**An Overview of Tool for Response Action Cost Estimating (TRACE) - 12407**

Steven R. Ferries, Bradley Ostapkowicz, P.E. CH2M HILL Plateau Remediation Company, and Kevin L. Klink, P.E., Freestone Environmental, Richland, Washington, 99354

**ABSTRACT**

Tools and techniques that provide improved performance and reduced costs are important to government programs, particularly in current times. An opportunity for improvement was identified for preparation of cost estimates used to support the evaluation of response action alternatives. As a result, CH2M HILL Plateau Remediation Company has developed Tool for Response Action Cost Estimating (TRACE). TRACE is a multi-page Microsoft Excