | NA                               | 6.8E-02   | NA         | 6.8E-02 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 6.8E-02    | NA      | 6.8E-02               |
| Ground Water          | Indoor Air            | Indoor Air (Property C) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA      | NA                    | Liver                            | NA        | 6.1E-02    | NA      | 6.1E-02               |
|                       |                       | Chemical Total          |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 6.1E-02    | NA      | 6.1E-02               |
|                       | Exposure Medium Total |                         | NA                            | NA                | NA         | 0.0E+00 |                       | NA                               | 6.1E-02   | NA         | 6.1E-02 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 6.1E-02    | NA      | 6.1E-02               |
| Ground Water          | Indoor Air            | Indoor Air (Property D) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA      | NA                    | Liver                            | NA        | 4.7E-02    | NA      | 4.7E-02               |
|                       |                       | Chemical Total          |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 4.7E-02    | NA      | 4.7E-02               |
|                       | Exposure Medium Total |                         | NA                            | NA                | NA         | 0.0E+00 |                       | NA                               | 4.7E-02   | NA         | 4.7E-02 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 4.7E-02    | NA      | 4.7E-02               |
| Ground Water          | Indoor Air            | Indoor Air (Property E) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA      | NA                    | Liver                            | NA        | 2.6E-02    | NA      | 2.6E-02               |
|                       |                       | Chemical Total          |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 2.6E-02    | NA      | 2.6E-02               |
|                       | Exposure Medium Total |                         | NA                            | NA                | NA         | 0.0E+00 |                       | NA                               | 2.6E-02   | NA         | 2.6E-02 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 2.6E-02    | NA      | 2.6E-02               |
| Ground Water          | Indoor Air            | Indoor Air (Property F) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA      | NA                    | Liver                            | NA        | 4.4E-02    | NA      | 4.4E-02               |
|                       |                       | Chemical Total          |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 4.4E-02    | NA      | 4.4E-02               |
|                       | Exposure Medium Total |                         | NA                            | NA                | NA         | 0.0E+00 |                       | NA                               | 4.4E-02   | NA         | 4.4E-02 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 4.4E-02    | NA      | 4.4E-02               |
| Ground Water          | Indoor Air            | Indoor Air (Property G) | TETRACHLOROETHYLENE (PCE)     | NA                | NA         | NA      | NA                    | Liver                            | NA        | 2.4E-02    | NA      | 2.4E-02               |
|                       |                       | Chemical Total          |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 2.4E-02    | NA      | 2.4E-02               |
|                       | Exposure Medium Total |                         | NA                            | NA                | NA         | 0.0E+00 |                       | NA                               | 2.4E-02   | NA         | 2.4E-02 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | NA         | NA      | 0.0E+00               |                                  | NA        | 2.4E-02    | NA      | 2.4E-02               |

Total Circulatory HI Across Media = NA

Total Kidney HI Across Media = NA

**Table A1-9.1 RME**  
**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

|                                    |
|------------------------------------|
| Scenario Timeframe: Current/Future |
| Receptor Population: Resident      |
| Receptor Age: Adult/Child          |

| Medium                | Exposure Medium       | Exposure Point          | Chemical of Potential Concern | Carcinogenic Risk |            |         |                       | Non-Carcinogenic Hazard Quotient |           |            |        |                       |
|-----------------------|-----------------------|-------------------------|-------------------------------|-------------------|------------|---------|-----------------------|----------------------------------|-----------|------------|--------|-----------------------|
|                       |                       |                         |                               | Ingestion         | Inhalation | Dermal  | Exposure Routes Total | Primary Target Organ(s)          | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Ground Water          | Indoor Air            | Indoor Air (Property A) | TETRACHLOROETHYLENE (PCE)     | NA                | 2.6E-05    | NA      | 2.6E-05               | NA                               | NA        | NA         | NA     | NA                    |
|                       |                       | Chemical Total          |                               |                   | NA         | 2.6E-05 | NA                    | 2.6E-05                          |           | NA         | NA     | NA                    |
|                       | Exposure Medium Total |                         |                               | NA                | 2.6E-05    | NA      | 2.6E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Waterand Total |                       |                         |                               | NA                | 2.6E-05    | NA      | 2.6E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property B) | TETRACHLOROETHYLENE (PCE)     | NA                | 3.6E-05    | NA      | 3.6E-05               | NA                               | NA        | NA         | NA     | NA                    |
|                       |                       | Chemical Total          |                               |                   | NA         | 3.6E-05 | NA                    | 3.6E-05                          |           | NA         | NA     | NA                    |
|                       | Exposure Medium Total |                         |                               | NA                | 3.6E-05    | NA      | 3.6E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Waterand Total |                       |                         |                               | NA                | 3.6E-05    | NA      | 3.6E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property C) | TETRACHLOROETHYLENE (PCE)     | NA                | 3.2E-05    | NA      | 3.2E-05               | NA                               | NA        | NA         | NA     | NA                    |
|                       |                       | Chemical Total          |                               |                   | NA         | 3.2E-05 | NA                    | 3.2E-05                          |           | NA         | NA     | NA                    |
|                       | Exposure Medium Total |                         |                               | NA                | 3.2E-05    | NA      | 3.2E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Waterand Total |                       |                         |                               | NA                | 3.2E-05    | NA      | 3.2E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property D) | TETRACHLOROETHYLENE (PCE)     | NA                | 2.5E-05    | NA      | 2.5E-05               | NA                               | NA        | NA         | NA     | NA                    |
|                       |                       | Chemical Total          |                               |                   | NA         | 2.5E-05 | NA                    | 2.5E-05                          |           | NA         | NA     | NA                    |
|                       | Exposure Medium Total |                         |                               | NA                | 2.5E-05    | NA      | 2.5E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Waterand Total |                       |                         |                               | NA                | 2.5E-05    | NA      | 2.5E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property E) | TETRACHLOROETHYLENE (PCE)     | NA                | 1.4E-05    | NA      | 1.4E-05               | NA                               | NA        | NA         | NA     | NA                    |
|                       |                       | Chemical Total          |                               |                   | NA         | 1.4E-05 | NA                    | 1.4E-05                          |           | NA         | NA     | NA                    |
|                       | Exposure Medium Total |                         |                               | NA                | 1.4E-05    | NA      | 1.4E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Waterand Total |                       |                         |                               | NA                | 1.4E-05    | NA      | 1.4E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property F) | TETRACHLOROETHYLENE (PCE)     | NA                | 2.3E-05    | NA      | 2.3E-05               | NA                               | NA        | NA         | NA     | NA                    |
|                       |                       | Chemical Total          |                               |                   | NA         | 2.3E-05 | NA                    | 2.3E-05                          |           | NA         | NA     | NA                    |
|                       | Exposure Medium Total |                         |                               | NA                | 2.3E-05    | NA      | 2.3E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Waterand Total |                       |                         |                               | NA                | 2.3E-05    | NA      | 2.3E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property G) | TETRACHLOROETHYLENE (PCE)     | NA                | 1.3E-05    | NA      | 1.3E-05               | NA                               | NA        | NA         | NA     | NA                    |
|                       |                       | Chemical Total          |                               |                   | NA         | 1.3E-05 | NA                    | 1.3E-05                          |           | NA         | NA     | NA                    |
|                       | Exposure Medium Total |                         |                               | NA                | 1.3E-05    | NA      | 1.3E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |
| Ground Waterand Total |                       |                         |                               | NA                | 1.3E-05    | NA      | 1.3E-05               |                                  | NA        | NA         | NA     | 0.0E+00               |



**Table A1-9.1 CTE**  
**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**  
**CENTRAL TENDENCY EXPOSURE**  
Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Adult/Child

| Medium                | Exposure Medium       | Exposure Point          | Chemical of Potential Concern | Carcinogenic Risk |            |         |                       | Non-Carcinogenic Hazard Quotient |           |            |         |                       |
|-----------------------|-----------------------|-------------------------|-------------------------------|-------------------|------------|---------|-----------------------|----------------------------------|-----------|------------|---------|-----------------------|
|                       |                       |                         |                               | Ingestion         | Inhalation | Dermal  | Exposure Routes Total | Primary Target Organ(s)          | Ingestion | Inhalation | Dermal  | Exposure Routes Total |
| Ground Water          | Indoor Air            | Indoor Air (Property A) | TETRACHLOROETHYLENE (PCE)     | NA                | 8.8E-06    | NA      | 8.8E-06               | NA                               | NA        | NA         | NA      |                       |
|                       |                       | Chemical Total          |                               | NA                | 8.8E-06    | NA      | 8.8E-06               |                                  | NA        | NA         | NA      | 0.0E+00               |
|                       | Exposure Medium Total |                         | NA                            | 8.8E-06           | NA         | 8.8E-06 |                       | NA                               | NA        | NA         | 0.0E+00 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | 8.8E-06    | NA      | 8.8E-06               |                                  | NA        | NA         | NA      | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property B) | TETRACHLOROETHYLENE (PCE)     | NA                | 1.3E-05    | NA      | 1.3E-05               | NA                               | NA        | NA         | NA      |                       |
|                       |                       | Chemical Total          |                               | NA                | 1.3E-05    | NA      | 1.3E-05               |                                  | NA        | NA         | NA      | 0.0E+00               |
|                       | Exposure Medium Total |                         | NA                            | 1.3E-05           | NA         | 1.3E-05 |                       | NA                               | NA        | NA         | 0.0E+00 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | 1.3E-05    | NA      | 1.3E-05               |                                  | NA        | NA         | NA      | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property C) | TETRACHLOROETHYLENE (PCE)     | NA                | 1.8E-05    | NA      | 1.8E-05               | NA                               | NA        | NA         | NA      |                       |
|                       |                       | Chemical Total          |                               | NA                | 1.8E-05    | NA      | 1.8E-05               |                                  | NA        | NA         | NA      | 0.0E+00               |
|                       | Exposure Medium Total |                         | NA                            | 1.8E-05           | NA         | 1.8E-05 |                       | NA                               | NA        | NA         | 0.0E+00 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | 1.8E-05    | NA      | 1.8E-05               |                                  | NA        | NA         | NA      | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property D) | TETRACHLOROETHYLENE (PCE)     | NA                | 1.2E-05    | NA      | 1.2E-05               | NA                               | NA        | NA         | NA      |                       |
|                       |                       | Chemical Total          |                               | NA                | 1.2E-05    | NA      | 1.2E-05               |                                  | NA        | NA         | NA      | 0.0E+00               |
|                       | Exposure Medium Total |                         | NA                            | 1.2E-05           | NA         | 1.2E-05 |                       | NA                               | NA        | NA         | 0.0E+00 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | 1.2E-05    | NA      | 1.2E-05               |                                  | NA        | NA         | NA      | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property E) | TETRACHLOROETHYLENE (PCE)     | NA                | 9.4E-06    | NA      | 9.4E-06               | NA                               | NA        | NA         | NA      |                       |
|                       |                       | Chemical Total          |                               | NA                | 9.4E-06    | NA      | 9.4E-06               |                                  | NA        | NA         | NA      | 0.0E+00               |
|                       | Exposure Medium Total |                         | NA                            | 9.4E-06           | NA         | 9.4E-06 |                       | NA                               | NA        | NA         | 0.0E+00 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | 9.4E-06    | NA      | 9.4E-06               |                                  | NA        | NA         | NA      | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property F) | TETRACHLOROETHYLENE (PCE)     | NA                | 1.6E-05    | NA      | 1.6E-05               | NA                               | NA        | NA         | NA      |                       |
|                       |                       | Chemical Total          |                               | NA                | 1.6E-05    | NA      | 1.6E-05               |                                  | NA        | NA         | NA      | 0.0E+00               |
|                       | Exposure Medium Total |                         | NA                            | 1.6E-05           | NA         | 1.6E-05 |                       | NA                               | NA        | NA         | 0.0E+00 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | 1.6E-05    | NA      | 1.6E-05               |                                  | NA        | NA         | NA      | 0.0E+00               |
| Ground Water          | Indoor Air            | Indoor Air (Property G) | TETRACHLOROETHYLENE (PCE)     | NA                | 9.7E-06    | NA      | 9.7E-06               | NA                               | NA        | NA         | NA      |                       |
|                       |                       | Chemical Total          |                               | NA                | 9.7E-06    | NA      | 9.7E-06               |                                  | NA        | NA         | NA      | 0.0E+00               |
|                       | Exposure Medium Total |                         | NA                            | 9.7E-06           | NA         | 9.7E-06 |                       | NA                               | NA        | NA         | 0.0E+00 |                       |
| Ground Waterand Total |                       |                         |                               | NA                | 9.7E-06    | NA      | 9.7E-06               |                                  | NA        | NA         | NA      | 0.0E+00               |

**Table A1-9.2 RME**  
**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

Scenario Timeframe: Current/Future  
 Receptor Population: Industrial Worker  
 Receptor Age: Adult

| Medium       | Exposure Medium        | Exposure Point                   | Chemical of Potential Concern | Carcinogenic Risk |            |        |                       | Non-Carcinogenic Hazard Quotient |           |            |        |                       |
|--------------|------------------------|----------------------------------|-------------------------------|-------------------|------------|--------|-----------------------|----------------------------------|-----------|------------|--------|-----------------------|
|              |                        |                                  |                               | Ingestion         | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s)          | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Ground Water | Indoor Air             | Indoor Air (PAL Boxing Facility) | TETRACHLOROETHYLENE (PCE)     | NA                | 7.0E-07    | NA     | 7.0E-07               | Liver                            | NA        | 8.6E-04    | NA     | 8.6E-04               |
|              |                        | Chemical Total                   |                               | NA                | NA         | NA     | 7.0E-07               |                                  | NA        | 8.6E-04    | NA     | 8.6E-04               |
|              | Exposure Medium Total  |                                  |                               | NA                | NA         | NA     | 7.0E-07               |                                  | NA        | 8.6E-04    | NA     | 8.6E-04               |
|              | Ground Water and Total |                                  |                               | NA                | NA         | NA     | 7.0E-07               |                                  | NA        | 8.6E-04    | NA     | 8.6E-04               |

**Table A1-9.2 RME**  
**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**  
**REASONABLE MAXIMUM EXPOSURE**  
 Griggs and Walnut Ground Water Plume Site

|                                                       |
|-------------------------------------------------------|
| Scenario Timeframe: Current/Future                    |
| Receptor Population: Recreator (Boxing Facility User) |
| Receptor Age: Adolescent                              |

| Medium       | Exposure Medium        | Exposure Point                   | Chemical of Potential Concern | Carcinogenic Risk |            |        |                       | Non-Carcinogenic Hazard Quotient |           |            |        |                       |
|--------------|------------------------|----------------------------------|-------------------------------|-------------------|------------|--------|-----------------------|----------------------------------|-----------|------------|--------|-----------------------|
|              |                        |                                  |                               | Ingestion         | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s)          | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Ground Water | Indoor Air             | Indoor Air (PAL Boxing Facility) | TETRACHLOROETHYLENE (PCE)     | NA                | 4.2E-08    | NA     | 4.2E-08               | Liver                            | NA        | 6.9E-05    | NA     | 6.9E-05               |
|              |                        | Chemical Total                   |                               | NA                | NA         | NA     | 4.2E-08               |                                  | NA        | 6.9E-05    | NA     | 6.9E-05               |
|              | Exposure Medium Total  |                                  |                               | NA                | NA         | NA     | 4.2E-08               |                                  | NA        | 6.9E-05    | NA     | 6.9E-05               |
|              | Ground Water and Total |                                  |                               | NA                | NA         | NA     | 4.2E-08               |                                  | NA        | 6.9E-05    | NA     | 6.9E-05               |

# APPENDIX B

## Cost Tables

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE SUMMARY <sup>2</sup>

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

|                                                                 |                      |
|-----------------------------------------------------------------|----------------------|
| <b>Capital Cost</b>                                             |                      |
| Construction                                                    | \$ 1,764,781         |
| Project Management                                              | \$ 141,182           |
| Design                                                          | \$ 264,717           |
| Construction Management                                         | \$ 264,717           |
| Subcontractor General Requirements                              | \$ 88,239            |
| G&A                                                             | \$ 353,309           |
| Overhead                                                        | \$ 126,182           |
| Tax                                                             | \$ 179,809           |
| Contingency                                                     | \$ 630,909           |
| Bonding& Insurance                                              | \$ 76,277            |
| Fee                                                             | \$ 305,108           |
| <b>Total Capital Cost</b>                                       | <b>\$ 4,195,230</b>  |
| <b>Year 1 Operations and Maintenance</b>                        |                      |
| System Startup                                                  | \$ 27,050            |
| Routine System O&M                                              | \$ 357,127           |
| Reporting (Annual Report and Construction Completion Report)    | \$ 73,500            |
| Professional Services <sup>1</sup>                              | \$ 105,266           |
| Subcontractor General Requirements                              | \$ 22,884            |
| G&A                                                             | \$ 82,016            |
| Overhead                                                        | \$ 29,291            |
| Tax                                                             | \$ 41,740            |
| Contingency                                                     | \$ 146,457           |
| Bonding& Insurance                                              | \$ -                 |
| Fee                                                             | \$ 70,826            |
| <b>Total Year 1 Operations and Maintenance</b>                  | <b>\$ 956,157</b>    |
| <b>Annual Operations and Maintenance Cost: Years 2-5</b>        |                      |
| Routine System O&M                                              | \$ 304,087           |
| Reporting (Annual Reports)                                      | \$ 18,375            |
| Professional Services <sup>1</sup>                              | \$ 74,166            |
| Subcontractor General Requirements                              | \$ 16,123            |
| G&A                                                             | \$ 57,785            |
| Overhead                                                        | \$ 20,638            |
| New Mexico Gross Receipts Tax                                   | \$ 29,409            |
| Contingency                                                     | \$ 103,188           |
| Bonding& Insurance                                              | \$ -                 |
| Fee                                                             | \$ 49,902            |
| <b>Total Annual Operations and Maintenance Cost: Years 2-5</b>  | <b>\$ 673,672</b>    |
| <b>Annual Operations and Maintenance Cost: Years 6-14</b>       |                      |
| Routine System O&M                                              | \$ 287,711           |
| Reporting (Annual Reports)                                      | \$ 18,375            |
| Professional Services <sup>1</sup>                              | \$ 74,166            |
| Subcontractor General Requirements                              | \$ 16,123            |
| G&A                                                             | \$ 55,493            |
| Overhead                                                        | \$ 19,819            |
| New Mexico Gross Receipts Tax                                   | \$ 28,242            |
| Contingency                                                     | \$ 99,094            |
| Bonding& Insurance                                              | \$ -                 |
| Fee                                                             | \$ 47,922            |
| <b>Total Annual Operations and Maintenance Cost: Years 6-14</b> | <b>\$ 646,944</b>    |
| <b>Post Closure Cost</b>                                        |                      |
| Closure Reporting                                               | \$ 18,375            |
| Equipment Demobilization and Well Abandonment                   | \$ 184,000           |
| Professional Services <sup>1</sup>                              | \$ 66,784            |
| Subcontractor General Requirements                              | \$ 10,119            |
| G&A                                                             | \$ 39,099            |
| Overhead                                                        | \$ 13,964            |
| New Mexico Gross Receipts Tax                                   | \$ 19,899            |
| Contingency                                                     | \$ 69,819            |
| Bonding& Insurance                                              | \$ 8,441             |
| Fee                                                             | \$ 33,765            |
| <b>Total Post Closure Cost</b>                                  | <b>\$ 464,264</b>    |
| <b>TOTAL PRESENT WORTH</b>                                      | <b>\$ 14,132,838</b> |

#### NOTES:

1 - Professional Services includes Project Management, Design/Technical Support, and Construction Management.  
 2 - The cost estimates provided are to an accuracy of +50 percent to -30 percent and are prepared for the sole purpose of alternative comparison. The alternative cost estimates are in 2006 dollars and are based on conceptual design from information available at the time of this study. The actual cost of the project would depend on the final scope and design of the selected remedial action, the schedule of implementation, competitive market conditions, and other variables.

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### SITE DATA AND ALTERNATIVE CONCEPTUAL DESIGN

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
PREPARED BY: L.Colella, T.Palaia  
PROJECT NUMBER: 346535.FS.01

#### Site Background Data

Elevation of Site = 4100 ft amsl or 12.68 psia  
Volume of Contaminated Ground Water greater than 5 ug/L = 7,350 acre-ft based on JSAI model  
Volume of Contaminated Ground Water greater than 1 ug/L = 25,700 acre-ft based on JSAI model

PCE Concentrations in wells sampled December 2005.

| Sample Location | PCE (ug/L)                     |
|-----------------|--------------------------------|
| MW-SF1          | 11                             |
| MW-SF10         | 17                             |
| GWMW01 Port 2   | 21                             |
| GWMW01 Port 6   | 6                              |
|                 | 14 ug/L, average concentration |

#### Pumping Rates for Plume Containment and Remediation: 14 Years (per JSAI modeling)

|        |         |
|--------|---------|
| CLC-18 | 460 gpm |
| CLC-27 | 620 gpm |

New Well #1 to replace operation of CLC-18 after 5 years per JSAI modeling 300 gpm

|                          |           |
|--------------------------|-----------|
| Total Annual: Years 1-5  | 568 MMgal |
| Total Annual: Years 6-14 | 484 MMgal |

#### Mass Estimate

Mass of PCE above MCL in ground water = 150 kg of PCE based on JSAI model - JSAI estimate based on an effective porosity of 20% and does not address potential PCE mass in additional pore space

#### Conceptual Design

##### Pumping System Design Parameters

|                                      |                                          |
|--------------------------------------|------------------------------------------|
| Estimated Number of Pumping Wells =  | 3 wells                                  |
| Estimated pumping rate from CLC-18 = | 460 gpm (based on JSAI modeling results) |
| Estimated pumping rate from CLC-27 = | 620 gpm (based on JSAI modeling results) |

Estimated pumping rate from New Well = 300 gpm (to replace operation of CLC-18 after 5 years)

|                                   |                                            |
|-----------------------------------|--------------------------------------------|
| Total Pumping Rate in Years 1-5=  | 1,080 gpm (assumes CLC-18 and 27 only)     |
| Total Pumping Rate in Years 6-14= | 920 gpm (assumes CLC-27 and new well only) |
| Depth of new pumping well =       | 450 ft bgs                                 |

##### System Construction Time

|                                                             |              |                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Estimated drilling rate =                                   | 125 lf/day   | based on invoice                                                                                                                                                                                                                                                             |
| Total linear footage drilling =                             | 900 lf       |                                                                                                                                                                                                                                                                              |
| Estimated duration of drilling =                            | 7.2 days or  | 8 days (rounded up)                                                                                                                                                                                                                                                          |
| Estimated linear footage of field piping per pumping well = | 1500 lf      | average of piping required for all wells                                                                                                                                                                                                                                     |
| Total linear footage of connection piping =                 | 500 lf       | assumed 500 lf to stub up to treatment system and reconnect to existing CLC-27 line to UGR connection of CLC-18 to CLC -27 connection to Upper Griggs Reservoir; CLC estimated 1000 lf new piping needed in addition to the approximate length of 500 lf of existing piping. |
| Total linear footage of effluent field piping=              | 1,000 lf     |                                                                                                                                                                                                                                                                              |
| Total linear footage of effluent field piping=              | 750 lf       | estimated connection of new well to CLC -27 connection to Upper Griggs Reservoir                                                                                                                                                                                             |
| Estimated field piping placing rate =                       | 75 lf/day    |                                                                                                                                                                                                                                                                              |
| Estimated duration of field piping =                        | 30.0 days or | 30 days (rounded up)                                                                                                                                                                                                                                                         |
| Total construction timeframe =                              | 38 days      |                                                                                                                                                                                                                                                                              |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### SITE DATA AND ALTERNATIVE CONCEPTUAL DESIGN

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Air Stripper Design Parameters

Stripper design flowrate 1080 gpm  
 Unit flow rate 540 gpm (NEEP Model 41251 Tray Air stripper) 2 units in series needed for treatment  
 Governing contaminant PCE at 14 µg/L  
 Governing contaminant is based on consideration of a combination of low Henry's Constant and highest concentration versus MCL.  
 Influent temperature 50 °F

Unit Size: 12.5 ft x 7.3 ft NEEP Model 41251 Tray Air stripper

The Henry's Law Constant for PCE (25°C) = 176.5 atm  
 Converting the Henry's Constant for an actual temperature of 10 °C and using STRIPR Model data (CH2M HILL, 1991)  
 Actual Henry's Constant is 224 atm which is greater than the 10 atm threshold for effective air stripping.

Assume 100% of PCE is stripped and discharged untreated to the atmosphere. PCE is the controlling contaminant for air stripper design.

Vendor modeling indicates the Tray Air stripper uses a blower airflow rate of 2,400 scfm  
 PCE emissions 0.007 lbs/hr or 0.18 lbs/day or 65.2 lbs/yr  
 Average PCE emissions concentration is 0.8 mg/m<sup>3</sup> or 0.2 ppmv

PCE is a hazardous air pollutant and therefore is a regulated air pollutant

The NIOSH PEL (10-hr TWA) for PCE is 25 ppmv or 136.5 mg/m<sup>3</sup> or at 68°F and 1 atm  
 THEREFORE, NO OFFGAS EMISSIONS CONTROL WILL BE REQUIRED SINCE MASS EMISSIONS IS VERY LOW AND  
 THE CONCENTRATION IS TWO ORDERS OF MAGNITUDE LOWER THAN THE NIOSH STANDARD WITHOUT CONSIDERING ATMOSPHERIC DISPERSION.

#### Pretreatment Design Parameters - Langlier Index and Ryznar Stability Index for CaCO<sub>3</sub> Scaling Potential

|                   |                                    | 1 (influent water) | 2 (estimate of parameters within the stripper) |
|-------------------|------------------------------------|--------------------|------------------------------------------------|
| Flow              | gpm                                | 1080               | 1080                                           |
| Temperature       | Deg . F                            | 60                 | 77                                             |
| Alkalinity, Total | mg/l CaCO <sub>3</sub>             | 211                | 211                                            |
| pH                | Std. Units                         | 7.39               | 8.00                                           |
| TDS               | mg/l                               | 919                | 919                                            |
| Calcium           | mg/l CaCO <sub>3</sub>             | 305                | 305                                            |
| Magnesium         | mg/l CaCO <sub>3</sub>             | 124                | 123.6                                          |
| Sulfate           | mg/l SO <sub>4</sub> <sup>2-</sup> | 243                | 243                                            |
| Chloride          | mg/l Cl <sup>-</sup>               | 165                | 165                                            |
| LSI               |                                    | 0.170              | 0.936                                          |
| RSI               |                                    | 7.05               | 6.13                                           |

LSI greater than 1 indicates potential for scaling

RSI less than 6 indicates potential for scaling

The LSI is close to the level indicating potential for scaling

The RSI, which is more commonly used, is close to the level that indicates that there is a potential for scaling once the stripping process begins.

Slight changes in parameters affect the results of these calculations.

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                                               |            |               |              |                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------|------------|---------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                                              | Qty Unit   | Unit Cost     | Cost         | Comments and References                                                                                                                                                  |
| <u>Construction</u>                                                                        |            |               |              |                                                                                                                                                                          |
| Underground Piping from CLC-18 to CLC-27 connection to Upper Griggs Reservoir              | 1,000 ft   | \$ 100.17     | \$ 100,170   | estimated LF from CLC: cost includes 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                                          |
| Underground Piping from new extraction well to CLC-27 connection to Upper Griggs Reservoir | 750 ft     | \$ 100.17     | \$ 75,128    | 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                                                                               |
| Piping Connection to Treatment System                                                      | 500 lf     | \$ 100.17     | \$ 50,085    | 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                                                                               |
| Ground Water Extraction Well Installation                                                  | 1 well     | \$ 200,000.00 | \$ 200,000   | JSP Memo 7/8/06                                                                                                                                                          |
| Pumping Well Modifications                                                                 | 2 ea       | \$ 25,000.00  | \$ 50,000    | JSP Memo 7/8/06                                                                                                                                                          |
| Ground Water Extraction Pumps                                                              | 3 ea       | \$ 10,000.00  | \$ 30,000    | assume new + replace city pumps, vendor quote; 100gpm, 15 hp, 3-phase, 230V, 6 inch                                                                                      |
| Influent Equalization Tank                                                                 | 21,600 gal | \$ 1.00       | \$ 21,600    | provides 20-minutes of storage                                                                                                                                           |
| Tank Effluent Pump                                                                         | 0 ea       | \$ 4,000.00   | \$ -         | included with air stripper                                                                                                                                               |
| Influent and Effluent Bag Filters                                                          | 2 LS       | \$ 7,500.00   | \$ 15,000    | 1080 gpm size filter                                                                                                                                                     |
| Low-Profile Tray Air Stripper Package                                                      | 2 LS       | \$ 70,000.00  | \$ 140,000   | Assume 540 gpm NEEP Model 41251 Tray Air stripper (controls, piping, skid, blower, influent and effluent pumps)                                                          |
| Protective Enclosure                                                                       | 1 ea       | \$ 150,000.00 | \$ 150,000   | Assume 30'x25' building at \$200/sf, includes overhead crane, pre-fab metal                                                                                              |
| Repair discharge line on CLC-27                                                            | 1 LS       | \$ 300.00     | \$ 300       |                                                                                                                                                                          |
| Sulfuric Acid Bulk Storage Tank - Pretreatment Unit                                        | 1 LS       | \$ 65,663.20  | \$ 65,663    | 5,000 gal tank. 1 month supply, prorated costs for similar system, 1,000 gal unit at Fruit Ave, Albuquerque                                                              |
| Dessicant Dryer Unit - Pretreatment Unit                                                   | 1 LS       | \$ 39,397.92  | \$ 39,398    | 5,000 gal unit. prorated costs for similar system, 1,000 gal unit at Fruit Ave, Albuquerque                                                                              |
| Acid Feed Pump System - Pretreatment Unit                                                  | 1 LS       | \$ 83,384.29  | \$ 83,384    | Prorated costs for similar system, 100 gpm system at Fruit Ave, Albuquerque.                                                                                             |
| Acid Feed System Piping - Pretreatment Unit                                                | 1 LS       | \$ 44,923.64  | \$ 44,924    | Prorated costs based on facility size for similar system, 100 gpm at Fruit Ave, Albuquerque                                                                              |
| Health and Safety Provisions - Pretreatment Unit                                           | 1 LS       | \$ 8,000.00   | \$ 8,000     | Prorated costs for similar system, 100 gpm at Fruit Ave, Albuquerque                                                                                                     |
| Acid Storage Facility - Pretreatment Unit                                                  | 1 LS       | \$ 89,847.27  | \$ 89,847    | Assume 35'x35' for 5,000 gal tank incl. canopy, 2° concrete containment, and fencing. Prorated costs for similar system, 1,000 gal tank system at Fruit Ave, Albuquerque |
| Well Permits                                                                               | 1 ea       | \$ 30.00      | \$ 30        | new extraction well                                                                                                                                                      |
| Equipment Rental                                                                           | 26 wk      | \$ 200.00     | \$ 5,200     | MultiRAE                                                                                                                                                                 |
| Subtotal Capital Cost                                                                      |            |               | \$ 1,168,729 |                                                                                                                                                                          |



## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

1. The accuracy of the cost estimate is +50%/-30%
2. See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
3. The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
4. Number of new ground water extraction wells to be installed = 1 wells
5. Number of piezometers to be installed = 0 piezometers included under ground water monitoring
6. Number of reinjection wells to be installed = 0 wells
7. Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
8. The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
9. The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
10. The G&A rate is 14%
11. The overhead rate is 5%
12. The Bonding & Insurance rate is 2%
13. The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                           |        |      |                 |                     |                         |
|----------------------------------------|--------|------|-----------------|---------------------|-------------------------|
| Item/Activity                          | Qty    | Unit | Unit Cost       | Cost                | Comments and References |
| Site Work Allowance                    | 7%     | of   | \$ 1,168,728.81 | \$ 81,811           |                         |
| Mechanical Allowance                   | 15%    | of   | \$ 1,168,728.81 | \$ 175,309          |                         |
| Instrumentation and Controls Allowance | 12%    | of   | \$ 1,168,728.81 | \$ 140,247          | including SCADA system  |
| Electrical Allowance                   | 12%    | of   | \$ 1,168,728.81 | \$ 140,247          |                         |
| Miscellaneous Equipment Allowance      | 5%     | of   | \$ 1,168,728.81 | \$ 58,436           |                         |
| Subtotal Capital Cost                  |        |      |                 | \$ 1,764,781        |                         |
| Project Management                     | 8%     | of   | \$ 1,764,780.51 | \$ 141,182          |                         |
| Design                                 | 15%    | of   | \$ 1,764,780.51 | \$ 264,717          |                         |
| Construction Management                | 15%    | of   | \$ 1,764,780.51 | \$ 264,717          |                         |
| Subcontractor General Requirements     | 5%     | of   | \$ 1,764,780.51 | \$ 88,239           |                         |
| Subtotal Capital Cost                  |        |      |                 | \$ 2,523,636        |                         |
| G&A                                    | 14%    | of   | \$ 2,523,636.12 | \$ 353,309          |                         |
| Overhead                               | 5%     | of   | \$ 2,523,636.12 | \$ 126,182          |                         |
| New Mexico Gross Receipts Tax          | 7.125% | of   | \$ 2,523,636.12 | \$ 179,809          |                         |
| Contingency                            | 25%    | of   | \$ 2,523,636.12 | \$ 630,909          |                         |
| Subtotal Capital Cost                  |        |      |                 | \$ 3,813,845        |                         |
| Bonding& Insurance                     | 2%     | of   | \$ 3,813,845.09 | \$ 76,277           |                         |
| Fee                                    | 8%     | of   | \$ 3,813,845.09 | \$ 305,108          |                         |
| <b>TOTAL CAPITAL COST</b>              |        |      |                 | <b>\$ 4,195,230</b> |                         |

#### YEAR 1 OPERATIONS AND MAINTENANCE

| Item/Activity            | Qty | Unit   | Unit Cost   | Cost      | Comments                                                           |
|--------------------------|-----|--------|-------------|-----------|--------------------------------------------------------------------|
| <i>System Startup</i>    |     |        |             |           |                                                                    |
| Labor - Technician       | 150 | hr     | \$ 75.00    | \$ 11,250 | Assume 15 days for startup, 10 hrs/day                             |
| Labor - Engineer         | 100 | hr     | \$ 120.00   | \$ 12,000 | Assume 10 days for startup, 10 hrs/day                             |
| Air Sample Analysis      | 6   | sample | \$ 150.00   | \$ 900    | quarterly sampling to prove de minimis VOC emissions, plus 2 QA/QC |
| Water Sample Analysis    | 6   | sample | \$ 150.00   | \$ 900    | 3 sets, VOC analysis for infl/effl, incl data valid.               |
| Startup Equipment Rental | 2   | week   | \$ 1,000.00 | \$ 2,000  | water quality monitoring for pretreatment effectiveness            |
| Total System Startup     |     |        |             | \$ 27,050 |                                                                    |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                        |         |        |               |                   |                                                                                                                     |
|---------------------------------------------------------------------|---------|--------|---------------|-------------------|---------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                       | Qty     | Unit   | Unit Cost     | Cost              | Comments and References                                                                                             |
| <u>Routine System O&amp;M</u>                                       |         |        |               |                   |                                                                                                                     |
| Labor - Technician                                                  | 416     | hr     | \$ 75.00      | \$ 31,200         | 8 hours/week                                                                                                        |
| Labor - Engineer                                                    | 416     | hr     | \$ 120.00     | \$ 49,920         | 100% of the Tech time for first year                                                                                |
| Water Sample Analysis                                               | 29      | sample | \$ 150.00     | \$ 4,350          | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                     |
| Air Sample Analysis                                                 | 0       | sample | \$ 100.00     | \$ -              | none needed after startup                                                                                           |
| Acid Supply - Pretreatment Unit                                     | 1       | LS     | \$ 110,067.27 | \$ 110,067        | Prorated from 100 gpm system at Fruit Ave.                                                                          |
| O&M Supplies and Cleaning Subcontractor                             | 1       | LS     | \$ 4,000.00   | \$ 4,000          | Annual air stripper tray cleaning by subcontractor                                                                  |
| Electricity                                                         | 588,146 | kw-hr  | \$ 0.08       | \$ 47,052         | Air Stripper: 25 hp blowers + (2) 10 hp pumps per unit, full-time operations                                        |
| Annual Extraction Well and Distribution Operating Cost              | 568     | MMGal  | \$ 194.73     | \$ 110,538        | 98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27) |
| Total Routine System O&M                                            |         |        |               | \$ 357,127        |                                                                                                                     |
| <u>Reporting (Annual Report and Construction Completion Report)</u> |         |        |               |                   |                                                                                                                     |
| Labor - Engineer/Hydrogeologist                                     | 400     | hr     | \$ 120.00     | \$ 48,000         |                                                                                                                     |
| Labor - Editor                                                      | 200     | hr     | \$ 85.00      | \$ 17,000         |                                                                                                                     |
| Labor - CAD Technician                                              | 100     | hr     | \$ 85.00      | \$ 8,500          |                                                                                                                     |
| Total Annual Reporting                                              |         |        |               | \$ 73,500         |                                                                                                                     |
| Subtotal Year 1 Operations and Maintenance                          |         |        |               | \$ 457,677        |                                                                                                                     |
| Project Management                                                  | 8%      | of     | \$ 457,677.09 | \$ 36,614         |                                                                                                                     |
| Technical Support                                                   | 15%     | of     | \$ 457,677.09 | \$ 68,652         |                                                                                                                     |
| Construction Management                                             | 0%      | of     | \$ 457,677.09 | \$ -              |                                                                                                                     |
| Subcontractor General Requirements                                  | 5%      | of     | \$ 457,677.09 | \$ 22,884         |                                                                                                                     |
| Subtotal Year 1 Operations and Maintenance                          |         |        |               | \$ 585,827        |                                                                                                                     |
| G&A                                                                 | 14%     | of     | \$ 585,826.67 | \$ 82,016         |                                                                                                                     |
| Overhead                                                            | 5%      | of     | \$ 585,826.67 | \$ 29,291         |                                                                                                                     |
| New Mexico Gross Receipts Tax                                       | 7.125%  | of     | \$ 585,826.67 | \$ 41,740         |                                                                                                                     |
| Contingency                                                         | 25%     | of     | \$ 585,826.67 | \$ 146,457        |                                                                                                                     |
| Subtotal Year 1 Operations and Maintenance                          |         |        |               | \$ 885,331        |                                                                                                                     |
| Bonding & Insurance                                                 | 0%      | of     | \$ 885,330.56 | \$ -              | Bonding only applies to Capital Costs                                                                               |
| Fee                                                                 | 8%      | of     | \$ 885,330.56 | \$ 70,826         |                                                                                                                     |
| <b>TOTAL YEAR 1 OPERATIONS AND MAINTENANCE COST</b>                 |         |        |               | <b>\$ 956,157</b> |                                                                                                                     |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                     |         |        |               |            |                                                                                                                                                                      |
|------------------------------------------------------------------|---------|--------|---------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                    | Qty     | Unit   | Unit Cost     | Cost       | Comments and References                                                                                                                                              |
| ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 2-5 (ANNUAL COST) |         |        |               |            |                                                                                                                                                                      |
| Item/Activity                                                    | Qty     | Unit   | Unit Cost     | Cost       | Comments                                                                                                                                                             |
| <i>Routine System O&amp;M</i>                                    |         |        |               |            |                                                                                                                                                                      |
| Labor - Technician                                               | 208     | hr     | \$ 75.00      | \$ 15,600  | 4 hours/week                                                                                                                                                         |
| Labor - Engineer                                                 | 104     | hr     | \$ 120.00     | \$ 12,480  | 50% of the Tech time                                                                                                                                                 |
| Water Sample Analysis                                            | 29      | sample | \$ 150.00     | \$ 4,350   | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                                                                      |
| Acid Supply - Pretreatment Unit                                  | 1       | LS     | \$ 110,067.27 | \$ 110,067 | Prorated from 100 gpm system at Fruit Ave.                                                                                                                           |
| O&M Supplies and Cleaning Subcontractor                          | 1       | LS     | \$ 4,000.00   | \$ 4,000   | Annual air stripper tray cleaning by subcontractor                                                                                                                   |
| Electricity                                                      | 588,146 | kw-hr  | \$ 0.08       | \$ 47,052  | Air Stripper: 25 hp blowers + (2) 10 hp pumps per unit, full-time operations<br>98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values |
| Annual Extraction Well and Distribution Operating Cost           | 568     | MMGal  | \$ 194.73     | \$ 110,538 | (used avg. for CLC 19, 21, 27)                                                                                                                                       |
| Total Routine System O&M                                         |         |        |               | \$ 304,087 |                                                                                                                                                                      |
| <i>Reporting (Annual Reports)</i>                                |         |        |               |            |                                                                                                                                                                      |
| Labor - Engineer/Hydrogeologist                                  | 100     | hr     | \$ 120.00     | \$ 12,000  |                                                                                                                                                                      |
| Labor - Editor                                                   | 50      | hr     | \$ 85.00      | \$ 4,250   |                                                                                                                                                                      |
| Labor - CAD Technician                                           | 25      | hr     | \$ 85.00      | \$ 2,125   |                                                                                                                                                                      |
| Total Reporting                                                  |         |        |               | \$ 18,375  |                                                                                                                                                                      |
| Subtotal Year 2-5 Operations and Maintenance                     |         |        |               | \$ 322,462 |                                                                                                                                                                      |
| Project Management                                               | 8%      | of     | \$ 322,462.09 | \$ 25,797  |                                                                                                                                                                      |
| Technical Support                                                | 15%     | of     | \$ 322,462.09 | \$ 48,369  |                                                                                                                                                                      |
| Construction Management                                          | 0%      | of     | \$ 322,462.09 | \$ -       |                                                                                                                                                                      |
| Subcontractor General Requirements                               | 5%      | of     | \$ 322,462.09 | \$ 16,123  |                                                                                                                                                                      |
| Subtotal Year 2-5 Operations and Maintenance                     |         |        |               | \$ 412,751 |                                                                                                                                                                      |
| G&A                                                              | 14%     | of     | \$ 412,751.47 | \$ 57,785  |                                                                                                                                                                      |
| Overhead                                                         | 5%      | of     | \$ 412,751.47 | \$ 20,638  |                                                                                                                                                                      |
| New Mexico Gross Receipts Tax                                    | 7.125%  | of     | \$ 412,751.47 | \$ 29,409  |                                                                                                                                                                      |
| Contingency                                                      | 25%     | of     | \$ 412,751.47 | \$ 103,188 |                                                                                                                                                                      |
| Subtotal Year 2-5 Operations and Maintenance                     |         |        |               | \$ 623,771 |                                                                                                                                                                      |
| Bonding& Insurance                                               | 0%      | of     | \$ 623,770.67 | \$ -       | Bonding only applies to Capital Costs                                                                                                                                |
| Fee                                                              | 8%      | of     | \$ 623,770.67 | \$ 49,902  |                                                                                                                                                                      |
| TOTAL ANNUAL COST: YEARS 2-5 OPERATIONS AND MAINTENANCE COST     |         |        |               | \$ 673,672 |                                                                                                                                                                      |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                      |         |        |               |            |                                                                                                                                                                      |
|-------------------------------------------------------------------|---------|--------|---------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                     | Qty     | Unit   | Unit Cost     | Cost       | Comments and References                                                                                                                                              |
| ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 6-14 (ANNUAL COST) |         |        |               |            |                                                                                                                                                                      |
| Item/Activity                                                     | Qty     | Unit   | Unit Cost     | Cost       | Comments                                                                                                                                                             |
| <i>Routine System O&amp;M</i>                                     |         |        |               |            |                                                                                                                                                                      |
| Labor - Technician                                                | 208     | hr     | \$ 75.00      | \$ 15,600  | 4 hours/week                                                                                                                                                         |
| Labor - Engineer                                                  | 104     | hr     | \$ 120.00     | \$ 12,480  | 50% of the Tech time                                                                                                                                                 |
| Water Sample Analysis                                             | 29      | sample | \$ 150.00     | \$ 4,350   | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                                                                      |
| Acid Supply - Pretreatment Unit                                   | 1       | LS     | \$ 110,067.27 | \$ 110,067 | Prorated from 100 gpm system at Fruit Ave.                                                                                                                           |
| O&M Supplies and Cleaning Subcontractor                           | 1       | LS     | \$ 4,000.00   | \$ 4,000   | Annual air stripper tray cleaning by subcontractor                                                                                                                   |
| Electricity                                                       | 588,146 | kw-hr  | \$ 0.08       | \$ 47,052  | Air Stripper: 25 hp blowers + (2) 10 hp pumps per unit, full-time operations<br>98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values |
| Annual Extraction Well and Distribution Operating Cost            | 484     | MMGal  | \$ 194.73     | \$ 94,162  | (used avg. for CLC 19, 21, 27)                                                                                                                                       |
| Total Routine System O&M                                          |         |        |               | \$ 287,711 |                                                                                                                                                                      |
| <i>Reporting (Annual Reports)</i>                                 |         |        |               |            |                                                                                                                                                                      |
| Labor - Engineer/Hydrogeologist                                   | 100     | hr     | \$ 120.00     | \$ 12,000  |                                                                                                                                                                      |
| Labor - Editor                                                    | 50      | hr     | \$ 85.00      | \$ 4,250   |                                                                                                                                                                      |
| Labor - CAD Technician                                            | 25      | hr     | \$ 85.00      | \$ 2,125   |                                                                                                                                                                      |
| Total Reporting                                                   |         |        |               | \$ 18,375  |                                                                                                                                                                      |
| Subtotal Year 6-14 Operations and Maintenance                     |         |        |               | \$ 306,086 |                                                                                                                                                                      |
| Project Management                                                | 8%      | of     | \$ 322,462.09 | \$ 25,797  |                                                                                                                                                                      |
| Technical Support                                                 | 15%     | of     | \$ 322,462.09 | \$ 48,369  |                                                                                                                                                                      |
| Construction Management                                           | 0%      | of     | \$ 322,462.09 | \$ -       |                                                                                                                                                                      |
| Subcontractor General Requirements                                | 5%      | of     | \$ 322,462.09 | \$ 16,123  |                                                                                                                                                                      |
| Subtotal Year 6-14 Operations and Maintenance                     |         |        |               | \$ 396,375 |                                                                                                                                                                      |
| G&A                                                               | 14%     | of     | \$ 396,375.46 | \$ 55,493  |                                                                                                                                                                      |
| Overhead                                                          | 5%      | of     | \$ 396,375.46 | \$ 19,819  |                                                                                                                                                                      |
| New Mexico Gross Receipts Tax                                     | 7.125%  | of     | \$ 396,375.46 | \$ 28,242  |                                                                                                                                                                      |
| Contingency                                                       | 25%     | of     | \$ 396,375.46 | \$ 99,094  |                                                                                                                                                                      |
| Subtotal Year 6-14 Operations and Maintenance                     |         |        |               | \$ 599,022 |                                                                                                                                                                      |
| Bonding & Insurance                                               | 0%      | of     | \$ 599,022.41 | \$ -       | Bonding only applies to Capital Costs                                                                                                                                |
| Fee                                                               | 8%      | of     | \$ 599,022.41 | \$ 47,922  |                                                                                                                                                                      |
| TOTAL ANNUAL COST: YEARS 6-14 OPERATIONS AND MAINTENANCE COST     |         |        |               | \$ 646,944 |                                                                                                                                                                      |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                  |        |      |               |                   |                                                                          |
|---------------------------------------------------------------|--------|------|---------------|-------------------|--------------------------------------------------------------------------|
| Item/Activity                                                 | Qty    | Unit | Unit Cost     | Cost              | Comments and References                                                  |
| POST CLOSURE COST                                             |        |      |               |                   |                                                                          |
| Item/Activity                                                 | Qty    | Unit | Unit Cost     | Cost              | Comments                                                                 |
| <u>Closure Reporting</u>                                      |        |      |               |                   |                                                                          |
| Labor - Engineer/Hydrogeologist                               | 100    | hr   | \$120.00      | \$ 12,000         |                                                                          |
| Labor - Editor                                                | 50     | hr   | \$85.00       | \$ 4,250          |                                                                          |
| Labor - CAD Technician                                        | 25     | hr   | \$85.00       | \$ 2,125          |                                                                          |
| <u>Total Closure Reporting</u>                                |        |      |               | \$ 18,375         |                                                                          |
| <u>Equipment Demobilization and Well Abandonment</u>          |        |      |               |                   |                                                                          |
| Well Abandonment                                              | 1      | well | \$ 10,000.00  | \$ 10,000         | new extraction wells only, others included under ground water monitoring |
| Equipment Demobilization                                      | 1      | LS   | \$ 150,000.00 | \$ 150,000        |                                                                          |
| <u>Subtotal Equipment Demobilization and Well Abandonment</u> |        |      |               | \$ 160,000        |                                                                          |
| Site Work Allowance                                           | 10%    | of   | \$ 160,000.00 | \$ 16,000         |                                                                          |
| Mechanical Allowance                                          | 0%     | of   | \$ 160,000.00 | \$ -              |                                                                          |
| Instrumentation and Controls Allowance                        | 0%     | of   | \$ 160,000.00 | \$ -              |                                                                          |
| Electrical Allowance                                          | 5%     | of   | \$ 160,000.00 | \$ 8,000          |                                                                          |
| Miscellaneous Equipment Allowance                             | 0%     | of   | \$ 160,000.00 | \$ -              |                                                                          |
| <u>Total Equipment Demobilization and Well Abandonment</u>    |        |      |               | \$ 184,000        |                                                                          |
| <u>Subtotal Post-Closure Cost</u>                             |        |      |               | \$ 202,375        |                                                                          |
| Project Management                                            | 8%     | of   | \$ 202,375.00 | \$ 16,190         |                                                                          |
| Technical Support                                             | 15%    | of   | \$ 202,375.00 | \$ 30,356         |                                                                          |
| Construction Management                                       | 10%    | of   | \$ 202,375.00 | \$ 20,238         |                                                                          |
| Subcontractor General Requirements                            | 5%     | of   | \$ 202,375.00 | \$ 10,119         |                                                                          |
| <u>Subtotal Post-Closure Cost</u>                             |        |      |               | \$ 279,278        |                                                                          |
| G&A                                                           | 14%    | of   | \$ 279,277.50 | \$ 39,099         |                                                                          |
| Overhead                                                      | 5%     | of   | \$ 279,277.50 | \$ 13,964         |                                                                          |
| New Mexico Gross Receipts Tax                                 | 7.125% | of   | \$ 279,277.50 | \$ 19,899         |                                                                          |
| Contingency                                                   | 25%    | of   | \$ 279,277.50 | \$ 69,819         |                                                                          |
| <u>Subtotal Post-Closure Cost</u>                             |        |      |               | \$ 422,058        |                                                                          |
| Bonding& Insurance                                            | 2%     | of   | \$ 422,058.12 | \$ 8,441          |                                                                          |
| Fee                                                           | 8%     | of   | \$ 422,058.12 | \$ 33,765         |                                                                          |
| <b>TOTAL POST CLOSURE COST</b>                                |        |      |               | <b>\$ 464,264</b> |                                                                          |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### PRESENT WORTH ANALYSIS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

1. Real Discount Rate **3.00%** Source: OMB Circular No. A-94, Jan. 2007 version of Appendix C obtained from [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)
2. Assumes Total PV earns interest for an entire year (12 months), compound annually.
3. Escalation factor is **3.00%**

### Present Worth Analysis

|                                                    |      | E                     | A                   | B                    | C=A+B                | A*E                 | B*E                 | C*E                  |              |                             |
|----------------------------------------------------|------|-----------------------|---------------------|----------------------|----------------------|---------------------|---------------------|----------------------|--------------|-----------------------------|
|                                                    |      | Total PV              |                     |                      |                      | Capital Costs       |                     | Total PV O&M         | Total PV     | Balance of Interest Bearing |
| Elapsed Time                                       | Year | Discount Factor at 3% | Capital Cost        | O&M Cost             | Total Cost           | at 3%               | Costs at 3%         | Costs at 3%          | Costs at 3%  | Account at 3%               |
| 0                                                  | 2007 | 1.000                 | \$ 4,195,230        |                      | \$ 4,195,230         | \$ 4,195,230        | \$ -                | \$ 4,195,230         | \$ 4,195,230 | \$ 10,235,736               |
| 1                                                  | 2008 | 0.971                 |                     | \$ 984,842           | \$ 984,842           | \$ -                | \$ 956,157          | \$ 956,157           | \$ 956,157   | \$ 9,528,421                |
| 2                                                  | 2009 | 0.943                 |                     | \$ 714,699           | \$ 714,699           | \$ -                | \$ 673,672          | \$ 673,672           | \$ 673,672   | \$ 9,078,134                |
| 3                                                  | 2010 | 0.915                 |                     | \$ 736,140           | \$ 736,140           | \$ -                | \$ 673,672          | \$ 673,672           | \$ 673,672   | \$ 8,592,254                |
| 4                                                  | 2011 | 0.888                 |                     | \$ 758,224           | \$ 758,224           | \$ -                | \$ 673,672          | \$ 673,672           | \$ 673,672   | \$ 8,069,051                |
| 5                                                  | 2012 | 0.863                 |                     | \$ 780,971           | \$ 780,971           | \$ -                | \$ 673,672          | \$ 673,672           | \$ 673,672   | \$ 7,506,722                |
| 6                                                  | 2013 | 0.837                 |                     | \$ 772,485           | \$ 772,485           | \$ -                | \$ 646,944          | \$ 646,944           | \$ 646,944   | \$ 6,936,264                |
| 7                                                  | 2014 | 0.813                 |                     | \$ 795,660           | \$ 795,660           | \$ -                | \$ 646,944          | \$ 646,944           | \$ 646,944   | \$ 6,324,823                |
| 8                                                  | 2015 | 0.789                 |                     | \$ 819,530           | \$ 819,530           | \$ -                | \$ 646,944          | \$ 646,944           | \$ 646,944   | \$ 5,670,452                |
| 9                                                  | 2016 | 0.766                 |                     | \$ 844,115           | \$ 844,115           | \$ -                | \$ 646,944          | \$ 646,944           | \$ 646,944   | \$ 4,971,126                |
| 10                                                 | 2017 | 0.744                 |                     | \$ 869,439           | \$ 869,439           | \$ -                | \$ 646,944          | \$ 646,944           | \$ 646,944   | \$ 4,224,738                |
| 11                                                 | 2018 | 0.722                 |                     | \$ 895,522           | \$ 895,522           | \$ -                | \$ 646,944          | \$ 646,944           | \$ 646,944   | \$ 3,429,093                |
| 12                                                 | 2019 | 0.701                 |                     | \$ 922,388           | \$ 922,388           | \$ -                | \$ 646,944          | \$ 646,944           | \$ 646,944   | \$ 2,581,906                |
| 13                                                 | 2020 | 0.681                 |                     | \$ 950,059           | \$ 950,059           | \$ -                | \$ 646,944          | \$ 646,944           | \$ 646,944   | \$ 1,680,802                |
| 14                                                 | 2021 | 0.661                 | \$ 702,241          | \$ 978,561           | \$ 1,680,802         | \$ 464,264          | \$ 646,944          | \$ 1,111,208         | \$ 1,111,208 | \$ 0                        |
| <b>Total Alternative 4 Enhanced Ground Water E</b> |      |                       | <b>\$ 4,897,470</b> | <b>\$ 11,822,635</b> | <b>\$ 16,720,105</b> | <b>\$ 4,659,494</b> | <b>\$ 9,473,344</b> | <b>\$ 14,132,838</b> |              |                             |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE SUMMARY <sup>2</sup>

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

|                                                                 |                      |
|-----------------------------------------------------------------|----------------------|
| <b>Capital Cost</b>                                             |                      |
| Construction                                                    | \$ 1,763,925         |
| Project Management                                              | \$ 141,114           |
| Design                                                          | \$ 264,589           |
| Construction Management                                         | \$ 264,589           |
| Subcontractor General Requirements                              | \$ 88,196            |
| G&A                                                             | \$ 353,138           |
| Overhead                                                        | \$ 126,121           |
| Tax                                                             | \$ 179,722           |
| Contingency                                                     | \$ 630,603           |
| Bonding& Insurance                                              | \$ 76,240            |
| Fee                                                             | \$ 304,960           |
| <b>Total Capital Cost</b>                                       | <b>\$ 4,193,197</b>  |
| <b>Year 1 Operations and Maintenance</b>                        |                      |
| System Startup                                                  | \$ 53,400            |
| Routine System O&M                                              | \$ 252,240           |
| Reporting (Annual Report and Construction Completion Report)    | \$ 73,500            |
| Professional Services <sup>1</sup>                              | \$ 87,202            |
| Subcontractor General Requirements                              | \$ 18,957            |
| G&A                                                             | \$ 67,942            |
| Overhead                                                        | \$ 24,265            |
| Tax                                                             | \$ 34,578            |
| Contingency                                                     | \$ 121,325           |
| Bonding& Insurance                                              | \$ -                 |
| Fee                                                             | \$ 58,673            |
| <b>Total Year 1 Operations and Maintenance</b>                  | <b>\$ 792,081</b>    |
| <b>Annual Operations and Maintenance Cost: Years 2-5</b>        |                      |
| Routine System O&M                                              | \$ 199,200           |
| Reporting (Annual Reports)                                      | \$ 18,375            |
| Professional Services <sup>1</sup>                              | \$ 50,042            |
| Subcontractor General Requirements                              | \$ 10,879            |
| G&A                                                             | \$ 38,989            |
| Overhead                                                        | \$ 13,925            |
| New Mexico Gross Receipts Tax                                   | \$ 19,843            |
| Contingency                                                     | \$ 69,624            |
| Bonding& Insurance                                              | \$ -                 |
| Fee                                                             | \$ 33,670            |
| <b>Total Annual Operations and Maintenance Cost: Years 2-5</b>  | <b>\$ 454,547</b>    |
| <b>Annual Operations and Maintenance Cost: Years 6-14</b>       |                      |
| Routine System O&M                                              | \$ 182,824           |
| Reporting (Annual Reports)                                      | \$ 18,375            |
| Professional Services <sup>1</sup>                              | \$ 50,042            |
| Subcontractor General Requirements                              | \$ 10,879            |
| G&A                                                             | \$ 36,697            |
| Overhead                                                        | \$ 13,106            |
| New Mexico Gross Receipts Tax                                   | \$ 18,676            |
| Contingency                                                     | \$ 65,530            |
| Bonding& Insurance                                              | \$ -                 |
| Fee                                                             | \$ 31,690            |
| <b>Total Annual Operations and Maintenance Cost: Years 6-14</b> | <b>\$ 427,819</b>    |
| <b>Post Closure Cost</b>                                        |                      |
| Closure Reporting                                               | \$ 18,375            |
| Equipment Demobilization and Well Abandonment                   | \$ 184,000           |
| Professional Services <sup>1</sup>                              | \$ 66,784            |
| Subcontractor General Requirements                              | \$ 10,119            |
| G&A                                                             | \$ 39,099            |
| Overhead                                                        | \$ 13,964            |
| New Mexico Gross Receipts Tax                                   | \$ 19,899            |
| Contingency                                                     | \$ 69,819            |
| Bonding& Insurance                                              | \$ 8,441             |
| Fee                                                             | \$ 33,765            |
| <b>Total Post Closure Cost</b>                                  | <b>\$ 464,264</b>    |
| <b>TOTAL PRESENT WORTH</b>                                      | <b>\$ 11,118,104</b> |

#### NOTES:

1 - Professional Services includes Project Management, Design/Technical Support, and Construction Management.  
 2 - The cost estimates provided are to an accuracy of +50 percent to -30 percent and are prepared for the sole purpose of alternative comparison. The alternative cost estimates are in 2006 dollars and are based on conceptual design from information available at the time of this study. The actual cost of the project would depend on the final scope and design of the selected remedial action, the schedule of implementation, competitive market conditions, and other variables.

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### SITE DATA AND ALTERNATIVE CONCEPTUAL DESIGN

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
PREPARED BY: L.Colella, T.Palaia  
PROJECT NUMBER: 346535.FS.01

#### Site Background Data

|                                                          |        |            |       |      |                     |
|----------------------------------------------------------|--------|------------|-------|------|---------------------|
| Elevation of Site =                                      | 4100   | ft amsl or | 12.68 | psia |                     |
| Volume of Contaminated Ground water greater than 5 ug/L= | 7,350  | acre-ft    |       |      | based on JSAI model |
| Volume of Contaminated Ground water greater than 1 ug/L= | 25,700 | acre-ft    |       |      | based on JSAI model |

PCE Concentrations in wells sampled December 2005.

| Sample Location | PCE (ug/L) |
|-----------------|------------|
| MW-SF1          | 11         |
| MW-SF10         | 17         |
| GWMW01 Port 2   | 21         |
| GWMW01 Port 6   | 6          |
|                 | 14         |

ug/L, average concentration

Pumping Rates for Plume Containment and Remediation <20 Years (per JSAI modeling)

|        |     |     |
|--------|-----|-----|
| CLC-18 | 460 | gpm |
| CLC-27 | 620 | gpm |



## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### SITE DATA AND ALTERNATIVE CONCEPTUAL DESIGN

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PROJECT NUMBER: 346535.FS.01

New Well #1 to replace operation of CLC-18 after 5 years per JSAI modeling 300 gpm

|                          |     |       |
|--------------------------|-----|-------|
| Total Annual: Years 1-5  | 568 | MMgal |
| Total Annual: Years 6-14 | 484 | MMgal |

#### Mass Estimate

Mass of PCE above MCL in ground water = 150 kg of PCE based on JSAI model - JSAI estimate based on an effective porosity of 20% and does not address potential PCE mass in additional pore space

#### Conceptual Design

##### Pumping System Design Parameters

|                                      |                                          |
|--------------------------------------|------------------------------------------|
| Estimated Number of Pumping Wells =  | 3 wells                                  |
| Estimated pumping rate from CLC-18 = | 460 gpm (based on JSAI modeling results) |
| Estimated pumping rate from CLC-27 = | 620 gpm (based on JSAI modeling results) |

Estimated pumping rate from New Well = 300

Total Pumping Rate in Years 1-5= 1,080 gpm (assumes CLC-18 and 27 only)  
Total Pumping Rate in Years 6-14= 920 gpm (assumes CLC-27 and new well only)  
Depth of new pumping wells = 450 ft bgs

##### System Construction Time

|                                                             |             |                                                                                            |
|-------------------------------------------------------------|-------------|--------------------------------------------------------------------------------------------|
| Estimated drilling rate =                                   | 125 lf/day  | based on invoice                                                                           |
| Total linear footage drilling =                             | 900 lf      |                                                                                            |
| Estimated duration of drilling =                            | 7.2 days or | 8 days (rounded up)                                                                        |
| Estimated linear footage of field piping per pumping well = | 500 lf      | 1500 lf per well average of piping required for all wells                                  |
| Total linear footage of connection piping =                 |             | assumed 500 lf to stub up to treatment system and reconnect to existing CLC-27 line to UGR |

|                                                |              |                                                                                               |
|------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------|
| Total linear footage of effluent field piping= | 1,000 lf     | connection of CLC-18 to CLC -27 connection to Upper Griggs Reservoir; CLC estimated           |
| Total linear footage of effluent field piping= | 750 lf       | 1000 lf new piping needed in addition to the approximate length of 500 lf of existing piping. |
| Estimated field piping placing rate =          | 75 lf/day    | estimated connection of new well to CLC -27 connection to Upper Griggs Reservoir              |
| Estimated duration of field piping =           | 30.0 days or | 30 days (rounded up)                                                                          |
| Total construction timeframe =                 | 38 days      |                                                                                               |

##### HiPOx Treatment System Components (1080 gpm system)

|                                          |    |         |                                                                                                          |
|------------------------------------------|----|---------|----------------------------------------------------------------------------------------------------------|
| System Costs:                            | \$ | 531,250 | (Vendor quote [Applied Process Technology] of \$425,000 plus 25% uncertainty factor, plus FOB and taxes) |
| Operating Costs (per year - Vendor Quote |    |         |                                                                                                          |
| Oxygen Generator                         | \$ | 8,760   |                                                                                                          |
| Hydrogen Peroxide                        | \$ | 6,389   | Assumes NSF grade                                                                                        |
| O3 Generator Electricity                 | \$ | 4,739   |                                                                                                          |
| Consumable Costs                         | \$ | 19,888  |                                                                                                          |
| TOTAL ANNUAL COST                        | \$ | 39,776  |                                                                                                          |

Note: HiPOx is a specific patented ex-situ chemical oxidation process that combines ozone and hydrogen peroxide to destroy contaminants in the influent ground water

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

1. The accuracy of the cost estimate is +50%/-30%
2. See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
3. The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
4. Number of new ground water extraction wells to be installed = 1 wells
5. Number of piezometers to be installed = 0 piezometers included under ground water monitoring
6. Number of reinjection wells to be installed = 0 wells
7. Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
8. The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
9. The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
10. The G&A rate is 14%
11. The overhead rate is 5%
12. The Bonding & Insurance rate is 2%
13. The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                                                                              | Qty   | Unit | Unit Cost       | Cost         | Comments and References                                                                                                                                                       |
|--------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Construction</b>                                                                        |       |      |                 |              |                                                                                                                                                                               |
| Underground Piping from CLC-18 to CLC-27 connection to Upper Griggs Reservoir              | 1,000 | ft   | \$ 100.17       | \$ 100,170   | estimated LF from CLC: cost includes 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                                               |
| Underground Piping from new extraction well to CLC-27 connection to Upper Griggs Reservoir | 750   | ft   | \$ 100.17       | \$ 75,128    | 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                                                                                    |
| Piping Connection to Treatment System                                                      | 500   | lf   | \$ 100.17       | \$ 50,085    | 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                                                                                    |
| Pumping Well Modifications                                                                 | 2     | ea   | \$ 25,000.00    | \$ 50,000    | JSP Memo 7/8/06                                                                                                                                                               |
| Ground Water Extraction Well Installation                                                  | 1     | well | \$ 200,000.00   | \$ 200,000   | JSP Memo 7/8/06                                                                                                                                                               |
| Ground Water Extraction Pumps                                                              | 3     | ea   | \$ 10,000.00    | \$ 30,000    | assume new + replace city pumps, vendor quote; 100gpm, 15 hp, 3-phase, 230V, 6 inch                                                                                           |
| Influent Equalization Tank                                                                 | 0     | gal  | \$ 1.00         | \$ -         | provides 20 of storage                                                                                                                                                        |
| Tank Effluent Pump                                                                         | 2     | ea   | \$ 4,000.00     | \$ 8,000     | Assumes two 10 hp units (Pump with motor controls for 540 GPM @ 50'TDH)                                                                                                       |
| Influent and Effluent Bag Filters                                                          | 2     | LS   | \$ 7,500.00     | \$ 15,000    | gpm size filter                                                                                                                                                               |
|                                                                                            |       |      |                 |              | Equipment is skid mounted, pre-assembled, pre-tested, and fully automated. Equipment includes reactor, instruments, controls, H2O2 storage, O3 generator/chiller, and on-site |
| HiPOx Treatment System                                                                     | 1     | LS   | \$ 531,250.00   | \$ 531,250   | O2 generation system                                                                                                                                                          |
| HiPOx Bench Test                                                                           | 1     | LS   | \$ 3,000.00     | \$ 3,000     | 1-time bench test to accurately determine dosing requirements and equipment sizing                                                                                            |
| Protective Enclosure                                                                       | 1     | ea   | \$ 100,000.00   | \$ 100,000   | Vendor quote: 8' x 40' climate-controlled enclosure                                                                                                                           |
| Repair discharge line on CLC-27                                                            | 1     | LS   | \$ 300.00       | \$ 300       |                                                                                                                                                                               |
| Well Permits                                                                               | 1     | ea   | \$ 30.00        | \$ 30        | new extraction well                                                                                                                                                           |
| Equipment Rental                                                                           | 26    | wk   | \$ 200.00       | \$ 5,200     | MultiRAE                                                                                                                                                                      |
| <b>Subtotal Capital Cost</b>                                                               |       |      |                 | \$ 1,168,163 |                                                                                                                                                                               |
| Site Work Allowance                                                                        | 7%    | of   | \$ 1,168,162.50 | \$ 81,771    |                                                                                                                                                                               |
| Mechanical Allowance                                                                       | 15%   | of   | \$ 1,168,162.50 | \$ 175,224   |                                                                                                                                                                               |
| Instrumentation and Controls Allowance                                                     | 12%   | of   | \$ 1,168,162.50 | \$ 140,180   | including SCADA system                                                                                                                                                        |
| Electrical Allowance                                                                       | 12%   | of   | \$ 1,168,162.50 | \$ 140,180   |                                                                                                                                                                               |
| Miscellaneous Equipment Allowance                                                          | 5%    | of   | \$ 1,168,162.50 | \$ 58,408    |                                                                                                                                                                               |
| <b>Subtotal Capital Cost</b>                                                               |       |      |                 | \$ 1,763,925 |                                                                                                                                                                               |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                      | Qty    | Unit | Unit Cost       | Cost                | Comments and References |
|------------------------------------|--------|------|-----------------|---------------------|-------------------------|
| Project Management                 | 8%     | of   | \$ 1,763,925.38 | \$ 141,114          |                         |
| Design                             | 15%    | of   | \$ 1,763,925.38 | \$ 264,589          |                         |
| Construction Management            | 15%    | of   | \$ 1,763,925.38 | \$ 264,589          |                         |
| Subcontractor General Requirements | 5%     | of   | \$ 1,763,925.38 | \$ 88,196           |                         |
| Subtotal Capital Cost              |        |      |                 | \$ 2,522,413        |                         |
| G&A                                | 14%    | of   | \$ 2,522,413.29 | \$ 353,138          |                         |
| Overhead                           | 5%     | of   | \$ 2,522,413.29 | \$ 126,121          |                         |
| New Mexico Gross Receipts Tax      | 7.125% | of   | \$ 2,522,413.29 | \$ 179,722          |                         |
| Contingency                        | 25%    | of   | \$ 2,522,413.29 | \$ 630,603          |                         |
| Subtotal Capital Cost              |        |      |                 | \$ 3,811,997        |                         |
| Bonding & Insurance                | 2%     | of   | \$ 3,811,997.08 | \$ 76,240           |                         |
| Fee                                | 8%     | of   | \$ 3,811,997.08 | \$ 304,960          |                         |
| <b>TOTAL CAPITAL COST</b>          |        |      |                 | <b>\$ 4,193,197</b> |                         |

##### YEAR 1 OPERATIONS AND MAINTENANCE

| Item/Activity            | Qty | Unit   | Unit Cost   | Cost      | Comments                                             |
|--------------------------|-----|--------|-------------|-----------|------------------------------------------------------|
| <u>System Startup</u>    |     |        |             |           |                                                      |
| Labor - Technician       | 300 | hr     | \$ 75.00    | \$ 22,500 | Assume 30 days for startup, 10 hrs/day               |
| Labor - Engineer         | 200 | hr     | \$ 120.00   | \$ 24,000 | Assume 20 days for startup, 10 hrs/day               |
| Water Sample Analysis    | 6   | sample | \$ 150.00   | \$ 900    | 3 sets, VOC analysis for infl/effl, incl data valid. |
| Air Sample Analysis      | 0   | sample | \$ 150.00   | \$ -      | no air emissions from HiPOx                          |
| Startup Equipment Rental | 6   | week   | \$ 1,000.00 | \$ 6,000  | intensive water quality monitoring                   |
| Total System Startup     |     |        |             | \$ 53,400 |                                                      |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

1. The accuracy of the cost estimate is +50%/-30%
2. See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
3. The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
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8. The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
9. The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
10. The G&A rate is 14%
11. The overhead rate is 5%
12. The Bonding & Insurance rate is 2%
13. The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                        |         |        |               |            |                                                                                                                     |
|---------------------------------------------------------------------|---------|--------|---------------|------------|---------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                       | Qty     | Unit   | Unit Cost     | Cost       | Comments and References                                                                                             |
| <u>Routine System O&amp;M</u>                                       |         |        |               |            |                                                                                                                     |
| Labor - Technician                                                  | 416     | hr     | \$ 75.00      | \$ 31,200  | 8 hours/week                                                                                                        |
| Labor - Engineer                                                    | 416     | hr     | \$ 120.00     | \$ 49,920  | 100% of the Tech time for first year                                                                                |
| Water Sample Analysis                                               | 29      | sample | \$ 150.00     | \$ 4,350   | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                     |
| Air Sample Analysis                                                 | 0       | sample | \$ 100.00     | \$ -       | no air emissions from HiPOx                                                                                         |
| O&M Supplies                                                        | 1       | LS     | \$ 6,000.00   | \$ 6,000   |                                                                                                                     |
| Electricity                                                         | 130,699 | kw-hr  | \$ 0.08       | \$ 10,456  | Assumes continuous operation of the tank effluent pumps                                                             |
| HiPOx System O&M                                                    | 1       | LS     | \$ 39,776.00  | \$ 39,776  | chemical and O3 generator electrical costs per vendor                                                               |
| Annual Extraction Well and Distribution Operating Cost              | 568     | MMGal  | \$ 194.73     | \$ 110,538 | 98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27) |
| Total Routine System O&M                                            |         |        |               | \$ 252,240 |                                                                                                                     |
| <u>Reporting (Annual Report and Construction Completion Report)</u> |         |        |               |            |                                                                                                                     |
| Labor - Engineer/Hydrogeologist                                     | 400     | hr     | \$ 120.00     | \$ 48,000  |                                                                                                                     |
| Labor - Editor                                                      | 200     | hr     | \$ 85.00      | \$ 17,000  |                                                                                                                     |
| Labor - CAD Technician                                              | 100     | hr     | \$ 85.00      | \$ 8,500   |                                                                                                                     |
| Total Annual Reporting                                              |         |        |               | \$ 73,500  |                                                                                                                     |
| Subtotal Year 1 Operations and Maintenance                          |         |        |               | \$ 379,140 |                                                                                                                     |
| Project Management                                                  | 8%      | of     | \$ 379,140.05 | \$ 30,331  |                                                                                                                     |
| Technical Support                                                   | 15%     | of     | \$ 379,140.05 | \$ 56,871  |                                                                                                                     |
| Construction Management                                             | 0%      | of     | \$ 379,140.05 | \$ -       |                                                                                                                     |
| Subcontractor General Requirements                                  | 5%      | of     | \$ 379,140.05 | \$ 18,957  |                                                                                                                     |
| Subtotal Year 1 Operations and Maintenance                          |         |        |               | \$ 485,299 |                                                                                                                     |
| G&A                                                                 | 14%     | of     | \$ 485,299.26 | \$ 67,942  |                                                                                                                     |
| Overhead                                                            | 5%      | of     | \$ 485,299.26 | \$ 24,265  |                                                                                                                     |
| New Mexico Gross Receipts Tax                                       | 7.125%  | of     | \$ 485,299.26 | \$ 34,578  |                                                                                                                     |
| Contingency                                                         | 25%     | of     | \$ 485,299.26 | \$ 121,325 |                                                                                                                     |
| Subtotal Year 1 Operations and Maintenance                          |         |        |               | \$ 733,409 |                                                                                                                     |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                     |         |        |               |                   |                                                                                                                     |
|------------------------------------------------------------------|---------|--------|---------------|-------------------|---------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                    | Qty     | Unit   | Unit Cost     | Cost              | Comments and References                                                                                             |
| Bonding & Insurance                                              | 0%      | of     | \$ 733,408.51 | \$ -              | Bonding only applies to Capital Costs                                                                               |
| Fee                                                              | 8%      | of     | \$ 733,408.51 | \$ 58,673         |                                                                                                                     |
| <b>TOTAL YEAR 1 OPERATIONS AND MAINTENANCE COST</b>              |         |        |               | <b>\$ 792,081</b> |                                                                                                                     |
| ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 2-5 (ANNUAL COST) |         |        |               |                   |                                                                                                                     |
| Item/Activity                                                    | Qty     | Unit   | Unit Cost     | Cost              | Comments                                                                                                            |
| <i>Routine System O&amp;M</i>                                    |         |        |               |                   |                                                                                                                     |
| Labor - Technician                                               | 208     | hr     | \$ 75.00      | \$ 15,600         | 4 hours/week                                                                                                        |
| Labor - Engineer                                                 | 104     | hr     | \$ 120.00     | \$ 12,480         | 50% of the Tech time                                                                                                |
| Water Sample Analysis                                            | 29      | sample | \$ 150.00     | \$ 4,350          | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                     |
| O&M Supplies                                                     | 1       | LS     | \$ 6,000.00   | \$ 6,000          |                                                                                                                     |
| Electricity                                                      | 130,699 | kw-hr  | \$ 0.08       | \$ 10,456         | Assumes continuous operation of the tank effluent pumps                                                             |
| HiPOx System O&M                                                 | 1       | LS     | \$ 39,776.00  | \$ 39,776         | chemical and O3 generator electrical costs per vendor                                                               |
| Annual Extraction Well and Distribution Operating Cost           | 568     | MMGal  | \$ 194.73     | \$ 110,538        | 98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27) |
| <i>Total Routine System O&amp;M</i>                              |         |        |               | <b>\$ 199,200</b> |                                                                                                                     |
| <i>Reporting (Annual Reports)</i>                                |         |        |               |                   |                                                                                                                     |
| Labor - Engineer/Hydrogeologist                                  | 100     | hr     | \$ 120.00     | \$ 12,000         |                                                                                                                     |
| Labor - Editor                                                   | 50      | hr     | \$ 85.00      | \$ 4,250          |                                                                                                                     |
| Labor - CAD Technician                                           | 25      | hr     | \$ 85.00      | \$ 2,125          |                                                                                                                     |
| <i>Total Reporting</i>                                           |         |        |               | <b>\$ 18,375</b>  |                                                                                                                     |
| <b>Subtotal Year 2-5 Operations and Maintenance</b>              |         |        |               | <b>\$ 217,575</b> |                                                                                                                     |
| Project Management                                               | 8%      | of     | \$ 217,575.05 | \$ 17,406         |                                                                                                                     |
| Technical Support                                                | 15%     | of     | \$ 217,575.05 | \$ 32,636         |                                                                                                                     |
| Construction Management                                          | 0%      | of     | \$ 217,575.05 | \$ -              |                                                                                                                     |
| Subcontractor General Requirements                               | 5%      | of     | \$ 217,575.05 | \$ 10,879         |                                                                                                                     |
| <b>Subtotal Year 2-5 Operations and Maintenance</b>              |         |        |               | <b>\$ 278,496</b> |                                                                                                                     |
| G&A                                                              | 14%     | of     | \$ 278,496.06 | \$ 38,989         |                                                                                                                     |
| Overhead                                                         | 5%      | of     | \$ 278,496.06 | \$ 13,925         |                                                                                                                     |
| New Mexico Gross Receipts Tax                                    | 7.125%  | of     | \$ 278,496.06 | \$ 19,843         |                                                                                                                     |
| Contingency                                                      | 25%     | of     | \$ 278,496.06 | \$ 69,624         |                                                                                                                     |
| <b>Subtotal Year 2-5 Operations and Maintenance</b>              |         |        |               | <b>\$ 420,877</b> |                                                                                                                     |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                                                       | Qty | Unit | Unit Cost     | Cost              | Comments and References               |
|---------------------------------------------------------------------|-----|------|---------------|-------------------|---------------------------------------|
| Bonding & Insurance                                                 | 0%  | of   | \$ 420,877.17 | \$ -              | Bonding only applies to Capital Costs |
| Fee                                                                 | 8%  | of   | \$ 420,877.17 | \$ 33,670         |                                       |
| <b>TOTAL ANNUAL COST: YEARS 2-5 OPERATIONS AND MAINTENANCE COS*</b> |     |      |               | <b>\$ 454,547</b> |                                       |

##### ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 6-14 (ANNUAL COST)

| Item/Activity                                          | Qty     | Unit   | Unit Cost     | Cost       | Comments                                                                                                            |
|--------------------------------------------------------|---------|--------|---------------|------------|---------------------------------------------------------------------------------------------------------------------|
| <i>Routine System O&amp;M</i>                          |         |        |               |            |                                                                                                                     |
| Labor - Technician                                     | 208     | hr     | \$ 75.00      | \$ 15,600  | 4 hours/week                                                                                                        |
| Labor - Engineer                                       | 104     | hr     | \$ 120.00     | \$ 12,480  | 50% of the Tech time                                                                                                |
| Water Sample Analysis                                  | 29      | sample | \$ 150.00     | \$ 4,350   | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                     |
| O&M Supplies                                           | 1       | LS     | \$ 6,000.00   | \$ 6,000   |                                                                                                                     |
| Electricity                                            | 130,699 | kw-hr  | \$ 0.08       | \$ 10,456  | Assumes continuous operation of the tank effluent pumps                                                             |
| HIPOx System O&M                                       | 1       | LS     | \$ 39,776.00  | \$ 39,776  | chemical and O3 generator electrical costs per vendor                                                               |
| Annual Extraction Well and Distribution Operating Cost | 484     | MMGal  | \$ 194.73     | \$ 94,162  | 98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27) |
| Total Routine System O&M                               |         |        |               | \$ 182,824 |                                                                                                                     |
| <i>Reporting (Annual Reports)</i>                      |         |        |               |            |                                                                                                                     |
| Labor - Engineer/Hydrogeologist                        | 100     | hr     | \$ 120.00     | \$ 12,000  |                                                                                                                     |
| Labor - Editor                                         | 50      | hr     | \$ 85.00      | \$ 4,250   |                                                                                                                     |
| Labor - CAD Technician                                 | 25      | hr     | \$ 85.00      | \$ 2,125   |                                                                                                                     |
| Total Reporting                                        |         |        |               | \$ 18,375  |                                                                                                                     |
| Subtotal Year 6-14 Operations and Maintenance          |         |        |               | \$ 201,199 |                                                                                                                     |
| Project Management                                     | 8%      | of     | \$ 217,575.05 | \$ 17,406  |                                                                                                                     |
| Technical Support                                      | 15%     | of     | \$ 217,575.05 | \$ 32,636  |                                                                                                                     |
| Construction Management                                | 0%      | of     | \$ 217,575.05 | \$ -       |                                                                                                                     |
| Subcontractor General Requirements                     | 5%      | of     | \$ 217,575.05 | \$ 10,879  |                                                                                                                     |
| Subtotal Year 6-14 Operations and Maintenance          |         |        |               | \$ 262,120 |                                                                                                                     |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                                                       | Qty    | Unit | Unit Cost     | Cost              | Comments and References               |
|---------------------------------------------------------------------|--------|------|---------------|-------------------|---------------------------------------|
| G&A                                                                 | 14%    | of   | \$ 262,120.04 | \$ 36,697         |                                       |
| Overhead                                                            | 5%     | of   | \$ 262,120.04 | \$ 13,106         |                                       |
| New Mexico Gross Receipts Tax                                       | 7.125% | of   | \$ 262,120.04 | \$ 18,676         |                                       |
| Contingency                                                         | 25%    | of   | \$ 262,120.04 | \$ 65,530         |                                       |
| Subtotal Year 6-14 Operations and Maintenance                       |        |      |               | \$ 396,129        |                                       |
| Bonding& Insurance                                                  | 0%     | of   | \$ 396,128.92 | \$ -              | Bonding only applies to Capital Costs |
| Fee                                                                 | 8%     | of   | \$ 396,128.92 | \$ 31,690         |                                       |
| <b>TOTAL ANNUAL COST: YEARS 6-14 OPERATIONS AND MAINTENANCE COS</b> |        |      |               | <b>\$ 427,819</b> |                                       |

##### POST CLOSURE COST

| Item/Activity                                          | Qty | Unit | Unit Cost     | Cost       | Comments                                                                 |
|--------------------------------------------------------|-----|------|---------------|------------|--------------------------------------------------------------------------|
| <u>Closure Reporting</u>                               |     |      |               |            |                                                                          |
| Labor - Engineer/Hydrogeologist                        | 100 | hr   | \$120.00      | \$ 12,000  |                                                                          |
| Labor - Editor                                         | 50  | hr   | \$85.00       | \$ 4,250   |                                                                          |
| Labor - CAD Technician                                 | 25  | hr   | \$85.00       | \$ 2,125   |                                                                          |
| Total Closure Reporting                                |     |      |               | \$ 18,375  |                                                                          |
| <u>Equipment Demobilization and Well Abandonment</u>   |     |      |               |            |                                                                          |
| Well Abandonment                                       | 1   | well | \$ 10,000.00  | \$ 10,000  | new extraction wells only, others included under ground water monitoring |
| Equipment Demobilization                               | 1   | LS   | \$ 150,000.00 | \$ 150,000 |                                                                          |
| Subtotal Equipment Demobilization and Well Abandonment |     |      |               | \$ 160,000 |                                                                          |
| Site Work Allowance                                    | 10% | of   | \$ 160,000.00 | \$ 16,000  |                                                                          |
| Mechanical Allowance                                   | 0%  | of   | \$ 160,000.00 | \$ -       |                                                                          |
| Instrumentation and Controls Allowance                 | 0%  | of   | \$ 160,000.00 | \$ -       |                                                                          |
| Electrical Allowance                                   | 5%  | of   | \$ 160,000.00 | \$ 8,000   |                                                                          |
| Miscellaneous Equipment Allowance                      | 0%  | of   | \$ 160,000.00 | \$ -       |                                                                          |
| Subtotal Well Abandonment                              |     |      |               | \$ 184,000 |                                                                          |
| Subtotal Post-Closure Cost                             |     |      |               | \$ 202,375 |                                                                          |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

1. The accuracy of the cost estimate is +50%/-30%
2. See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
3. The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
4. Number of new ground water extraction wells to be installed = 1 wells
5. Number of piezometers to be installed = 0 piezometers included under ground water monitoring
6. Number of reinjection wells to be installed = 0 wells
7. Assume that the duration of construction is 129 working days (includes 90 working days for treatment system construction and installation)
8. The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
9. The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
10. The G&A rate is 14%
11. The overhead rate is 5%
12. The Bonding & Insurance rate is 2%
13. The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                      | Qty    | Unit | Unit Cost     | Cost              | Comments and References |
|------------------------------------|--------|------|---------------|-------------------|-------------------------|
| Project Management                 | 8%     | of   | \$ 202,375.00 | \$ 16,190         |                         |
| Technical Support                  | 15%    | of   | \$ 202,375.00 | \$ 30,356         |                         |
| Construction Management            | 10%    | of   | \$ 202,375.00 | \$ 20,238         |                         |
| Subcontractor General Requirements | 5%     | of   | \$ 202,375.00 | \$ 10,119         |                         |
| Subtotal Post-Closure Cost         |        |      |               | \$ 279,278        |                         |
| G&A                                | 14%    | of   | \$ 279,277.50 | \$ 39,099         |                         |
| Overhead                           | 5%     | of   | \$ 279,277.50 | \$ 13,964         |                         |
| New Mexico Gross Receipts Tax      | 7.125% | of   | \$ 279,277.50 | \$ 19,899         |                         |
| Contingency                        | 25%    | of   | \$ 279,277.50 | \$ 69,819         |                         |
| Subtotal Post-Closure Cost         |        |      |               | \$ 422,058        |                         |
| Bonding & Insurance                | 2%     | of   | \$ 422,058.12 | \$ 8,441          |                         |
| Fee                                | 8%     | of   | \$ 422,058.12 | \$ 33,765         |                         |
| <b>TOTAL POST CLOSURE COST</b>     |        |      |               | <b>\$ 464,264</b> |                         |



## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### PRESENT WORTH ANALYSIS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Chemical/UV Oxidation  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

1. Real Discount Rate **3.00%** Source: OMB Circular No. A-94, Jan. 2007 version of Appendix C obtained from [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)
2. Assumes Total PV earns interest for an entire year (12 months), compound annually.
3. Escalation factor is **3.00%**

### Present Worth Analysis

|                                                    |      | E                     | A                   | B                   | C=A+B                | A*E                 | B*E                 | C*E                  |               |                             |
|----------------------------------------------------|------|-----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|----------------------|---------------|-----------------------------|
|                                                    |      | Total PV              |                     |                     |                      | Capital Costs       |                     | Total PV O&M         | Total PV      | Balance of Interest Bearing |
| Elapsed Time                                       | Year | Discount Factor at 3% | Capital Cost        | O&M Cost            | Total Cost           | at 3%               | Costs at 3%         | Costs at 3%          | Account at 3% |                             |
| 0                                                  | 2007 | 1.000                 | \$ 4,193,197        |                     | \$ 4,193,197         | \$ 4,193,197        | \$ -                | \$ 4,193,197         | \$ 7,132,655  |                             |
| 1                                                  | 2008 | 0.971                 |                     | \$ 815,844          | \$ 815,844           | \$ -                | \$ 792,081          | \$ 792,081           | \$ 6,506,316  |                             |
| 2                                                  | 2009 | 0.943                 |                     | \$ 482,229          | \$ 482,229           | \$ -                | \$ 454,547          | \$ 454,547           | \$ 6,204,809  |                             |
| 3                                                  | 2010 | 0.915                 |                     | \$ 496,696          | \$ 496,696           | \$ -                | \$ 454,547          | \$ 454,547           | \$ 5,879,356  |                             |
| 4                                                  | 2011 | 0.888                 |                     | \$ 511,597          | \$ 511,597           | \$ -                | \$ 454,547          | \$ 454,547           | \$ 5,528,792  |                             |
| 5                                                  | 2012 | 0.863                 |                     | \$ 526,945          | \$ 526,945           | \$ -                | \$ 454,547          | \$ 454,547           | \$ 5,151,902  |                             |
| 6                                                  | 2013 | 0.837                 |                     | \$ 510,839          | \$ 510,839           | \$ -                | \$ 427,819          | \$ 427,819           | \$ 4,780,296  |                             |
| 7                                                  | 2014 | 0.813                 |                     | \$ 526,164          | \$ 526,164           | \$ -                | \$ 427,819          | \$ 427,819           | \$ 4,381,756  |                             |
| 8                                                  | 2015 | 0.789                 |                     | \$ 541,949          | \$ 541,949           | \$ -                | \$ 427,819          | \$ 427,819           | \$ 3,955,001  |                             |
| 9                                                  | 2016 | 0.766                 |                     | \$ 558,207          | \$ 558,207           | \$ -                | \$ 427,819          | \$ 427,819           | \$ 3,498,698  |                             |
| 10                                                 | 2017 | 0.744                 |                     | \$ 574,953          | \$ 574,953           | \$ -                | \$ 427,819          | \$ 427,819           | \$ 3,011,457  |                             |
| 11                                                 | 2018 | 0.722                 |                     | \$ 592,202          | \$ 592,202           | \$ -                | \$ 427,819          | \$ 427,819           | \$ 2,491,833  |                             |
| 12                                                 | 2019 | 0.701                 |                     | \$ 609,968          | \$ 609,968           | \$ -                | \$ 427,819          | \$ 427,819           | \$ 1,938,321  |                             |
| 13                                                 | 2020 | 0.681                 |                     | \$ 628,267          | \$ 628,267           | \$ -                | \$ 427,819          | \$ 427,819           | \$ 1,349,356  |                             |
| 14                                                 | 2021 | 0.661                 | \$ 702,241          | \$ 647,115          | \$ 1,349,356         | \$ 464,264          | \$ 427,819          | \$ 892,083           | \$ 0          |                             |
| <b>Total Alternative 4 Enhanced Ground Water E</b> |      |                       | <b>\$ 4,895,438</b> | <b>\$ 8,022,974</b> | <b>\$ 12,918,412</b> | <b>\$ 4,657,461</b> | <b>\$ 6,460,644</b> | <b>\$ 11,118,104</b> |               |                             |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE SUMMARY <sup>2</sup>

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with GAC  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

|                                                                 |                     |
|-----------------------------------------------------------------|---------------------|
| <b>Capital Cost</b>                                             |                     |
| Construction                                                    | \$ 1,498,996        |
| Project Management                                              | \$ 119,920          |
| Design                                                          | \$ 224,849          |
| Construction Management                                         | \$ 224,849          |
| Subcontractor General Requirements                              | \$ 74,950           |
| G&A                                                             | \$ 300,099          |
| Overhead                                                        | \$ 107,178          |
| Tax                                                             | \$ 152,729          |
| Contingency                                                     | \$ 535,891          |
| Bonding& Insurance                                              | \$ 64,789           |
| Fee                                                             | \$ 259,157          |
| <b>Total Capital Cost</b>                                       | <b>\$ 3,563,407</b> |
| <b>Year 1 Operations and Maintenance</b>                        |                     |
| System Startup                                                  | \$ 17,200           |
| Routine System O&M                                              | \$ 182,024          |
| Reporting (Annual Report and Construction Completion Report)    | \$ 73,500           |
| Professional Services <sup>1</sup>                              | \$ 62,727           |
| Subcontractor General Requirements                              | \$ 13,636           |
| G&A                                                             | \$ 48,872           |
| Overhead                                                        | \$ 17,454           |
| Tax                                                             | \$ 24,872           |
| Contingency                                                     | \$ 87,272           |
| Bonding& Insurance                                              | \$ -                |
| Fee                                                             | \$ 42,205           |
| <b>Total Year 1 Operations and Maintenance</b>                  | <b>\$ 569,762</b>   |
| <b>Annual Operations and Maintenance Cost: Years 2-5</b>        |                     |
| Routine System O&M                                              | \$ 161,984          |
| Reporting (Annual Reports)                                      | \$ 18,375           |
| Professional Services <sup>1</sup>                              | \$ 41,483           |
| Subcontractor General Requirements                              | \$ 9,018            |
| G&A                                                             | \$ 32,320           |
| Overhead                                                        | \$ 11,543           |
| New Mexico Gross Receipts Tax                                   | \$ 16,449           |
| Contingency                                                     | \$ 57,715           |
| Bonding& Insurance                                              | \$ -                |
| Fee                                                             | \$ 27,911           |
| <b>Total Annual Operations and Maintenance Cost: Years 2-5</b>  | <b>\$ 376,797</b>   |
| <b>Annual Operations and Maintenance Cost: Years 6-14</b>       |                     |
| Routine System O&M                                              | \$ 139,560          |
| Reporting (Annual Reports)                                      | \$ 18,375           |
| Professional Services <sup>1</sup>                              | \$ 41,483           |
| Subcontractor General Requirements                              | \$ 9,018            |
| G&A                                                             | \$ 29,181           |
| Overhead                                                        | \$ 10,422           |
| New Mexico Gross Receipts Tax                                   | \$ 14,851           |
| Contingency                                                     | \$ 52,109           |
| Bonding& Insurance                                              | \$ -                |
| Fee                                                             | \$ 25,200           |
| <b>Total Annual Operations and Maintenance Cost: Years 6-14</b> | <b>\$ 340,198</b>   |
| <b>Post Closure Cost</b>                                        |                     |
| Closure Reporting                                               | \$ 18,375           |
| Well Abandonment and Equipment Demobilization                   | \$ 126,500          |
| Professional Services <sup>1</sup>                              | \$ 47,809           |
| Subcontractor General Requirements                              | \$ 7,244            |
| G&A                                                             | \$ 27,990           |
| Overhead                                                        | \$ 9,996            |
| New Mexico Gross Receipts Tax                                   | \$ 14,245           |
| Contingency                                                     | \$ 49,982           |
| Bonding& Insurance                                              | \$ 6,043            |
| Fee                                                             | \$ 24,171           |
| <b>Total Post Closure Cost</b>                                  | <b>\$ 332,354</b>   |
| <b>TOTAL PRESENT WORTH</b>                                      | <b>\$ 9,034,497</b> |

#### NOTES:

1 - Professional Services includes Project Management, Design/Technical Support, and Construction Management.  
 2 - The cost estimates provided are to an accuracy of +50 percent to -30 percent and are prepared for the sole purpose of alternative comparison. The alternative cost estimates are in 2006 dollars and are based on conceptual design from information available at the time of this study. The actual cost of the project would depend on the final scope and design of the selected remedial action, the schedule of implementation, competitive market conditions, and other variables.

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### SITE DATA AND ALTERNATIVE CONCEPTUAL DESIGN

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
DESCRIPTION: Ground Water Extraction and Treatment with GAC  
PREPARED BY: L.Colella, T.Palaia  
PROJECT NUMBER: 346535.FS.01

#### Site Background Data

Elevation of Site = 4100 ft amsl or 12.68 psia  
Volume of Contaminated Ground Water greater than 5 ug/L = 7,350 acre-ft based on JSAI model  
Volume of Contaminated Ground Water greater than 1 ug/L = 25,700 acre-ft based on JSAI model

PCE Concentrations in wells sampled December 2005.

| Sample Location | PCE (µg/L)                     |
|-----------------|--------------------------------|
| MW-SF1          | 11                             |
| MW-SF10         | 17                             |
| GWMW01 Port 2   | 21                             |
| GWMW01 Port 6   | 6                              |
|                 | 14 µg/L, average concentration |

#### Pumping Rates for Plume Containment and Remediation <20 Years (per JSAI modeling)

|        |         |
|--------|---------|
| CLC-18 | 460 gpm |
| CLC-27 | 620 gpm |

New Well #1 to replace operation of CLC-18 after 5 years per JSAI modeling 300 gpm

|                          |     |       |
|--------------------------|-----|-------|
| Total Annual: Years 1-5  | 568 | MMgal |
| Total Annual: Years 6-14 | 484 | MMgal |

#### Mass Estimate

Mass of PCE above MCL in ground water = 150 kg of PCE based on JSAI model - JSAI estimate based on an effective porosity of 20% and does not address potential PCE mass in additional pore space

#### Conceptual Design

##### Pumping System Design Parameters

|                                      |                                          |
|--------------------------------------|------------------------------------------|
| Estimated Number of Pumping Wells =  | 3 wells                                  |
| Estimated pumping rate from CLC-18 = | 460 gpm (based on JSAI modeling results) |
| Estimated pumping rate from CLC-27 = | 620 gpm (based on JSAI modeling results) |

Estimated pumping rate from New Well = 300 gpm (to replace operation of CLC-18 after 5 years)

|                                   |                                            |
|-----------------------------------|--------------------------------------------|
| Total Pumping Rate in Years 1-5=  | 1,080 gpm (assumes CLC-18 and 27 only)     |
| Total Pumping Rate in Years 6-14= | 920 gpm (assumes CLC-27 and new well only) |
| Depth of new pumping wells =      | 450 ft bgs                                 |

##### System Construction Time

|                                                             |              |                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Estimated drilling rate =                                   | 125 lf/day   | based on invoice                                                                                                                                                                                                                                                             |
| Total linear footage drilling =                             | 900 lf       |                                                                                                                                                                                                                                                                              |
| Estimated duration of drilling =                            | 7.2 days or  | 8 days (rounded up)                                                                                                                                                                                                                                                          |
| Estimated linear footage of field piping per pumping well = | 1500 lf      | average of piping required for all wells                                                                                                                                                                                                                                     |
| Total linear footage of connection piping =                 | 500 lf       | assumed 500 lf to stub up to treatment system and reconnect to existing CLC-27 line to UGR connection of CLC-18 to CLC -27 connection to Upper Griggs Reservoir; CLC estimated 1000 lf new piping needed in addition to the approximate length of 500 lf of existing piping. |
| Total linear footage of effluent field piping=              | 1,000 lf     |                                                                                                                                                                                                                                                                              |
| Total linear footage of effluent field piping=              | 750 lf       | estimated connection of new well to CLC -27 connection to Upper Griggs Reservoir                                                                                                                                                                                             |
| Estimated field piping placing rate =                       | 75 lf/day    |                                                                                                                                                                                                                                                                              |
| Estimated duration of field piping =                        | 30.0 days or | 30 days (rounded up)                                                                                                                                                                                                                                                         |
| Total construction timeframe =                              | 38 days      |                                                                                                                                                                                                                                                                              |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### SITE DATA AND ALTERNATIVE CONCEPTUAL DESIGN

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
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DESCRIPTION: Ground Water Extraction and Treatment with GAC  
PREPARED BY: L.Colella, T.Palaia  
PROJECT NUMBER: 346535.FS.01

#### Granular Activated Carbon (GAC) Conceptual Design Parameters

All organic contaminants found are adsorbable with GAC.

GAC treatment system design flowrate is 1,080 gpm

Governing contaminant PCE at 14 µg/L

GAC usage rate for PCE only 0.99 lbs GAC/hr or 23.7 lbs GAC/day or 8,640 lbs GAC/yr based on GAC vendor modeling

Assuming a multiplier of 1.00 for additional organic contaminants that will also adsorb and use carbon (vendor modeling includes other contaminants)

The total GAC usage rate = 1.0 lbs GAC/hr or 23.7 lbs GAC/day or 8,640 lbs GAC/yr

Assuming a carbon cost of \$1.75 per lb GAC for supply and changeout --> \$15,120 per GAC changeout per year per vendor quote

Required changeout period of 0.2 times per year

Assume a carbon vessel size of 10,000 lb and we need

350 gpm

4 vessels in parallel

based on GAC vendor modeling

GAC Unit: QED Model CWS10000, rated for up to 350 gpm

Assuming a 10,000 lb vessel costs

\$18,000 with GAC, total cost = \$72,000 for vessels and GAC only per vendor quote

In addition, there would be an annual recurring cost of \$15,120 per GAC changeout per year

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
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 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with GAC  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 108 working days (includes 70 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                                               |        |        |                 |                     |                                                                                                                 |
|--------------------------------------------------------------------------------------------|--------|--------|-----------------|---------------------|-----------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                                              | Qty    | Unit   | Unit Cost       | Cost                | Comments and References                                                                                         |
| <u>Construction</u>                                                                        |        |        |                 |                     |                                                                                                                 |
| Underground Piping from CLC-18 to CLC-27 connection to Upper Griggs Reservoir              | 1,000  | ft     | \$ 100.17       | \$ 100,170          | estimated LF from CLC: cost includes 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means) |
| Underground Piping from new extraction well to CLC-27 connection to Upper Griggs Reservoir | 750    | ft     | \$ 100.17       | \$ 75,128           | 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                      |
| Piping Connection to Treatment System                                                      | 500    | lf     | \$ 100.17       | \$ 50,085           | 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                      |
| Pumping Well Modifications                                                                 | 2      | ea     | \$ 25,000.00    | \$ 50,000           | JSP Memo 7/8/06                                                                                                 |
| Ground Water Extraction Well Installation                                                  | 1      | well   | \$ 200,000.00   | \$ 200,000          | JSP Memo 7/8/06                                                                                                 |
| Ground Water Extraction Pumps                                                              | 3      | ea     | \$ 10,000.00    | \$ 30,000           | assume new + replace city pumps, vendor quote; 100gpm, 15 hp, 3-phase, 230V, 6 inch                             |
| Influent Equalization Tank                                                                 | 21,600 | gal    | \$ 1.00         | \$ 21,600           | provides 20-minutes of storage                                                                                  |
| Tank Effluent Pump                                                                         | 2      | ea     | \$ 4,000.00     | \$ 8,000            | Assumes 10 hp units - one pump will supply 2 GAC units (Pump with motor controls for 540 GPM @ 50'TDH)          |
| Influent and Effluent Bag Filters                                                          | 2      | LS     | \$ 7,500.00     | \$ 15,000           | 0 gpm size filter                                                                                               |
| GAC Treatment system                                                                       | 4      | vessel | \$ 72,000.00    | \$ 288,000          | QED Model CWS10000, rated for up to 350 gpm                                                                     |
| Protective Enclosure                                                                       | 1      | ea     | \$ 150,000.00   | \$ 150,000          | Assume 30'x25' building at \$200/sf, includes overhead crane, pre-fab metal                                     |
| Repair discharge line on CLC-27                                                            | 1      | LS     | \$ 300.00       | \$ 300              |                                                                                                                 |
| Well Permits                                                                               | 1      | ea     | \$ 30.00        | \$ 30               | new extraction well                                                                                             |
| Equipment Rental                                                                           | 22     | wk     | \$ 200.00       | \$ 4,400            | MultiRAE                                                                                                        |
| <b>Subtotal Capital Cost</b>                                                               |        |        |                 | <b>\$ 992,713</b>   |                                                                                                                 |
| Site Work Allowance                                                                        | 7%     | of     | \$ 992,712.50   | \$ 69,490           |                                                                                                                 |
| Mechanical Allowance                                                                       | 15%    | of     | \$ 992,712.50   | \$ 148,907          |                                                                                                                 |
| Instrumentation and Controls Allowance                                                     | 12%    | of     | \$ 992,712.50   | \$ 119,126          | including SCADA system                                                                                          |
| Electrical Allowance                                                                       | 12%    | of     | \$ 992,712.50   | \$ 119,126          |                                                                                                                 |
| Miscellaneous Equipment Allowance                                                          | 5%     | of     | \$ 992,712.50   | \$ 49,636           |                                                                                                                 |
| <b>Subtotal Capital Cost</b>                                                               |        |        |                 | <b>\$ 1,498,996</b> |                                                                                                                 |
| Project Management                                                                         | 8%     | of     | \$ 1,498,995.88 | \$ 119,920          |                                                                                                                 |
| Design                                                                                     | 15%    | of     | \$ 1,498,995.88 | \$ 224,849          |                                                                                                                 |
| Construction Management                                                                    | 15%    | of     | \$ 1,498,995.88 | \$ 224,849          |                                                                                                                 |
| Subcontractor General Requirements                                                         | 5%     | of     | \$ 1,498,995.88 | \$ 74,950           |                                                                                                                 |
| <b>Subtotal Capital Cost</b>                                                               |        |        |                 | <b>\$ 2,143,564</b> |                                                                                                                 |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with GAC  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

1. The accuracy of the cost estimate is +50%/-30%
2. See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
3. The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
4. Number of new ground water extraction wells to be installed = 1 wells
5. Number of piezometers to be installed = 0 piezometers included under ground water monitoring
6. Number of reinjection wells to be installed = 0 wells
7. Assume that the duration of construction is 108 working days (includes 70 working days for treatment system construction and installation)
8. The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
9. The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
10. The G&A rate is 14%
11. The overhead rate is 5%
12. The Bonding & Insurance rate is 2%
13. The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                  |        |      |                 |              |                         |
|-------------------------------|--------|------|-----------------|--------------|-------------------------|
| Item/Activity                 | Qty    | Unit | Unit Cost       | Cost         | Comments and References |
| G&A                           | 14%    | of   | \$ 2,143,564.10 | \$ 300,099   |                         |
| Overhead                      | 5%     | of   | \$ 2,143,564.10 | \$ 107,178   |                         |
| New Mexico Gross Receipts Tax | 7.125% | of   | \$ 2,143,564.10 | \$ 152,729   |                         |
| Contingency                   | 25%    | of   | \$ 2,143,564.10 | \$ 535,891   |                         |
| Subtotal Capital Cost         |        |      |                 | \$ 3,239,461 |                         |
|                               |        |      |                 |              |                         |
| Bonding& Insurance            | 2%     | of   | \$ 3,239,461.25 | \$ 64,789    |                         |
| Fee                           | 8%     | of   | \$ 3,239,461.25 | \$ 259,157   |                         |
| TOTAL CAPITAL COST            |        |      |                 | \$ 3,563,407 |                         |

| YEAR 1 OPERATIONS AND MAINTENANCE                      |         |        |              |            |                                                                                                                                                                                         |
|--------------------------------------------------------|---------|--------|--------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                          | Qty     | Unit   | Unit Cost    | Cost       | Comments                                                                                                                                                                                |
| <u>System Startup</u>                                  |         |        |              |            |                                                                                                                                                                                         |
| Labor - Technician                                     | 100     | hr     | \$ 75.00     | \$ 7,500   | Assume 10 days for startup, 10 hrs/day                                                                                                                                                  |
| Labor - Engineer                                       | 70      | hr     | \$ 120.00    | \$ 8,400   | Assume 7 days for startup, 10 hrs/day                                                                                                                                                   |
| Water Sample Analysis                                  | 6       | sample | \$ 150.00    | \$ 900     | 3 sets, VOC analysis for infl/effl, incl data valid.                                                                                                                                    |
| Air Sample Analysis                                    | 0       | sample | \$ 150.00    | \$ -       | no air emissions with GAC                                                                                                                                                               |
| Startup Equipment Rental                               | 2       | week   | \$ 200.00    | \$ 400     |                                                                                                                                                                                         |
| Total System Startup                                   |         |        |              | \$ 17,200  |                                                                                                                                                                                         |
| <u>Routine System O&amp;M</u>                          |         |        |              |            |                                                                                                                                                                                         |
| Labor - Technician                                     | 208     | hr     | \$ 75.00     | \$ 15,600  | 4 hours/week                                                                                                                                                                            |
| Labor - Engineer                                       | 208     | hr     | \$ 120.00    | \$ 24,960  | 100% of the Tech time for first year                                                                                                                                                    |
| Water Sample Analysis                                  | 29      | sample | \$ 150.00    | \$ 4,350   | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                                                                                         |
| Air Sample Analysis                                    | 0       | sample | \$ -         | \$ -       | no air emissions with GAC                                                                                                                                                               |
| O&M Supplies                                           | 1       | LS     | \$ 1,000.00  | \$ 1,000   |                                                                                                                                                                                         |
| GAC Replacement                                        | 1       | LS     | \$ 15,120.00 | \$ 15,120  |                                                                                                                                                                                         |
| Electricity                                            | 130,699 | kw-hr  | \$ 0.08      | \$ 10,456  | Assumes continuous operation of the tank effluent pumps<br>98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27). Assumes |
| Annual Extraction Well and Distribution Operating Cost | 568     | MMGal  | \$ 194.73    | \$ 110,538 | O&M costs for new well will be the same as for CLC-18.                                                                                                                                  |
| Total Routine System O&M                               |         |        |              | \$ 182,024 |                                                                                                                                                                                         |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with GAC  
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 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 108 working days (includes 70 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                        |        |      |               |                   |                                       |
|---------------------------------------------------------------------|--------|------|---------------|-------------------|---------------------------------------|
| Item/Activity                                                       | Qty    | Unit | Unit Cost     | Cost              | Comments and References               |
| <i>Reporting (Annual Report and Construction Completion Report)</i> |        |      |               |                   |                                       |
| Labor - Engineer/Hydrogeologist                                     | 400    | hr   | \$ 120.00     | \$ 48,000         |                                       |
| Labor - Editor                                                      | 200    | hr   | \$ 85.00      | \$ 17,000         |                                       |
| Labor - CAD Technician                                              | 100    | hr   | \$ 85.00      | \$ 8,500          |                                       |
| <b>Total Annual Reporting</b>                                       |        |      |               | <b>\$ 73,500</b>  |                                       |
| <b>Subtotal Year 1 Operations and Maintenance</b>                   |        |      |               | <b>\$ 272,724</b> |                                       |
| Project Management                                                  | 8%     | of   | \$ 272,724.05 | \$ 21,818         |                                       |
| Technical Support                                                   | 15%    | of   | \$ 272,724.05 | \$ 40,909         |                                       |
| Construction Management                                             | 0%     | of   | \$ 272,724.05 | \$ -              |                                       |
| Subcontractor General Requirements                                  | 5%     | of   | \$ 272,724.05 | \$ 13,636         |                                       |
| <b>Subtotal Year 1 Operations and Maintenance</b>                   |        |      |               | <b>\$ 349,087</b> |                                       |
| G&A                                                                 | 14%    | of   | \$ 349,086.78 | \$ 48,872         |                                       |
| Overhead                                                            | 5%     | of   | \$ 349,086.78 | \$ 17,454         |                                       |
| New Mexico Gross Receipts Tax                                       | 7.125% | of   | \$ 349,086.78 | \$ 24,872         |                                       |
| Contingency                                                         | 25%    | of   | \$ 349,086.78 | \$ 87,272         |                                       |
| <b>Subtotal Year 1 Operations and Maintenance</b>                   |        |      |               | <b>\$ 527,557</b> |                                       |
| Bonding& Insurance                                                  | 0%     | of   | \$ 527,557.40 | \$ -              | Bonding only applies to Capital Costs |
| Fee                                                                 | 8%     | of   | \$ 527,557.40 | \$ 42,205         |                                       |
| <b>TOTAL YEAR 1 OPERATIONS AND MAINTENANCE COST</b>                 |        |      |               | <b>\$ 569,762</b> |                                       |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

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#### Assumptions

1. The accuracy of the cost estimate is +50%/-30%
2. See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
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8. The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
9. The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
10. The G&A rate is 14%
11. The overhead rate is 5%
12. The Bonding & Insurance rate is 2%
13. The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                            |         |        |               |                   |                                                                                                                                                                                |
|-------------------------------------------------------------------------|---------|--------|---------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                           | Qty     | Unit   | Unit Cost     | Cost              | Comments and References                                                                                                                                                        |
| <b>ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 2-5 (ANNUAL COST)</b> |         |        |               |                   |                                                                                                                                                                                |
| Item/Activity                                                           | Qty     | Unit   | Unit Cost     | Cost              | Comments                                                                                                                                                                       |
| <i>Routine System O&amp;M</i>                                           |         |        |               |                   |                                                                                                                                                                                |
| Labor - Technician                                                      | 208     | hr     | \$ 75.00      | \$ 15,600         | 4 hours/week                                                                                                                                                                   |
| Labor - Engineer                                                        | 104     | hr     | \$ 120.00     | \$ 12,480         | 50% of the Tech time                                                                                                                                                           |
| Water Sample Analysis                                                   | 29      | sample | \$ 150.00     | \$ 4,350          | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                                                                                |
| O&M Supplies                                                            | 1       | LS     | \$ 1,000.00   | \$ 1,000          |                                                                                                                                                                                |
| GAC Replacement                                                         | 1       | LS     | \$ 7,560.00   | \$ 7,560          | assumes GAC usage rate drops 50% from initial rate                                                                                                                             |
| Electricity                                                             | 130,699 | kw-hr  | \$ 0.08       | \$ 10,456         | Assumes continuous operation of the tank effluent pumps<br>98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27) |
| Annual Extraction Well and Distribution Operating Cost                  | 568     | MMGal  | \$ 194.73     | \$ 110,538        |                                                                                                                                                                                |
| Total Routine System O&M                                                |         |        |               | \$ 161,984        |                                                                                                                                                                                |
| <i>Reporting (Annual Reports)</i>                                       |         |        |               |                   |                                                                                                                                                                                |
| Labor - Engineer/Hydrogeologist                                         | 100     | hr     | \$ 120.00     | \$ 12,000         |                                                                                                                                                                                |
| Labor - Editor                                                          | 50      | hr     | \$ 85.00      | \$ 4,250          |                                                                                                                                                                                |
| Labor - CAD Technician                                                  | 25      | hr     | \$ 85.00      | \$ 2,125          |                                                                                                                                                                                |
| Total Reporting                                                         |         |        |               | \$ 18,375         |                                                                                                                                                                                |
| Subtotal Year 2-5 Operations and Maintenance                            |         |        |               | \$ 180,359        |                                                                                                                                                                                |
| Project Management                                                      | 8%      | of     | \$ 180,359.05 | \$ 14,429         |                                                                                                                                                                                |
| Technical Support                                                       | 15%     | of     | \$ 180,359.05 | \$ 27,054         |                                                                                                                                                                                |
| Construction Management                                                 | 0%      | of     | \$ 180,359.05 | \$ -              |                                                                                                                                                                                |
| Subcontractor General Requirements                                      | 5%      | of     | \$ 180,359.05 | \$ 9,018          |                                                                                                                                                                                |
| Subtotal Year 2-5 Operations and Maintenance                            |         |        |               | \$ 230,860        |                                                                                                                                                                                |
| G&A                                                                     | 14%     | of     | \$ 230,859.58 | \$ 32,320         |                                                                                                                                                                                |
| Overhead                                                                | 5%      | of     | \$ 230,859.58 | \$ 11,543         |                                                                                                                                                                                |
| New Mexico Gross Receipts Tax                                           | 7.125%  | of     | \$ 230,859.58 | \$ 16,449         |                                                                                                                                                                                |
| Contingency                                                             | 25%     | of     | \$ 230,859.58 | \$ 57,715         |                                                                                                                                                                                |
| Subtotal Year 2-5 Operations and Maintenance                            |         |        |               | \$ 348,887        |                                                                                                                                                                                |
| Bonding& Insurance                                                      | 0%      | of     | \$ 348,886.54 | \$ -              | Bonding only applies to Capital Costs                                                                                                                                          |
| Fee                                                                     | 8%      | of     | \$ 348,886.54 | \$ 27,911         |                                                                                                                                                                                |
| <b>TOTAL ANNUAL COST: YEARS 2-5 OPERATIONS AND MAINTENANCE COST</b>     |         |        |               | <b>\$ 376,797</b> |                                                                                                                                                                                |



## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with GAC  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

1. The accuracy of the cost estimate is +50%/-30%
2. See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
3. The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
4. Number of new ground water extraction wells to be installed = 1 wells
5. Number of piezometers to be installed = 0 piezometers included under ground water monitoring
6. Number of reinjection wells to be installed = 0 wells
7. Assume that the duration of construction is 108 working days (includes 70 working days for treatment system construction and installation)
8. The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
9. The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
10. The G&A rate is 14%
11. The overhead rate is 5%
12. The Bonding & Insurance rate is 2%
13. The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                             |               |               |            |                                                                                                                                                                                |
|--------------------------------------------------------------------------|---------------|---------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                            | Qty Unit      | Unit Cost     | Cost       | Comments and References                                                                                                                                                        |
| <b>ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 6-10 (ANNUAL COST)</b> |               |               |            |                                                                                                                                                                                |
| Item/Activity                                                            | Qty Unit      | Unit Cost     | Cost       | Comments                                                                                                                                                                       |
| <i>Routine System O&amp;M</i>                                            |               |               |            |                                                                                                                                                                                |
| Labor - Technician                                                       | 208 hr        | \$ 75.00      | \$ 15,600  | 4 hours/week                                                                                                                                                                   |
| Labor - Engineer                                                         | 104 hr        | \$ 120.00     | \$ 12,480  | 50% of the Tech time                                                                                                                                                           |
| Water Sample Analysis                                                    | 29 sample     | \$ 150.00     | \$ 4,350   | monthly infil/effl sampling for permit, plus 20% extra for QA/QC                                                                                                               |
| O&M Supplies                                                             | 1 LS          | \$ 1,000.00   | \$ 1,000   |                                                                                                                                                                                |
| GAC Replacement                                                          | 1 LS          | \$ 1,512.00   | \$ 1,512   | assumes GAC usage rate drops 90% from initial rate                                                                                                                             |
| Electricity                                                              | 130,699 kw-hr | \$ 0.08       | \$ 10,456  | Assumes continuous operation of the tank effluent pumps<br>98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27) |
| Annual Extraction Well and Distribution Operating Cost                   | 484 MMGal     | \$ 194.73     | \$ 94,162  |                                                                                                                                                                                |
| Total Routine System O&M                                                 |               |               | \$ 139,560 |                                                                                                                                                                                |
| <i>Reporting (Annual Reports)</i>                                        |               |               |            |                                                                                                                                                                                |
| Labor - Engineer/Hydrogeologist                                          | 100 hr        | \$ 120.00     | \$ 12,000  |                                                                                                                                                                                |
| Labor - Editor                                                           | 50 hr         | \$ 85.00      | \$ 4,250   |                                                                                                                                                                                |
| Labor - CAD Technician                                                   | 25 hr         | \$ 85.00      | \$ 2,125   |                                                                                                                                                                                |
| Total Reporting                                                          |               |               | \$ 18,375  |                                                                                                                                                                                |
| Subtotal Year 6-10 Operations and Maintenance                            |               |               | \$ 157,935 |                                                                                                                                                                                |
| Project Management                                                       | 8% of         | \$ 180,359.05 | \$ 14,429  |                                                                                                                                                                                |
| Technical Support                                                        | 15% of        | \$ 180,359.05 | \$ 27,054  |                                                                                                                                                                                |
| Construction Management                                                  | 0% of         | \$ 180,359.05 | \$ -       |                                                                                                                                                                                |
| Subcontractor General Requirements                                       | 5% of         | \$ 180,359.05 | \$ 9,018   |                                                                                                                                                                                |
| Subtotal Year 6-10 Operations and Maintenance                            |               |               | \$ 208,436 |                                                                                                                                                                                |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with GAC  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 108 working days (includes 70 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                                                        | Qty    | Unit | Unit Cost     | Cost              | Comments and References               |
|----------------------------------------------------------------------|--------|------|---------------|-------------------|---------------------------------------|
| G&A                                                                  | 14%    | of   | \$ 208,435.56 | \$ 29,181         |                                       |
| Overhead                                                             | 5%     | of   | \$ 208,435.56 | \$ 10,422         |                                       |
| New Mexico Gross Receipts Tax                                        | 7.125% | of   | \$ 208,435.56 | \$ 14,851         |                                       |
| Contingency                                                          | 25%    | of   | \$ 208,435.56 | \$ 52,109         |                                       |
| Subtotal Year 6-10 Operations and Maintenance                        |        |      |               | \$ 314,998        |                                       |
| Bonding& Insurance                                                   | 0%     | of   | \$ 314,998.25 | \$ -              | Bonding only applies to Capital Costs |
| Fee                                                                  | 8%     | of   | \$ 314,998.25 | \$ 25,200         |                                       |
| <b>TOTAL ANNUAL COST: YEARS 6-10 OPERATIONS AND MAINTENANCE COST</b> |        |      |               | <b>\$ 340,198</b> |                                       |

##### POST CLOSURE COST

| Item/Activity                                          | Qty | Unit | Unit Cost     | Cost       | Comments |
|--------------------------------------------------------|-----|------|---------------|------------|----------|
| <u>Closure Reporting</u>                               |     |      |               |            |          |
| Labor - Engineer/Hydrogeologist                        | 100 | hr   | \$120.00      | \$ 12,000  |          |
| Labor - Editor                                         | 50  | hr   | \$85.00       | \$ 4,250   |          |
| Labor - CAD Technician                                 | 25  | hr   | \$85.00       | \$ 2,125   |          |
| Total Closure Reporting                                |     |      |               | \$ 18,375  |          |
| <u>Well Abandonment and Equipment Demobilization</u>   |     |      |               |            |          |
| Well Abandonment                                       | 1   | well | \$ 10,000.00  | \$ 10,000  |          |
| Equipment Demobilization                               | 1   | LS   | \$ 100,000.00 | \$ 100,000 |          |
| Subtotal Well Abandonment and Equipment Demobilization |     |      |               | \$ 110,000 |          |
| Site Work Allowance                                    | 10% | of   | \$ 110,000.00 | \$ 11,000  |          |
| Mechanical Allowance                                   | 0%  | of   | \$ 110,000.00 | \$ -       |          |
| Instrumentation and Controls Allowance                 | 0%  | of   | \$ 110,000.00 | \$ -       |          |
| Electrical Allowance                                   | 5%  | of   | \$ 110,000.00 | \$ 5,500   |          |
| Miscellaneous Equipment Allowance                      | 0%  | of   | \$ 110,000.00 | \$ -       |          |
| Subtotal Equipment Demobilization and Well Abandonment |     |      |               | \$ 126,500 |          |
| Subtotal Post-Closure Cost                             |     |      |               | \$ 144,875 |          |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with GAC  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 108 working days (includes 70 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes only new extraction well(s)
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                      | Qty    | Unit | Unit Cost     | Cost              | Comments and References               |
|------------------------------------|--------|------|---------------|-------------------|---------------------------------------|
| Project Management                 | 8%     | of   | \$ 144,875.00 | \$ 11,590         |                                       |
| Technical Support                  | 15%    | of   | \$ 144,875.00 | \$ 21,731         |                                       |
| Construction Management            | 10%    | of   | \$ 144,875.00 | \$ 14,488         |                                       |
| Subcontractor General Requirements | 5%     | of   | \$ 144,875.00 | \$ 7,244          |                                       |
| <b>Subtotal Post-Closure Cost</b>  |        |      |               | <b>\$ 199,928</b> |                                       |
| G&A                                | 14%    | of   | \$ 199,927.50 | \$ 27,990         |                                       |
| Overhead                           | 5%     | of   | \$ 199,927.50 | \$ 9,996          |                                       |
| New Mexico Gross Receipts Tax      | 7.125% | of   | \$ 199,927.50 | \$ 14,245         |                                       |
| Contingency                        | 25%    | of   | \$ 199,927.50 | \$ 49,982         |                                       |
| <b>Subtotal Post-Closure Cost</b>  |        |      |               | <b>\$ 302,140</b> |                                       |
| Bonding& Insurance                 | 2%     | of   | \$ 302,140.43 | \$ 6,043          | Bonding only applies to Capital Costs |
| Fee                                | 8%     | of   | \$ 302,140.43 | \$ 24,171         |                                       |
| <b>TOTAL POST CLOSURE COST</b>     |        |      |               | <b>\$ 332,354</b> |                                       |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### PRESENT WORTH ANALYSIS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with GAC  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

1. Real Discount Rate **3.00%** Source: OMB Circular No. A-94, Jan. 2007 version of Appendix C obtained from [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)
2. Assumes Total PV earns interest for an entire year (12 months), compound annually.
3. Escalation factor is **3.00%**

### Present Worth Analysis

|                                                    |      | E                     | A                   | B                   | C=A+B                | A*E                 | B*E                 | C*E                 |              |                             |
|----------------------------------------------------|------|-----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|---------------------|--------------|-----------------------------|
|                                                    |      | Total PV              |                     |                     |                      | Capital Costs       |                     | Total PV O&M        | Total PV     | Balance of Interest Bearing |
| Elapsed Time                                       | Year | Discount Factor at 3% | Capital Cost        | O&M Cost            | Total Cost           | at 3%               | Costs at 3%         | Costs at 3%         | Costs at 3%  | Account at 3%               |
| 0                                                  | 2007 | 1.000                 | \$ 3,563,407        |                     | \$ 3,563,407         | \$ 3,563,407        | \$ -                | \$ 3,563,407        | \$ 3,563,407 | \$ 5,635,222                |
| 1                                                  | 2008 | 0.971                 |                     | \$ 586,855          | \$ 586,855           | \$ -                | \$ 569,762          | \$ 569,762          | \$ 569,762   | \$ 5,199,818                |
| 2                                                  | 2009 | 0.943                 |                     | \$ 399,744          | \$ 399,744           | \$ -                | \$ 376,797          | \$ 376,797          | \$ 376,797   | \$ 4,944,076                |
| 3                                                  | 2010 | 0.915                 |                     | \$ 411,737          | \$ 411,737           | \$ -                | \$ 376,797          | \$ 376,797          | \$ 376,797   | \$ 4,668,309                |
| 4                                                  | 2011 | 0.888                 |                     | \$ 424,089          | \$ 424,089           | \$ -                | \$ 376,797          | \$ 376,797          | \$ 376,797   | \$ 4,371,547                |
| 5                                                  | 2012 | 0.863                 |                     | \$ 436,812          | \$ 436,812           | \$ -                | \$ 376,797          | \$ 376,797          | \$ 376,797   | \$ 4,052,778                |
| 6                                                  | 2013 | 0.837                 |                     | \$ 406,214          | \$ 406,214           | \$ -                | \$ 340,198          | \$ 340,198          | \$ 340,198   | \$ 3,755,960                |
| 7                                                  | 2014 | 0.813                 |                     | \$ 418,401          | \$ 418,401           | \$ -                | \$ 340,198          | \$ 340,198          | \$ 340,198   | \$ 3,437,686                |
| 8                                                  | 2015 | 0.789                 |                     | \$ 430,953          | \$ 430,953           | \$ -                | \$ 340,198          | \$ 340,198          | \$ 340,198   | \$ 3,096,935                |
| 9                                                  | 2016 | 0.766                 |                     | \$ 443,881          | \$ 443,881           | \$ -                | \$ 340,198          | \$ 340,198          | \$ 340,198   | \$ 2,732,646                |
| 10                                                 | 2017 | 0.744                 |                     | \$ 457,198          | \$ 457,198           | \$ -                | \$ 340,198          | \$ 340,198          | \$ 340,198   | \$ 2,343,711                |
| 11                                                 | 2018 | 0.722                 |                     | \$ 470,914          | \$ 470,914           | \$ -                | \$ 340,198          | \$ 340,198          | \$ 340,198   | \$ 1,928,981                |
| 12                                                 | 2019 | 0.701                 |                     | \$ 485,041          | \$ 485,041           | \$ -                | \$ 340,198          | \$ 340,198          | \$ 340,198   | \$ 1,487,259                |
| 13                                                 | 2020 | 0.681                 |                     | \$ 499,592          | \$ 499,592           | \$ -                | \$ 340,198          | \$ 340,198          | \$ 340,198   | \$ 1,017,296                |
| 14                                                 | 2021 | 0.661                 | \$ 502,716          | \$ 514,580          | \$ 1,017,296         | \$ 332,354          | \$ 340,198          | \$ 672,553          | \$ 672,553   | \$ 0                        |
| <b>Total Alternative 4 Enhanced Ground Water E</b> |      |                       | <b>\$ 4,066,123</b> | <b>\$ 6,386,011</b> | <b>\$ 10,452,134</b> | <b>\$ 3,895,762</b> | <b>\$ 5,138,735</b> | <b>\$ 9,034,497</b> |              |                             |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE SUMMARY <sup>2</sup>

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

|                                                                 |                     |
|-----------------------------------------------------------------|---------------------|
| <b>Capital Cost</b>                                             |                     |
| Construction                                                    | \$ 1,264,040        |
| Project Management                                              | \$ 101,123          |
| Design                                                          | \$ 189,606          |
| Construction Management                                         | \$ 189,606          |
| Subcontractor General Requirements                              | \$ 63,202           |
| G&A                                                             | \$ 253,061          |
| Overhead                                                        | \$ 90,379           |
| Tax                                                             | \$ 128,790          |
| Contingency                                                     | \$ 451,894          |
| Bonding& Insurance                                              | \$ 54,634           |
| Fee                                                             | \$ 218,536          |
| <b>Total Capital Cost</b>                                       | <b>\$ 3,004,871</b> |
| <b>Year 1 Operations and Maintenance</b>                        |                     |
| System Startup                                                  | \$ 19,700           |
| Routine System O&M                                              | \$ 206,500          |
| Reporting (Annual Report and Construction Completion Report)    | \$ 73,500           |
| Professional Services <sup>1</sup>                              | \$ 68,931           |
| Subcontractor General Requirements                              | \$ 14,985           |
| G&A                                                             | \$ 53,706           |
| Overhead                                                        | \$ 19,181           |
| Tax                                                             | \$ 27,333           |
| Contingency                                                     | \$ 95,904           |
| Bonding& Insurance                                              | \$ -                |
| Fee                                                             | \$ 46,379           |
| <b>Total Year 1 Operations and Maintenance</b>                  | <b>\$ 626,118</b>   |
| <b>Annual Operations and Maintenance Cost: Years 2-5</b>        |                     |
| Routine System O&M                                              | \$ 194,020          |
| Reporting (Annual Reports)                                      | \$ 18,375           |
| Professional Services <sup>1</sup>                              | \$ 48,851           |
| Subcontractor General Requirements                              | \$ 10,620           |
| G&A                                                             | \$ 38,061           |
| Overhead                                                        | \$ 13,593           |
| New Mexico Gross Receipts Tax                                   | \$ 19,370           |
| Contingency                                                     | \$ 67,966           |
| Bonding& Insurance                                              | \$ -                |
| Fee                                                             | \$ 32,869           |
| <b>Total Annual Operations and Maintenance Cost: Years 2-5</b>  | <b>\$ 443,725</b>   |
| <b>Annual Operations and Maintenance Cost: Years 6-14</b>       |                     |
| Routine System O&M                                              | \$ 177,644          |
| Reporting (Annual Reports)                                      | \$ 18,375           |
| Professional Services <sup>1</sup>                              | \$ 48,851           |
| Subcontractor General Requirements                              | \$ 10,620           |
| G&A                                                             | \$ 35,769           |
| Overhead                                                        | \$ 12,774           |
| New Mexico Gross Receipts Tax                                   | \$ 18,204           |
| Contingency                                                     | \$ 63,872           |
| Bonding& Insurance                                              | \$ -                |
| Fee                                                             | \$ 30,889           |
| <b>Total Annual Operations and Maintenance Cost: Years 6-14</b> | <b>\$ 416,997</b>   |
| <b>Post Closure Cost</b>                                        |                     |
| Closure Reporting                                               | \$ 18,375           |
| Equipment Demobilization and Well Abandonment                   | \$ 126,500          |
| Professional Services <sup>1</sup>                              | \$ 47,809           |
| Subcontractor General Requirements                              | \$ 7,244            |
| G&A                                                             | \$ 27,990           |
| Overhead                                                        | \$ 9,996            |
| New Mexico Gross Receipts Tax                                   | \$ 14,245           |
| Contingency                                                     | \$ 49,982           |
| Bonding& Insurance                                              | \$ 6,043            |
| Fee                                                             | \$ 24,171           |
| <b>Total Post Closure Cost</b>                                  | <b>\$ 332,354</b>   |
| <b>TOTAL PRESENT WORTH</b>                                      | <b>\$ 9,491,217</b> |

#### NOTES:

1 - Professional Services includes Project Management, Design/Technical Support, and Construction Management.  
 2 - The cost estimates provided are to an accuracy of +50 percent to -30 percent and are prepared for the sole purpose of alternative comparison. The alternative cost estimates are in 2006 dollars and are based on conceptual design from information available at the time of this study. The actual cost of the project would depend on the final scope and design of the selected remedial action, the schedule of implementation, competitive market conditions, and other variables.

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### SITE DATA AND ALTERNATIVE CONCEPTUAL DESIGN

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
PREPARED BY: L.Colella, T.Palaia  
PROJECT NUMBER: 346535.FS.01

#### Site Background Data

Elevation of Site = 4100 ft amsl or 12.68 psia  
Volume of Contaminated Ground Water greater than 5 ug/L = 7,350 acre-ft based on JSAI model  
Volume of Contaminated Ground Water greater than 1 ug/L = 25,700 acre-ft based on JSAI model

PCE Concentrations in wells sampled December 2005.

| Sample Location | PCE (ug/L)                     |
|-----------------|--------------------------------|
| MW-SF1          | 11                             |
| MW-SF10         | 17                             |
| GWMW01 Port 2   | 21                             |
| GWMW01 Port 6   | 6                              |
|                 | 14 ug/L, average concentration |

#### Pumping Rates for Plume Containment and Remediation: 14 Years (per JSAI modeling)

|        |         |
|--------|---------|
| CLC-18 | 460 gpm |
| CLC-27 | 620 gpm |

New Well #1 to replace operation of CLC-18 after 5 years per JSAI modeling 300 gpm

|                          |           |
|--------------------------|-----------|
| Total Annual: Years 1-5  | 568 MMgal |
| Total Annual: Years 6-14 | 484 MMgal |

#### Mass Estimate

Mass of PCE above MCL in ground water = 150 kg of PCE based on JSAI model - JSAI estimate based on an effective porosity of 20% and does not address potential PCE mass in additional pore space

#### Conceptual Design

##### Pumping System Design Parameters

|                                      |                                          |
|--------------------------------------|------------------------------------------|
| Estimated Number of Pumping Wells =  | 3 wells                                  |
| Estimated pumping rate from CLC-18 = | 460 gpm (based on JSAI modeling results) |
| Estimated pumping rate from CLC-27 = | 620 gpm (based on JSAI modeling results) |

Estimated pumping rate from New Well = 300 gpm (to replace operation of CLC-18 after 5 years)

|                                   |                                            |
|-----------------------------------|--------------------------------------------|
| Total Pumping Rate in Years 1-5=  | 1,080 gpm (assumes CLC-18 and 27 only)     |
| Total Pumping Rate in Years 6-14= | 920 gpm (assumes CLC-27 and new well only) |
| Depth of new pumping well =       | 450 ft bgs                                 |

##### System Construction Time

|                                                             |              |                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Estimated drilling rate =                                   | 125 lf/day   | based on invoice                                                                                                                                                                                                                                                             |
| Total linear footage drilling =                             | 900 lf       |                                                                                                                                                                                                                                                                              |
| Estimated duration of drilling =                            | 7.2 days or  | 8 days (rounded up)                                                                                                                                                                                                                                                          |
| Estimated linear footage of field piping per pumping well = | 1500 lf      | average of piping required for all wells                                                                                                                                                                                                                                     |
| Total linear footage of connection piping =                 | 500 lf       | assumed 500 lf to stub up to treatment system and reconnect to existing CLC-27 line to UGR connection of CLC-18 to CLC -27 connection to Upper Griggs Reservoir; CLC estimated 1000 lf new piping needed in addition to the approximate length of 500 lf of existing piping. |
| Total linear footage of effluent field piping=              | 1,000 lf     |                                                                                                                                                                                                                                                                              |
| Total linear footage of effluent field piping=              | 750 lf       | estimated connection of new well to CLC -27 connection to Upper Griggs Reservoir                                                                                                                                                                                             |
| Estimated field piping placing rate =                       | 75 lf/day    |                                                                                                                                                                                                                                                                              |
| Estimated duration of field piping =                        | 30.0 days or | 30 days (rounded up)                                                                                                                                                                                                                                                         |
| Total construction timeframe =                              | 38 days      |                                                                                                                                                                                                                                                                              |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### SITE DATA AND ALTERNATIVE CONCEPTUAL DESIGN

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Air Stripper Design Parameters

Stripper design flowrate 1,080 gpm  
 Unit flow rate 540 gpm (NEEP Model 41251 Tray Air stripper) 2 units in series needed for treatment  
 Governing contaminant PCE at 14 µg/L  
 Governing contaminant is based on consideration of a combination of low Henry's Constant and highest concentration versus MCL.  
 Influent temperature 50 °F

Unit Size: 12.5 ft x 7.3 ft NEEP Model 41251 Tray Air stripper

The Henry's Law Constant for PCE (25°C) = 176.5 atm  
 Converting the Henry's Constant for an actual temperature of 10 °C and using STRIPR Model data (CH2M HILL, 1991)  
 Actual Henry's Constant is 224 atm which is greater than the 10 atm threshold for effective air stripping.

Assume 100% of PCE is stripped and discharged untreated to the atmosphere. PCE is the controlling contaminant for air stripper design.

Vendor modeling indicates the Tray Air stripper uses a blower airflow rate of 2,400 scfm  
 PCE emissions 0.007 lbs/hr or 0.18 lbs/day or 65.2 lbs/yr  
 Average PCE emissions concentration is 0.8 mg/m<sup>3</sup> or 0.2 ppmv

PCE is a hazardous air pollutant and therefore is a regulated air pollutant

The NIOSH PEL (10-hr TWA) for PCE is 25 ppmv or 136.5 mg/m<sup>3</sup> or at 68°F and 1 atm  
 THEREFORE, NO OFFGAS EMISSIONS CONTROL WILL BE REQUIRED SINCE MASS EMISSIONS IS VERY LOW AND  
 THE CONCENTRATION IS TWO ORDERS OF MAGNITUDE LOWER THAN THE NIOSH STANDARD WITHOUT CONSIDERING ATMOSPHERIC DISPERSION.

#### Pretreatment Design Parameters - Langlier Index and Ryznar Stability Index for CaCO<sub>3</sub> Scaling Potential

|                   |                                    | 1 (influent water) | 2 (estimate of parameters within the stripper) |
|-------------------|------------------------------------|--------------------|------------------------------------------------|
| Flow              | gpm                                | 1080               | 1080                                           |
| Temperature       | Deg . F                            | 60                 | 77                                             |
| Alkalinity, Total | mg/l CaCO <sub>3</sub>             | 211                | 211                                            |
| pH                | Std. Units                         | 7.39               | 8.00                                           |
| TDS               | mg/l                               | 919                | 919                                            |
| Calcium           | mg/l CaCO <sub>3</sub>             | 305                | 305                                            |
| Magnesium         | mg/l CaCO <sub>3</sub>             | 124                | 123.6                                          |
| Sulfate           | mg/l SO <sub>4</sub> <sup>2-</sup> | 243                | 243                                            |
| Chloride          | mg/l Cl <sup>-</sup>               | 165                | 165                                            |
| LSI               |                                    | 0.170              | 0.936                                          |
| RSI               |                                    | 7.05               | 6.13                                           |

LSI greater than 1 indicates potential for scaling

RSI less than 6 indicates potential for scaling

The LSI is close to the level indicating potential for scaling

The RSI, which is more commonly used, is close to the level that indicates that there is a potential for scaling once the stripping process begins.

Slight changes in parameters affect the results of these calculations.

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed= 0 wells
- Assume that the duration of construction is 119 working days (includes 80 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                                                                              | Qty Unit   | Unit Cost     | Cost       | Comments and References                                                                                                                                                     |
|--------------------------------------------------------------------------------------------|------------|---------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Construction</b>                                                                        |            |               |            |                                                                                                                                                                             |
| Underground Piping from CLC-18 to CLC-27 connection to Upper Griggs Reservoir              | 1,000 ft   | \$ 100.17     | \$ 100,170 | estimated LF from CLC: cost includes 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                                             |
| Underground Piping from new extraction well to CLC-27 connection to Upper Griggs Reservoir | 750 ft     | \$ 100.17     | \$ 75,128  | 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                                                                                  |
| Piping Connection to Treatment System                                                      | 500 lf     | \$ 100.17     | \$ 50,085  | 10-inch pipe, trenching, backfill, compacting, asphalt repaving (RS Means)                                                                                                  |
| Pumping Well Modifications                                                                 | 2 ea       | \$ 25,000.00  | \$ 50,000  | JSP Memo 7/8/06                                                                                                                                                             |
| Ground Water Extraction Well Installation                                                  | 1 well     | \$ 200,000.00 | \$ 200,000 | JSP Memo 7/8/06                                                                                                                                                             |
| Ground Water Extraction Pumps                                                              | 3 ea       | \$ 10,000.00  | \$ 30,000  | assume new + replace city pumps, vendor quote; 100gpm, 15 hp, 3-phase, 230V, 6 inch                                                                                         |
| Influent Equalization Tank                                                                 | 21,600 gal | \$ 1.00       | \$ 21,600  | provides 20-minutes of storage                                                                                                                                              |
| Tank Effluent Pump                                                                         | 0 ea       | \$ 4,000.00   | \$ -       | included with air stripper                                                                                                                                                  |
| Influent and Effluent Bag Filters                                                          | 2 LS       | \$ 7,500.00   | \$ 15,000  | 1080 gpm size filter                                                                                                                                                        |
| Low-Profile Tray Air Stripper Package                                                      | 2 LS       | \$ 70,000.00  | \$ 140,000 | Assume 540 gpm NEEP Model 41251 Tray Air stripper (controls, piping, skid, blower, influent and effluent pumps)                                                             |
| Protective Enclosure                                                                       | 1 ea       | \$ 150,000.00 | \$ 150,000 | Assume 30'x25' building at \$200/sf, includes overhead crane, pre-fab metal                                                                                                 |
| Repair discharge line on CLC-27                                                            | 1 LS       | \$ 300.00     | \$ 300     |                                                                                                                                                                             |
| Sulfuric Acid Bulk Storage Tank - Pretreatment Unit                                        | 0 LS       | \$ 65,663.20  | \$ -       | - 5,000 gal tank. 1 month supply, prorated costs for similar system, 1,000 gal unit at Fruit Ave, Albuquerque                                                               |
| Dessicant Dryer Unit - Pretreatment Unit                                                   | 0 LS       | \$ 39,397.92  | \$ -       | - 5,000 gal unit. prorated costs for similar system, 1,000 gal unit at Fruit Ave, Albuquerque                                                                               |
| Acid Feed Pump System - Pretreatment Unit                                                  | 0 LS       | \$ 83,384.29  | \$ -       | - Prorated costs for similar system, 100 gpm system at Fruit Ave, Albuquerque.                                                                                              |
| Acid Feed System Piping - Pretreatment Unit                                                | 0 LS       | \$ 44,923.64  | \$ -       | - Prorated costs based on facility size for similar system, 100 gpm at Fruit Ave, Albuquerque                                                                               |
| Health and Safety Provisions - Pretreatment Unit                                           | 0 LS       | \$ 8,000.00   | \$ -       | - Prorated costs for similar system, 100 gpm at Fruit Ave, Albuquerque                                                                                                      |
| Acid Storage Facility - Pretreatment Unit                                                  | 0 LS       | \$ 89,847.27  | \$ -       | - Assume 35'x35' for 5,000 gal tank incl. canopy, 2 ° concrete containment, and fencing. Prorated costs for similar system, 1,000 gal tank system at Fruit Ave, Albuquerque |
| Well Permits                                                                               | 1 ea       | \$ 30.00      | \$ 30      | new extraction well                                                                                                                                                         |
| Equipment Rental                                                                           | 24 wk      | \$ 200.00     | \$ 4,800   | MultiRAE                                                                                                                                                                    |
| Subtotal Capital Cost                                                                      |            |               | \$ 837,113 |                                                                                                                                                                             |



## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

1. The accuracy of the cost estimate is +50%/-30%
2. See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
3. The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
4. Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
5. Number of piezometers to be installed = 0 piezometers included under ground water monitoring
6. Number of reinjection wells to be installed = 0 wells
7. Assume that the duration of construction is 119 working days (includes 80 working days for treatment system construction and installation)
8. The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
9. The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
10. The G&A rate is 14%
11. The overhead rate is 5%
12. The Bonding & Insurance rate is 2%
13. The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                          | Qty    | Unit | Unit Cost       | Cost                | Comments and References |
|----------------------------------------|--------|------|-----------------|---------------------|-------------------------|
| Site Work Allowance                    | 7%     | of   | \$ 837,112.50   | \$ 58,598           |                         |
| Mechanical Allowance                   | 15%    | of   | \$ 837,112.50   | \$ 125,567          |                         |
| Instrumentation and Controls Allowance | 12%    | of   | \$ 837,112.50   | \$ 100,454          | including SCADA system  |
| Electrical Allowance                   | 12%    | of   | \$ 837,112.50   | \$ 100,454          |                         |
| Miscellaneous Equipment Allowance      | 5%     | of   | \$ 837,112.50   | \$ 41,856           |                         |
| Subtotal Capital Cost                  |        |      |                 | \$ 1,264,040        |                         |
| Project Management                     | 8%     | of   | \$ 1,264,039.88 | \$ 101,123          |                         |
| Design                                 | 15%    | of   | \$ 1,264,039.88 | \$ 189,606          |                         |
| Construction Management                | 15%    | of   | \$ 1,264,039.88 | \$ 189,606          |                         |
| Subcontractor General Requirements     | 5%     | of   | \$ 1,264,039.88 | \$ 63,202           |                         |
| Subtotal Capital Cost                  |        |      |                 | \$ 1,807,577        |                         |
| G&A                                    | 14%    | of   | \$ 1,807,577.02 | \$ 253,061          |                         |
| Overhead                               | 5%     | of   | \$ 1,807,577.02 | \$ 90,379           |                         |
| New Mexico Gross Receipts Tax          | 7.125% | of   | \$ 1,807,577.02 | \$ 128,790          |                         |
| Contingency                            | 25%    | of   | \$ 1,807,577.02 | \$ 451,894          |                         |
| Subtotal Capital Cost                  |        |      |                 | \$ 2,731,701        |                         |
| Bonding& Insurance                     | 2%     | of   | \$ 2,731,700.77 | \$ 54,634           |                         |
| Fee                                    | 8%     | of   | \$ 2,731,700.77 | \$ 218,536          |                         |
| <b>TOTAL CAPITAL COST</b>              |        |      |                 | <b>\$ 3,004,871</b> |                         |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 119 working days (includes 80 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

### Detailed Capital and Operations and Maintenance Costs

#### CAPITAL COST

| Item/Activity                                                       | Qty Unit      | Unit Cost     | Cost       | Comments and References                                                                                             |
|---------------------------------------------------------------------|---------------|---------------|------------|---------------------------------------------------------------------------------------------------------------------|
| <b>YEAR 1 OPERATIONS AND MAINTENANCE</b>                            |               |               |            |                                                                                                                     |
| <u>System Startup</u>                                               |               |               |            |                                                                                                                     |
| Labor - Technician                                                  | 100 hr        | \$ 75.00      | \$ 7,500   | Assume 10 days for startup, 10 hrs/day                                                                              |
| Labor - Engineer                                                    | 70 hr         | \$ 120.00     | \$ 8,400   | Assume 7 days for startup, 10 hrs/day                                                                               |
| Air Sample Analysis                                                 | 6 sample      | \$ 150.00     | \$ 900     | quarterly sampling to prove de minimis VOC emissions, plus 2 QA/QC                                                  |
| Water Sample Analysis                                               | 6 sample      | \$ 150.00     | \$ 900     | 3 sets, VOC analysis for infl/effl, incl data valid.                                                                |
| Startup Equipment Rental                                            | 2 week        | \$ 1,000.00   | \$ 2,000   | water quality monitoring for pretreatment effectiveness                                                             |
| <u>Total System Startup</u>                                         |               |               | \$ 19,700  |                                                                                                                     |
| <u>Routine System O&amp;M</u>                                       |               |               |            |                                                                                                                     |
| Labor - Technician                                                  | 208 hr        | \$ 75.00      | \$ 15,600  | 4 hours/week                                                                                                        |
| Labor - Engineer                                                    | 208 hr        | \$ 120.00     | \$ 24,960  | 100% of the Tech time for first year                                                                                |
| Water Sample Analysis                                               | 29 sample     | \$ 150.00     | \$ 4,350   | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                     |
| Air Sample Analysis                                                 | 0 sample      | \$ 100.00     | \$ -       | - none needed after startup                                                                                         |
| Acid Supply - Pretreatment Unit                                     | 0 LS          | \$ 110,067.27 | \$ -       | - Prorated from 100 gpm system at Fruit Ave.                                                                        |
| O&M Supplies and Cleaning Subcontractor                             | 1 LS          | \$ 4,000.00   | \$ 4,000   | Annual air stripper tray cleaning by subcontractor                                                                  |
| Electricity                                                         | 588,146 kw-hr | \$ 0.08       | \$ 47,052  | Air Stripper: 25 hp blowers + (2) 10 hp pumps per unit, full-time operations                                        |
| Annual Extraction Well and Distribution Operating Cost              | 568 MMGal     | \$ 194.73     | \$ 110,538 | 98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27) |
| <u>Total Routine System O&amp;M</u>                                 |               |               | \$ 206,500 |                                                                                                                     |
| <u>Reporting (Annual Report and Construction Completion Report)</u> |               |               |            |                                                                                                                     |
| Labor - Engineer/Hydrogeologist                                     | 400 hr        | \$ 120.00     | \$ 48,000  |                                                                                                                     |
| Labor - Editor                                                      | 200 hr        | \$ 85.00      | \$ 17,000  |                                                                                                                     |
| Labor - CAD Technician                                              | 100 hr        | \$ 85.00      | \$ 8,500   |                                                                                                                     |
| <u>Total Annual Reporting</u>                                       |               |               | \$ 73,500  |                                                                                                                     |
| <u>Subtotal Year 1 Operations and Maintenance</u>                   |               |               | \$ 299,700 |                                                                                                                     |
| Project Management                                                  | 8% of         | \$ 299,699.82 | \$ 23,976  |                                                                                                                     |
| Technical Support                                                   | 15% of        | \$ 299,699.82 | \$ 44,955  |                                                                                                                     |
| Construction Management                                             | 0% of         | \$ 299,699.82 | \$ -       |                                                                                                                     |
| Subcontractor General Requirements                                  | 5% of         | \$ 299,699.82 | \$ 14,985  |                                                                                                                     |
| <u>Subtotal Year 1 Operations and Maintenance</u>                   |               |               | \$ 383,616 |                                                                                                                     |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

|                 |                                                                                   |
|-----------------|-----------------------------------------------------------------------------------|
| PROJECT:        | Griggs and Walnut Superfund Site Feasibility Study                                |
| SITE:           | Griggs and Walnut Superfund Site - Las Cruces, New Mexico                         |
| ALTERNATIVE:    | 4 Enhanced Ground Water Extraction with Treatment                                 |
| DESCRIPTION:    | Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment |
| PREPARED BY:    | L.Colella, T.Palaia                                                               |
| PROJECT NUMBER: | 346535.FS.01                                                                      |

#### Assumptions

1. The accuracy of the cost estimate is +50%/-30%
2. See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
3. The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
4. Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
5. Number of piezometers to be installed = 0 piezometers included under ground water monitoring
6. Number of reinjection wells to be installed = 0 wells
7. Assume that the duration of construction is 119 working days (includes 80 working days for treatment system construction and installation)
8. The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
9. The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
10. The G&A rate is 14%
11. The overhead rate is 5%
12. The Bonding & Insurance rate is 2%
13. The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                        |        |      |               |                   |                                       |
|-----------------------------------------------------|--------|------|---------------|-------------------|---------------------------------------|
| Item/Activity                                       | Qty    | Unit | Unit Cost     | Cost              | Comments and References               |
| G&A                                                 | 14%    | of   | \$ 383,615.77 | \$ 53,706         |                                       |
| Overhead                                            | 5%     | of   | \$ 383,615.77 | \$ 19,181         |                                       |
| New Mexico Gross Receipts Tax                       | 7.125% | of   | \$ 383,615.77 | \$ 27,333         |                                       |
| Contingency                                         | 25%    | of   | \$ 383,615.77 | \$ 95,904         |                                       |
| Subtotal Year 1 Operations and Maintenance          |        |      |               | \$ 579,739        |                                       |
| Bonding& Insurance                                  | 0%     | of   | \$ 579,739.34 | \$ -              | Bonding only applies to Capital Costs |
| Fee                                                 | 8%     | of   | \$ 579,739.34 | \$ 46,379         |                                       |
| <b>TOTAL YEAR 1 OPERATIONS AND MAINTENANCE COST</b> |        |      |               | <b>\$ 626,118</b> |                                       |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 119 working days (includes 80 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                            |               |               |                   |                                                                                                                                                                                                     |
|-------------------------------------------------------------------------|---------------|---------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                           | Qty Unit      | Unit Cost     | Cost              | Comments and References                                                                                                                                                                             |
| <b>ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 2-5 (ANNUAL COST)</b> |               |               |                   |                                                                                                                                                                                                     |
| Item/Activity                                                           | Qty Unit      | Unit Cost     | Cost              | Comments                                                                                                                                                                                            |
| <i>Routine System O&amp;M</i>                                           |               |               |                   |                                                                                                                                                                                                     |
| Labor - Technician                                                      | 208 hr        | \$ 75.00      | \$ 15,600         | 4 hours/week                                                                                                                                                                                        |
| Labor - Engineer                                                        | 104 hr        | \$ 120.00     | \$ 12,480         | 50% of the Tech time                                                                                                                                                                                |
| Water Sample Analysis                                                   | 29 sample     | \$ 150.00     | \$ 4,350          | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                                                                                                     |
| Acid Supply - Pretreatment Unit                                         | 0 LS          | \$ 110,067.27 | \$ -              | - Prorated from 100 gpm system at Fruit Ave.                                                                                                                                                        |
| O&M Supplies and Cleaning Subcontractor                                 | 1 LS          | \$ 4,000.00   | \$ 4,000          | Annual air stripper tray cleaning by subcontractor                                                                                                                                                  |
| Electricity                                                             | 588,146 kw-hr | \$ 0.08       | \$ 47,052         | Air Stripper: 25 hp blowers + (2) 10 hp pumps per unit, full-time operations<br>98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27) |
| Annual Extraction Well and Distribution Operating Cost                  | 568 MMGal     | \$ 194.73     | \$ 110,538        |                                                                                                                                                                                                     |
| Total Routine System O&M                                                |               |               | \$ 194,020        |                                                                                                                                                                                                     |
| <i>Reporting (Annual Reports)</i>                                       |               |               |                   |                                                                                                                                                                                                     |
| Labor - Engineer/Hydrogeologist                                         | 100 hr        | \$ 120.00     | \$ 12,000         |                                                                                                                                                                                                     |
| Labor - Editor                                                          | 50 hr         | \$ 85.00      | \$ 4,250          |                                                                                                                                                                                                     |
| Labor - CAD Technician                                                  | 25 hr         | \$ 85.00      | \$ 2,125          |                                                                                                                                                                                                     |
| Total Reporting                                                         |               |               | \$ 18,375         |                                                                                                                                                                                                     |
| Subtotal Year 2-5 Operations and Maintenance                            |               |               | \$ 212,395        |                                                                                                                                                                                                     |
| Project Management                                                      | 8% of         | \$ 212,394.82 | \$ 16,992         |                                                                                                                                                                                                     |
| Technical Support                                                       | 15% of        | \$ 212,394.82 | \$ 31,859         |                                                                                                                                                                                                     |
| Construction Management                                                 | 0% of         | \$ 212,394.82 | \$ -              |                                                                                                                                                                                                     |
| Subcontractor General Requirements                                      | 5% of         | \$ 212,394.82 | \$ 10,620         |                                                                                                                                                                                                     |
| Subtotal Year 2-5 Operations and Maintenance                            |               |               | \$ 271,865        |                                                                                                                                                                                                     |
| G&A                                                                     | 14% of        | \$ 271,865.37 | \$ 38,061         |                                                                                                                                                                                                     |
| Overhead                                                                | 5% of         | \$ 271,865.37 | \$ 13,593         |                                                                                                                                                                                                     |
| New Mexico Gross Receipts Tax                                           | 7.125% of     | \$ 271,865.37 | \$ 19,370         |                                                                                                                                                                                                     |
| Contingency                                                             | 25% of        | \$ 271,865.37 | \$ 67,966         |                                                                                                                                                                                                     |
| Subtotal Year 2-5 Operations and Maintenance                            |               |               | \$ 410,857        |                                                                                                                                                                                                     |
| Bonding & Insurance                                                     | 0% of         | \$ 410,856.55 | \$ -              | - Bonding only applies to Capital Costs                                                                                                                                                             |
| Fee                                                                     | 8% of         | \$ 410,856.55 | \$ 32,869         |                                                                                                                                                                                                     |
| <b>TOTAL ANNUAL COST: YEARS 2-5 OPERATIONS AND MAINTENANCE COS*</b>     |               |               | <b>\$ 443,725</b> |                                                                                                                                                                                                     |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed = 0 wells
- Assume that the duration of construction is 119 working days (includes 80 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

### Detailed Capital and Operations and Maintenance Costs

#### CAPITAL COST

| Item/Activity                                                            | Qty Unit      | Unit Cost            | Cost              | Comments and References                                                                                                                                                                             |
|--------------------------------------------------------------------------|---------------|----------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 6-14 (ANNUAL COST)</b> |               |                      |                   |                                                                                                                                                                                                     |
| Item/Activity                                                            | Qty Unit      | Unit Cost            | Cost              | Comments                                                                                                                                                                                            |
| <u>Routine System O&amp;M</u>                                            |               |                      |                   |                                                                                                                                                                                                     |
| Labor - Technician                                                       | 208 hr        | \$ 75.00             | \$ 15,600         | 4 hours/week                                                                                                                                                                                        |
| Labor - Engineer                                                         | 104 hr        | \$ 120.00            | \$ 12,480         | 50% of the Tech time                                                                                                                                                                                |
| Water Sample Analysis                                                    | 29 sample     | \$ 150.00            | \$ 4,350          | monthly infl/effl sampling for permit, plus 20% extra for QA/QC                                                                                                                                     |
| <b>Acid Supply - Pretreatment Unit</b>                                   | <b>0 LS</b>   | <b>\$ 110,067.27</b> | <b>\$ -</b>       | <b>- Prorated from 100 gpm system at Fruit Ave.</b>                                                                                                                                                 |
| O&M Supplies and Cleaning Subcontractor                                  | 1 LS          | \$ 4,000.00          | \$ 4,000          | Annual air stripper tray cleaning by subcontractor                                                                                                                                                  |
| Electricity                                                              | 588,146 kw-hr | \$ 0.08              | \$ 47,052         | Air Stripper: 25 hp blowers + (2) 10 hp pumps per unit, full-time operations<br>98-99 avg costs provided by City, 3% inflation factor added per year for 2006 values (used avg. for CLC 19, 21, 27) |
| Annual Extraction Well and Distribution Operating Cost                   | 484 MMGal     | \$ 194.73            | \$ 94,162         |                                                                                                                                                                                                     |
| Total Routine System O&M                                                 |               |                      | \$ 177,644        |                                                                                                                                                                                                     |
| <u>Reporting (Annual Reports)</u>                                        |               |                      |                   |                                                                                                                                                                                                     |
| Labor - Engineer/Hydrogeologist                                          | 100 hr        | \$ 120.00            | \$ 12,000         |                                                                                                                                                                                                     |
| Labor - Editor                                                           | 50 hr         | \$ 85.00             | \$ 4,250          |                                                                                                                                                                                                     |
| Labor - CAD Technician                                                   | 25 hr         | \$ 85.00             | \$ 2,125          |                                                                                                                                                                                                     |
| Total Reporting                                                          |               |                      | \$ 18,375         |                                                                                                                                                                                                     |
| Subtotal Year 6-14 Operations and Maintenance                            |               |                      | \$ 196,019        |                                                                                                                                                                                                     |
| Project Management                                                       | 8% of         | \$ 212,394.82        | \$ 16,992         |                                                                                                                                                                                                     |
| Technical Support                                                        | 15% of        | \$ 212,394.82        | \$ 31,859         |                                                                                                                                                                                                     |
| Construction Management                                                  | 0% of         | \$ 212,394.82        | \$ -              |                                                                                                                                                                                                     |
| Subcontractor General Requirements                                       | 5% of         | \$ 212,394.82        | \$ 10,620         |                                                                                                                                                                                                     |
| Subtotal Year 6-14 Operations and Maintenance                            |               |                      | \$ 255,489        |                                                                                                                                                                                                     |
| G&A                                                                      | 14% of        | \$ 255,489.36        | \$ 35,769         |                                                                                                                                                                                                     |
| Overhead                                                                 | 5% of         | \$ 255,489.36        | \$ 12,774         |                                                                                                                                                                                                     |
| New Mexico Gross Receipts Tax                                            | 7.125% of     | \$ 255,489.36        | \$ 18,204         |                                                                                                                                                                                                     |
| Contingency                                                              | 25% of        | \$ 255,489.36        | \$ 63,872         |                                                                                                                                                                                                     |
| Subtotal Year 6-14 Operations and Maintenance                            |               |                      | \$ 386,108        |                                                                                                                                                                                                     |
| Bonding& Insurance                                                       | 0% of         | \$ 386,108.29        | \$ -              | - Bonding only applies to Capital Costs                                                                                                                                                             |
| Fee                                                                      | 8% of         | \$ 386,108.29        | \$ 30,889         |                                                                                                                                                                                                     |
| <b>TOTAL ANNUAL COST: YEARS 6-14 OPERATIONS AND MAINTENANCE COS</b>      |               |                      | <b>\$ 416,997</b> |                                                                                                                                                                                                     |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested monitor wells required to be installed = 0 wells included under ground water monitoring
- Number of new ground water extraction wells to be installed = 1 wells included under ground water monitoring
- Number of piezometers to be installed = 0 piezometers included under ground water monitoring
- Number of reinjection wells to be installed= 0 wells
- Assume that the duration of construction is 119 working days (includes 80 working days for treatment system construction and installation)
- The number of wells to be sampled for VOCs is 0 wells per round included under ground water monitoring
- The number of wells on-site to be abandoned for post-closure is 1 wells includes new extraction wells only
- The G&A rate is 14%
- The overhead rate is 5%
- The Bonding & Insurance rate is 2%
- The fee rate is 8%

#### Detailed Capital and Operations and Maintenance Costs

##### CAPITAL COST

| Item/Activity                                                 | Qty    | Unit | Unit Cost     | Cost              | Comments and References                                                  |
|---------------------------------------------------------------|--------|------|---------------|-------------------|--------------------------------------------------------------------------|
| <b>POST CLOSURE COST</b>                                      |        |      |               |                   |                                                                          |
| Item/Activity                                                 | Qty    | Unit | Unit Cost     | Cost              | Comments                                                                 |
| <u>Closure Reporting</u>                                      |        |      |               |                   |                                                                          |
| Labor - Engineer/Hydrogeologist                               | 100    | hr   | \$120.00      | \$ 12,000         |                                                                          |
| Labor - Editor                                                | 50     | hr   | \$85.00       | \$ 4,250          |                                                                          |
| Labor - CAD Technician                                        | 25     | hr   | \$85.00       | \$ 2,125          |                                                                          |
| <u>Total Closure Reporting</u>                                |        |      |               | \$ 18,375         |                                                                          |
| <u>Equipment Demobilization and Well Abandonment</u>          |        |      |               |                   |                                                                          |
| Well Abandonment                                              | 1      | well | \$ 10,000.00  | \$ 10,000         | new extraction wells only, others included under ground water monitoring |
| Equipment Demobilization                                      | 1      | LS   | \$ 100,000.00 | \$ 100,000        |                                                                          |
| <u>Subtotal Equipment Demobilization and Well Abandonment</u> |        |      |               | \$ 110,000        |                                                                          |
| Site Work Allowance                                           | 10%    | of   | \$ 110,000.00 | \$ 11,000         |                                                                          |
| Mechanical Allowance                                          | 0%     | of   | \$ 110,000.00 | \$ -              |                                                                          |
| Instrumentation and Controls Allowance                        | 0%     | of   | \$ 110,000.00 | \$ -              |                                                                          |
| Electrical Allowance                                          | 5%     | of   | \$ 110,000.00 | \$ 5,500          |                                                                          |
| Miscellaneous Equipment Allowance                             | 0%     | of   | \$ 110,000.00 | \$ -              |                                                                          |
| <u>Total Equipment Demobilization and Well Abandonment</u>    |        |      |               | \$ 126,500        |                                                                          |
| <u>Subtotal Post-Closure Cost</u>                             |        |      |               | \$ 144,875        |                                                                          |
| Project Management                                            | 8%     | of   | \$ 144,875.00 | \$ 11,590         |                                                                          |
| Technical Support                                             | 15%    | of   | \$ 144,875.00 | \$ 21,731         |                                                                          |
| Construction Management                                       | 10%    | of   | \$ 144,875.00 | \$ 14,488         |                                                                          |
| Subcontractor General Requirements                            | 5%     | of   | \$ 144,875.00 | \$ 7,244          |                                                                          |
| <u>Subtotal Post-Closure Cost</u>                             |        |      |               | \$ 199,928        |                                                                          |
| G&A                                                           | 14%    | of   | \$ 199,927.50 | \$ 27,990         |                                                                          |
| Overhead                                                      | 5%     | of   | \$ 199,927.50 | \$ 9,996          |                                                                          |
| New Mexico Gross Receipts Tax                                 | 7.125% | of   | \$ 199,927.50 | \$ 14,245         |                                                                          |
| Contingency                                                   | 25%    | of   | \$ 199,927.50 | \$ 49,982         |                                                                          |
| <u>Subtotal Post-Closure Cost</u>                             |        |      |               | \$ 302,140        |                                                                          |
| Bonding& Insurance                                            | 2%     | of   | \$ 302,140.43 | \$ 6,043          |                                                                          |
| Fee                                                           | 8%     | of   | \$ 302,140.43 | \$ 24,171         |                                                                          |
| <b>TOTAL POST CLOSURE COST</b>                                |        |      |               | <b>\$ 332,354</b> |                                                                          |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### PRESENT WORTH ANALYSIS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Ground Water Extraction and Treatment with Air Stripper without Acid Pretreatment  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

1. Real Discount Rate **3.00%** Source: OMB Circular No. A-94, Jan. 2007 version of Appendix C obtained from [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)
2. Assumes Total PV earns interest for an entire year (12 months), compound annually.
3. Escalation factor is **3.00%**

### Present Worth Analysis

|                                                    |      | E                     | A                   | B                   | C=A+B                | A*E                 | B*E                 | C*E                 |              |                             |
|----------------------------------------------------|------|-----------------------|---------------------|---------------------|----------------------|---------------------|---------------------|---------------------|--------------|-----------------------------|
|                                                    |      | Total PV              |                     |                     |                      | Capital Costs       |                     | Total PV O&M        | Total PV     | Balance of Interest Bearing |
| Elapsed Time                                       | Year | Discount Factor at 3% | Capital Cost        | O&M Cost            | Total Cost           | at 3%               | Costs at 3%         | Costs at 3%         | Costs at 3%  | Account at 3%               |
| 0                                                  | 2007 | 1.000                 | \$ 3,004,871        |                     | \$ 3,004,871         | \$ 3,004,871        | \$ -                | \$ 3,004,871        | \$ 6,680,936 |                             |
| 1                                                  | 2008 | 0.971                 |                     | \$ 644,902          | \$ 644,902           | \$ -                | \$ 626,118          | \$ 626,118          | \$ 6,217,115 |                             |
| 2                                                  | 2009 | 0.943                 |                     | \$ 470,748          | \$ 470,748           | \$ -                | \$ 443,725          | \$ 443,725          | \$ 5,918,758 |                             |
| 3                                                  | 2010 | 0.915                 |                     | \$ 484,870          | \$ 484,870           | \$ -                | \$ 443,725          | \$ 443,725          | \$ 5,596,905 |                             |
| 4                                                  | 2011 | 0.888                 |                     | \$ 499,416          | \$ 499,416           | \$ -                | \$ 443,725          | \$ 443,725          | \$ 5,250,413 |                             |
| 5                                                  | 2012 | 0.863                 |                     | \$ 514,399          | \$ 514,399           | \$ -                | \$ 443,725          | \$ 443,725          | \$ 4,878,094 |                             |
| 6                                                  | 2013 | 0.837                 |                     | \$ 497,916          | \$ 497,916           | \$ -                | \$ 416,997          | \$ 416,997          | \$ 4,511,583 |                             |
| 7                                                  | 2014 | 0.813                 |                     | \$ 512,854          | \$ 512,854           | \$ -                | \$ 416,997          | \$ 416,997          | \$ 4,118,692 |                             |
| 8                                                  | 2015 | 0.789                 |                     | \$ 528,239          | \$ 528,239           | \$ -                | \$ 416,997          | \$ 416,997          | \$ 3,698,166 |                             |
| 9                                                  | 2016 | 0.766                 |                     | \$ 544,086          | \$ 544,086           | \$ -                | \$ 416,997          | \$ 416,997          | \$ 3,248,702 |                             |
| 10                                                 | 2017 | 0.744                 |                     | \$ 560,409          | \$ 560,409           | \$ -                | \$ 416,997          | \$ 416,997          | \$ 2,768,942 |                             |
| 11                                                 | 2018 | 0.722                 |                     | \$ 577,221          | \$ 577,221           | \$ -                | \$ 416,997          | \$ 416,997          | \$ 2,257,472 |                             |
| 12                                                 | 2019 | 0.701                 |                     | \$ 594,538          | \$ 594,538           | \$ -                | \$ 416,997          | \$ 416,997          | \$ 1,712,822 |                             |
| 13                                                 | 2020 | 0.681                 |                     | \$ 612,374          | \$ 612,374           | \$ -                | \$ 416,997          | \$ 416,997          | \$ 1,133,461 |                             |
| 14                                                 | 2021 | 0.661                 | \$ 502,716          | \$ 630,745          | \$ 1,133,461         | \$ 332,354          | \$ 416,997          | \$ 749,351          | \$ 0         |                             |
| <b>Total Alternative 4 Enhanced Ground Water E</b> |      |                       | <b>\$ 3,507,587</b> | <b>\$ 7,672,719</b> | <b>\$ 11,180,306</b> | <b>\$ 3,337,225</b> | <b>\$ 6,153,991</b> | <b>\$ 9,491,217</b> |              |                             |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE SUMMARY <sup>2</sup>

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Institutional Controls and Monitoring  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

|                                                                 |                     |
|-----------------------------------------------------------------|---------------------|
| <b>Capital Cost</b>                                             |                     |
| Construction                                                    | \$ 1,002,005        |
| Project Management                                              | \$ 80,160           |
| Design                                                          | \$ 50,100           |
| Construction Management                                         | \$ 100,201          |
| Subcontractor General Requirements                              | \$ 50,100           |
| G&A                                                             | \$ 179,559          |
| Overhead                                                        | \$ 64,128           |
| New Mexico Gross Receipts Tax                                   | \$ 91,383           |
| Contingency                                                     | \$ 320,642          |
| Bonding& Insurance                                              | \$ 38,766           |
| Fee                                                             | \$ 155,062          |
| Administrative/Legal Fees for IC                                | \$ 15,000           |
| <b>Total Capital Cost</b>                                       | <b>\$ 2,147,107</b> |
| <b>Annual Operations and Maintenance Cost: Years 1-5</b>        |                     |
| Monthly Water Level Measurements (Piezometers)                  | \$ 13,750           |
| Annual Ground Water Sampling (Monitor Wells)                    | \$ 77,850           |
| Professional Services <sup>1</sup>                              | \$ 21,068           |
| Subcontractor General Requirements                              | \$ 4,580            |
| G&A                                                             | \$ 16,415           |
| Overhead                                                        | \$ 5,862            |
| New Mexico Gross Receipts Tax                                   | \$ 8,354            |
| Contingency                                                     | \$ 29,312           |
| Bonding& Insurance                                              | \$ 3,544            |
| Fee                                                             | \$ 14,175           |
| <b>Total Annual Operations and Maintenance Cost: Years 1-5</b>  | <b>\$ 194,910</b>   |
| <b>Annual Operations and Maintenance Cost: Years 6-14</b>       |                     |
| Once Every Two Years Ground Water Sampling                      | \$ 43,750           |
| Professional Services <sup>1</sup>                              | \$ 10,063           |
| Subcontractor General Requirements                              | \$ 2,188            |
| G&A                                                             | \$ 7,840            |
| Overhead                                                        | \$ 2,800            |
| New Mexico Gross Receipts Tax                                   | \$ 3,990            |
| Contingency                                                     | \$ 14,000           |
| Bonding& Insurance                                              | \$ 1,693            |
| Fee                                                             | \$ 6,770            |
| <b>Total Annual Operations and Maintenance Cost: Years 6-14</b> | <b>\$ 93,093</b>    |
| <b>Five Year Review Cost Per Report</b>                         |                     |
| 5-year Review Report                                            | \$ 25,000           |
| Professional Services <sup>1</sup>                              | \$ -                |
| Subcontractor General Requirements                              | \$ -                |
| G&A                                                             | \$ 3,500            |
| Overhead                                                        | \$ 1,250            |
| New Mexico Gross Receipts Tax                                   | \$ 1,781            |
| Contingency                                                     | \$ 6,250            |
| Bonding& Insurance                                              | \$ -                |
| Fee                                                             | \$ 3,023            |
| <b>Total Five Year Review Cost Per Report</b>                   | <b>\$ 40,804</b>    |
| <b>Post Closure Cost</b>                                        |                     |
| Well Abandonment                                                | \$ 104,280          |
| Professional Services <sup>1</sup>                              | \$ 39,626           |
| Subcontractor General Requirements                              | \$ 5,214            |
| G&A                                                             | \$ 20,877           |
| Overhead                                                        | \$ 7,456            |
| New Mexico Gross Receipts Tax                                   | \$ 10,625           |
| Contingency                                                     | \$ 37,280           |
| Bonding& Insurance                                              | \$ 4,507            |
| Fee                                                             | \$ 18,029           |
| <b>Total Post Closure Cost</b>                                  | <b>\$ 247,894</b>   |
| <b>TOTAL PRESENT WORTH</b>                                      | <b>\$ 4,288,996</b> |

#### NOTES:

1 - Professional Services includes Project Management, Design/Technical Support, and Construction Management.

2 - The cost estimates provided are to an accuracy of +50 percent to -30 percent and are prepared for the sole purpose of alternative comparison. The alternative cost estimates are based on conceptual design from information available at the time of this study. The actual cost of the project would depend on the final scope and design of the selected remedial action, the schedule of implementation, competitive market conditions, and other variables.



## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### **SITE DATA AND ALTERNATIVE CONCEPTUAL DESIGN**

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
DESCRIPTION: Institutional Controls and Monitoring  
PREPARED BY: L.Colella, T.Palaia  
PROJECT NUMBER: 346535.FS.01

**NO DESIGN ACTIVITY FOR INSTITUTIONAL CONTROLS AND MONITORING PORTION OF THIS ALTERNATIVE.  
REFER TO COST DETAILS SHEET COST BASIS.**

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Institutional Controls and Monitoring  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested MWs to be installed 

|   |
|---|
| 3 |
|---|

 with 3 screens for a total of 

|      |
|------|
| 4125 |
|------|

 ft
- The number of new single-screen piezometers required to be installed 

|    |
|----|
| 10 |
|----|

 piezometers
- The number of wells to be sampled for NAIPs is 

|   |
|---|
| 0 |
|---|

 wells not necessary for entire plume treatment
- The number of wells to be sampled for VOCs only is 

|    |
|----|
| 84 |
|----|

 wells (includes all existing MWs in ground water sampling program plus new monitor wells)
- The number of wells on-site to be abandoned for post-closure is 

|    |
|----|
| 94 |
|----|

 wells
- The number of wells to be sampled for PAH is 

|   |
|---|
| 0 |
|---|
- The G&A rate is 

|     |
|-----|
| 14% |
|-----|
- The overhead rate is 

|    |
|----|
| 5% |
|----|
- The Bonding & Insurance rate is 

|    |
|----|
| 2% |
|----|
- The fee rate is 

|    |
|----|
| 8% |
|----|

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                  |        |            |                 |                     |
|-----------------------------------------------|--------|------------|-----------------|---------------------|
| Item/Activity                                 | Qty    | Unit       | Unit Cost       | Cost                |
| <b>Construction</b>                           |        |            |                 |                     |
| Nested Ground Water Monitor Well Installation | 3      | well       | \$ 129,409.00   | \$ 388,227          |
| Piezometer Installation                       | 10     | piezometer | \$ 56,469.38    | \$ 564,694          |
| Fencing (Institutional Control)               | 0      | ft         | \$ 10.00        | \$ -                |
| Well Permits                                  | 19     | ea         | \$ 30.00        | \$ 570              |
| Equipment Rental                              | 4      | wk         | \$ 200.00       | \$ 800              |
| Subtotal Capital Cost                         |        |            |                 | \$ 954,291          |
| Site Work Allowance                           | 5%     | of         | \$ 954,290.82   | \$ 47,715           |
| Mechanical Allowance                          | 0%     | of         | \$ 954,290.82   | \$ -                |
| Instrumentation and Controls Allowance        | 0%     | of         | \$ 954,290.82   | \$ -                |
| Electrical Allowance                          | 0%     | of         | \$ 954,290.82   | \$ -                |
| Miscellaneous Equipment Allowance             | 0%     | of         | \$ 954,290.82   | \$ -                |
| Subtotal Capital Cost                         |        |            |                 | \$ 1,002,005        |
| Project Management                            | 8%     | of         | \$ 1,002,005.36 | \$ 80,160           |
| Design                                        | 5%     | of         | \$ 1,002,005.36 | \$ 50,100           |
| Construction Management                       | 10%    | of         | \$ 1,002,005.36 | \$ 100,201          |
| Subcontractor General Requirements            | 5%     | of         | \$ 1,002,005.36 | \$ 50,100           |
| Subtotal Capital Cost                         |        |            |                 | \$ 1,282,567        |
| G&A                                           | 14%    | of         | \$ 1,282,566.86 | \$ 179,559          |
| Overhead                                      | 5%     | of         | \$ 1,282,566.86 | \$ 64,128           |
| New Mexico Gross Receipts Tax                 | 7.125% | of         | \$ 1,282,566.86 | \$ 91,383           |
| Contingency                                   | 25%    | of         | \$ 1,282,566.86 | \$ 320,642          |
| Subtotal Capital Cost                         |        |            |                 | \$ 1,938,279        |
| Bonding& Insurance                            | 2%     | of         | \$ 1,938,279.17 | \$ 38,766           |
| Fee                                           | 8%     | of         | \$ 1,938,279.17 | \$ 155,062          |
| Administrative/Legal Fees for IC              | 1      | LS         | \$ 15,000.00    | \$ 15,000           |
| <b>TOTAL CAPITAL COST</b>                     |        |            |                 | <b>\$ 2,147,107</b> |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Institutional Controls and Monitoring  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested MWs to be installed 

|   |
|---|
| 3 |
|---|

 with 3 screens for a total of 

|      |
|------|
| 4125 |
|------|

 ft
- The number of new single-screen piezometers required to be installed 

|    |
|----|
| 10 |
|----|

 piezometers
- The number of wells to be sampled for NAIPs is 

|   |
|---|
| 0 |
|---|

 wells not necessary for entire plume treatment
- The number of wells to be sampled for VOCs only is 

|    |
|----|
| 84 |
|----|

 wells (includes all existing MWs in ground water sampling program plus new monitor wells)
- The number of wells on-site to be abandoned for post-closure is 

|    |
|----|
| 94 |
|----|

 wells
- The number of wells to be sampled for PAH is 

|   |
|---|
| 0 |
|---|
- The G&A rate is 

|     |
|-----|
| 14% |
|-----|
- The overhead rate is 

|    |
|----|
| 5% |
|----|
- The Bonding & Insurance rate is 

|    |
|----|
| 2% |
|----|
- The fee rate is 

|    |
|----|
| 8% |
|----|

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                            |        |        |               |                   |                                                                                                                    |
|-------------------------------------------------------------------------|--------|--------|---------------|-------------------|--------------------------------------------------------------------------------------------------------------------|
| Item/Activity                                                           | Qty    | Unit   | Unit Cost     | Cost              | Comments and References                                                                                            |
| <b>ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 1-5 (ANNUAL COST)</b> |        |        |               |                   |                                                                                                                    |
| Item/Activity                                                           | Qty    | Unit   | Unit Cost     | Cost              | Comments                                                                                                           |
| <u>Monthly Water Level Measurements (Piezometers)</u>                   |        |        |               |                   |                                                                                                                    |
| Labor - Technician                                                      | 180    | hr     | \$ 75.00      | \$ 13,500         | 30 piezometers per event, 2 people, 4 piezometers per hour                                                         |
| Water Level Measurement Equipment Rental                                | 1      | LS     | \$ 250.00     | \$ 250            |                                                                                                                    |
| Total Water Level Measurement                                           |        |        |               | \$ 13,750         |                                                                                                                    |
| <u>Annual Ground Water Sampling (Monitor Wells)</u>                     |        |        |               |                   |                                                                                                                    |
| Subcontractor costs for multiport wells                                 | 1      | LS     | \$ 15,200.00  | \$ 15,200         | 5 multiport wells: based on Dec 2005 invoice (4 days including move/demove, materials, equipment, labor, per diem) |
| Labor - Technician                                                      | 632    | hr     | \$ 75.00      | \$ 47,400         | 4 hrs/well, 2 people, not including 5 multiport wells                                                              |
| Ground Water Sample Analysis - VOC only                                 | 97     | sample | \$ 150.00     | \$ 14,550         | Includes all wells plus 15% (on average #) QA/QC samples                                                           |
| Ground Water Sample Analysis - NAIP                                     | 0      | sample | \$ 600.00     | \$ -              | Includes 15% (on average #) QA/QC samples                                                                          |
| Sampling Supplies                                                       | 1      | round  | \$ 200.00     | \$ 200            |                                                                                                                    |
| GW Sampling Equipment Rental                                            | 1      | round  | \$ 500.00     | \$ 500            |                                                                                                                    |
| Total Annual Ground Water Sampling                                      |        |        |               | \$ 77,850         |                                                                                                                    |
| Subtotal Years 1-5 Operations and Maintenance                           |        |        |               | \$ 91,600         |                                                                                                                    |
| Project Management                                                      | 8%     | of     | \$ 91,600.00  | \$ 7,328          |                                                                                                                    |
| Technical Support                                                       | 15%    | of     | \$ 91,600.00  | \$ 13,740         |                                                                                                                    |
| Construction Management                                                 | 0%     | of     | \$ 91,600.00  | \$ -              |                                                                                                                    |
| Subcontractor General Requirements                                      | 5%     | of     | \$ 91,600.00  | \$ 4,580          |                                                                                                                    |
| Subtotal Years 1-5 Operations and Maintenance                           |        |        |               | \$ 117,248        |                                                                                                                    |
| G&A                                                                     | 14%    | of     | \$ 117,248.00 | \$ 16,415         |                                                                                                                    |
| Overhead                                                                | 5%     | of     | \$ 117,248.00 | \$ 5,862          |                                                                                                                    |
| New Mexico Gross Receipts Tax                                           | 7.125% | of     | \$ 117,248.00 | \$ 8,354          |                                                                                                                    |
| Contingency                                                             | 25%    | of     | \$ 117,248.00 | \$ 29,312         |                                                                                                                    |
| Subtotal Years 1-5 Operations and Maintenance                           |        |        |               | \$ 177,191        |                                                                                                                    |
| Bonding& Insurance                                                      | 2%     | of     | \$ 177,191.04 | \$ 3,544          |                                                                                                                    |
| Fee                                                                     | 8%     | of     | \$ 177,191.04 | \$ 14,175         |                                                                                                                    |
| <b>TOTAL ANNUAL COST: YEARS 1-5 OPERATIONS AND MAINTENANCE COS</b>      |        |        |               | <b>\$ 194,910</b> |                                                                                                                    |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Institutional Controls and Monitoring  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested MWs to be installed 

|   |
|---|
| 3 |
|---|

 with 3 screens for a total of 

|      |
|------|
| 4125 |
|------|

 ft
- The number of new single-screen piezometers required to be installed 

|    |
|----|
| 10 |
|----|

 piezometers
- The number of wells to be sampled for NAIPs is 

|   |
|---|
| 0 |
|---|

 wells not necessary for entire plume treatment
- The number of wells to be sampled for VOCs only is 

|    |
|----|
| 84 |
|----|

 wells (includes all existing MWs in ground water sampling program plus new monitor wells)
- The number of wells on-site to be abandoned for post-closure is 

|    |
|----|
| 94 |
|----|

 wells
- The number of wells to be sampled for PAH is 

|   |
|---|
| 0 |
|---|
- The G&A rate is 

|     |
|-----|
| 14% |
|-----|
- The overhead rate is 

|    |
|----|
| 5% |
|----|
- The Bonding & Insurance rate is 

|    |
|----|
| 2% |
|----|
- The fee rate is 

|    |
|----|
| 8% |
|----|

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                                                      |        |        |              |           |
|-------------------------------------------------------------------|--------|--------|--------------|-----------|
| Item/Activity                                                     | Qty    | Unit   | Unit Cost    | Cost      |
| ANNUAL OPERATIONS AND MAINTENANCE COST - YEARS 6-14 (ANNUAL COST) |        |        |              |           |
| Item/Activity                                                     | Qty    | Unit   | Unit Cost    | Cost      |
| <u>Quarterly Water Level Measurements</u>                         |        |        |              |           |
| Labor - Technician                                                | 60     | hr     | \$ 75.00     | \$ 4,500  |
| Water Level Measurement Equipment Rental                          | 1      | LS     | \$ 250.00    | \$ 250    |
| Total Water Level Measurement                                     |        |        |              | \$ 4,750  |
| <u>Once Every Two Years Ground Water Sampling</u>                 |        |        |              |           |
| Subcontractor costs for multiport wells                           | 1      | LS     | \$ 7,600.00  | \$ 7,600  |
| Labor - Technician                                                | 316    | hr     | \$ 75.00     | \$ 23,700 |
| Ground Water Sample Analysis - VOC only                           | 49     | sample | \$ 150.00    | \$ 7,350  |
| Sampling Supplies                                                 | 0.5    | round  | \$ 200.00    | \$ 100    |
| GW Sampling Equipment Rental                                      | 0.5    | round  | \$ 500.00    | \$ 250    |
| Total Semiannual Ground Water Sampling                            |        |        |              | \$ 39,000 |
| Subtotal Years 6-14 Operations and Maintenance                    |        |        |              | \$ 43,750 |
| Project Management                                                | 8%     | of     | \$ 43,750.00 | \$ 3,500  |
| Technical Support                                                 | 15%    | of     | \$ 43,750.00 | \$ 6,563  |
| Construction Management                                           | 0%     | of     | \$ 43,750.00 | \$ -      |
| Subcontractor General Requirements                                | 5%     | of     | \$ 43,750.00 | \$ 2,188  |
| Subtotal Years 6-14 Operations and Maintenance                    |        |        |              | \$ 56,000 |
| G&A                                                               | 14%    | of     | \$ 56,000.00 | \$ 7,840  |
| Overhead                                                          | 5%     | of     | \$ 56,000.00 | \$ 2,800  |
| New Mexico Gross Receipts Tax                                     | 7.125% | of     | \$ 56,000.00 | \$ 3,990  |
| Contingency                                                       | 25%    | of     | \$ 56,000.00 | \$ 14,000 |
| Subtotal Years 6-14 Operations and Maintenance                    |        |        |              | \$ 84,630 |
| Bonding& Insurance                                                | 2%     | of     | \$ 84,630.00 | \$ 1,693  |
| Fee                                                               | 8%     | of     | \$ 84,630.00 | \$ 6,770  |
| TOTAL ANNUAL COST: YEARS 6-14 OPERATIONS AND MAINTENANCE COS      |        |        |              | \$ 93,093 |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Institutional Controls and Monitoring  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested MWs to be installed 

|   |
|---|
| 3 |
|---|

 with 3 screens for a total of 

|      |
|------|
| 4125 |
|------|

 ft
- The number of new single-screen piezometers required to be installed 

|    |
|----|
| 10 |
|----|

 piezometers
- The number of wells to be sampled for NAIPs is 

|   |
|---|
| 0 |
|---|

 wells not necessary for entire plume treatment
- The number of wells to be sampled for VOCs only is 

|    |
|----|
| 84 |
|----|

 wells (includes all existing MWs in ground water sampling program plus new monitor wells)
- The number of wells on-site to be abandoned for post-closure is 

|    |
|----|
| 94 |
|----|

 wells
- The number of wells to be sampled for PAH is 

|   |
|---|
| 0 |
|---|
- The G&A rate is 

|     |
|-----|
| 14% |
|-----|
- The overhead rate is 

|    |
|----|
| 5% |
|----|
- The Bonding & Insurance rate is 

|    |
|----|
| 2% |
|----|
- The fee rate is 

|    |
|----|
| 8% |
|----|

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                             |        |      |              |           |                         |  |
|------------------------------------------|--------|------|--------------|-----------|-------------------------|--|
| Item/Activity                            | Qty    | Unit | Unit Cost    | Cost      | Comments and References |  |
| FIVE YEAR REVIEW COST - PER REPORT       |        |      |              |           |                         |  |
| Item/Activity                            | Qty    | Unit | Unit Cost    | Cost      | Comments                |  |
| <u>5-year Review Report</u>              |        |      |              |           |                         |  |
| 5-year Review Report                     | 1      | LS   | \$ 25,000.00 | \$ 25,000 |                         |  |
| Subtotal Five Year Review Cost           |        |      |              | \$ 25,000 |                         |  |
| Project Management                       | 0%     | of   | \$ 25,000.00 | \$ -      |                         |  |
| Technical Support                        | 0%     | of   | \$ 25,000.00 | \$ -      |                         |  |
| Construction Management                  | 0%     | of   | \$ 25,000.00 | \$ -      |                         |  |
| Subcontractor General Requirements       | 0%     | of   | \$ 25,000.00 | \$ -      |                         |  |
| Subtotal Five Year Review Cost           |        |      |              | \$ 25,000 |                         |  |
| G&A                                      | 14%    | of   | \$ 25,000.00 | \$ 3,500  |                         |  |
| Overhead                                 | 5%     | of   | \$ 25,000.00 | \$ 1,250  |                         |  |
| New Mexico Gross Receipts Tax            | 7.125% | of   | \$ 25,000.00 | \$ 1,781  |                         |  |
| Contingency                              | 25%    | of   | \$ 25,000.00 | \$ 6,250  |                         |  |
| Subtotal Five Year Review Cost           |        |      |              | \$ 37,781 |                         |  |
| Bonding& Insurance                       | 0%     | of   | \$ 37,781.25 | \$ -      |                         |  |
| Fee                                      | 8%     | of   | \$ 37,781.25 | \$ 3,023  |                         |  |
| TOTAL FIVE YEAR REVIEW COST - PER REPORT |        |      |              | \$ 40,804 |                         |  |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### COST ESTIMATE DETAILS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Institutional Controls and Monitoring  
 PREPARED BY: L. Colella, T. Palaia  
 PROJECT NUMBER: 346535.FS.01

#### Assumptions

- The accuracy of the cost estimate is +50%/-30%
- See "Conceptual Design" spreadsheet for basis of cost estimate assumptions.
- The number of new nested MWs to be installed 

|   |
|---|
| 3 |
|---|

 with 3 screens for a total of 

|      |
|------|
| 4125 |
|------|

 ft
- The number of new single-screen piezometers required to be installed 

|    |
|----|
| 10 |
|----|

 piezometers
- The number of wells to be sampled for NAIPs is 

|   |
|---|
| 0 |
|---|

 wells not necessary for entire plume treatment
- The number of wells to be sampled for VOCs only is 

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|----|
| 84 |
|----|

 wells (includes all existing MWs in ground water sampling program plus new monitor wells)
- The number of wells on-site to be abandoned for post-closure is 

|    |
|----|
| 94 |
|----|

 wells
- The number of wells to be sampled for PAH is 

|   |
|---|
| 0 |
|---|
- The G&A rate is 

|     |
|-----|
| 14% |
|-----|
- The overhead rate is 

|    |
|----|
| 5% |
|----|
- The Bonding & Insurance rate is 

|    |
|----|
| 2% |
|----|
- The fee rate is 

|    |
|----|
| 8% |
|----|

#### Detailed Capital and Operations and Maintenance Costs

| CAPITAL COST                           |        |      |               |            |
|----------------------------------------|--------|------|---------------|------------|
| Item/Activity                          | Qty    | Unit | Unit Cost     | Cost       |
| POST CLOSURE COST                      |        |      |               |            |
| Item/Activity                          | Qty    | Unit | Unit Cost     | Cost       |
| <u>Well Abandonment</u>                |        |      |               |            |
| Well Abandonment                       | 94     | well | \$ 1,000.00   | \$ 94,000  |
| Equipment Rental                       | 4      | wk   | \$ 200.00     | \$ 800     |
| Total Well Abandonment                 |        |      |               | \$ 94,800  |
| Site Work Allowance                    | 10%    | of   | \$ 94,800.00  | \$ 9,480   |
| Mechanical Allowance                   | 0%     | of   | \$ 94,800.00  | \$ -       |
| Instrumentation and Controls Allowance | 0%     | of   | \$ 94,800.00  | \$ -       |
| Electrical Allowance                   | 0%     | of   | \$ 94,800.00  | \$ -       |
| Miscellaneous Equipment Allowance      | 0%     | of   | \$ 94,800.00  | \$ -       |
| Total Well Abandonment                 |        |      |               | \$ 104,280 |
| Subtotal Post-Closure Cost             |        |      |               | \$ 104,280 |
| Project Management                     | 8%     | of   | \$ 104,280.00 | \$ 8,342   |
| Technical Support                      | 15%    | of   | \$ 104,280.00 | \$ 15,642  |
| Construction Management                | 15%    | of   | \$ 104,280.00 | \$ 15,642  |
| Subcontractor General Requirements     | 5%     | of   | \$ 104,280.00 | \$ 5,214   |
| Subtotal Post-Closure Cost             |        |      |               | \$ 149,120 |
| G&A                                    | 14%    | of   | \$ 149,120.40 | \$ 20,877  |
| Overhead                               | 5%     | of   | \$ 149,120.40 | \$ 7,456   |
| New Mexico Gross Receipts Tax          | 7.125% | of   | \$ 149,120.40 | \$ 10,625  |
| Contingency                            | 25%    | of   | \$ 149,120.40 | \$ 37,280  |
| Subtotal Post-Closure Cost             |        |      |               | \$ 225,358 |
| Bonding & Insurance                    | 2%     | of   | \$ 225,358.20 | \$ 4,507   |
| Fee                                    | 8%     | of   | \$ 225,358.20 | \$ 18,029  |
| TOTAL POST CLOSURE COST                |        |      |               | \$ 247,894 |

## Alternative 4 - Enhanced Ground Water Extraction with Treatment

### PRESENT WORTH ANALYSIS

PROJECT: Griggs and Walnut Superfund Site Feasibility Study  
 SITE: Griggs and Walnut Superfund Site - Las Cruces, New Mexico  
 ALTERNATIVE: 4 Enhanced Ground Water Extraction with Treatment  
 DESCRIPTION: Institutional Controls and Monitoring  
 PREPARED BY: L.Colella, T.Palaia  
 PROJECT NUMBER: 346535.FS.01

### Assumptions

1. Real Discount Rate **3.00%** Source: OMB Circular No. A-94, Jan. 2007 version of Appendix C obtained from [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html)
2. Assumes Total PV earns interest for an entire year (12 months), compound annually.
3. Escalation factor is **3.00%**

### Present Worth Analysis

|                                                    |      | E            | A                   | B                   | C=A+B               | A*E                 | B*E                 | C*E                 |                       |
|----------------------------------------------------|------|--------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-----------------------|
|                                                    |      | Discount     |                     |                     |                     | Total PV            | Total PV O&M        | Total PV            | Balance of Interest   |
| Elapsed Time                                       | Year | Factor at 3% | Capital Cost        | O&M Cost            | Total Cost          | Capital Costs at 3% | Costs at 3%         | Costs at 3%         | Bearing Account at 3% |
| 0                                                  | 2007 | 1.000        | \$ 2,147,107        |                     | \$ 2,147,107        | \$ 2,147,107        | \$ -                | \$ 2,147,107        | \$ 2,206,146          |
| 1                                                  | 2008 | 0.971        |                     | \$ 200,757          | \$ 200,757          | \$ -                | \$ 194,910          | \$ 194,910          | \$ 2,065,550          |
| 2                                                  | 2009 | 0.943        |                     | \$ 206,780          | \$ 206,780          | \$ -                | \$ 194,910          | \$ 194,910          | \$ 1,914,533          |
| 3                                                  | 2010 | 0.915        |                     | \$ 212,984          | \$ 212,984          | \$ -                | \$ 194,910          | \$ 194,910          | \$ 1,752,596          |
| 4                                                  | 2011 | 0.888        |                     | \$ 219,373          | \$ 219,373          | \$ -                | \$ 194,910          | \$ 194,910          | \$ 1,579,220          |
| 5                                                  | 2012 | 0.863        |                     | \$ 273,257          | \$ 273,257          | \$ -                | \$ 235,714          | \$ 235,714          | \$ 1,345,141          |
| 6                                                  | 2013 | 0.837        |                     | \$ 111,158          | \$ 111,158          | \$ -                | \$ 93,093           | \$ 93,093           | \$ 1,271,003          |
| 7                                                  | 2014 | 0.813        |                     | \$ 114,493          | \$ 114,493          | \$ -                | \$ 93,093           | \$ 93,093           | \$ 1,191,206          |
| 8                                                  | 2015 | 0.789        |                     | \$ 117,927          | \$ 117,927          | \$ -                | \$ 93,093           | \$ 93,093           | \$ 1,105,477          |
| 9                                                  | 2016 | 0.766        |                     | \$ 121,465          | \$ 121,465          | \$ -                | \$ 93,093           | \$ 93,093           | \$ 1,013,532          |
| 10                                                 | 2017 | 0.744        |                     | \$ 179,946          | \$ 179,946          | \$ -                | \$ 133,897          | \$ 133,897          | \$ 858,593            |
| 11                                                 | 2018 | 0.722        |                     | \$ 128,862          | \$ 128,862          | \$ -                | \$ 93,093           | \$ 93,093           | \$ 751,623            |
| 12                                                 | 2019 | 0.701        |                     | \$ 132,728          | \$ 132,728          | \$ -                | \$ 93,093           | \$ 93,093           | \$ 637,461            |
| 13                                                 | 2020 | 0.681        |                     | \$ 136,710          | \$ 136,710          | \$ -                | \$ 93,093           | \$ 93,093           | \$ 515,773            |
| 14                                                 | 2021 | 0.661        | \$ 374,962          | \$ 140,812          | \$ 515,773          | \$ 247,894          | \$ 93,093           | \$ 340,987          | \$ -                  |
| <b>Total Alternative 4 Enhanced Ground Water E</b> |      |              | <b>\$ 2,522,069</b> | <b>\$ 2,297,253</b> | <b>\$ 4,819,322</b> | <b>\$ 2,395,001</b> | <b>\$ 1,893,995</b> | <b>\$ 4,288,996</b> |                       |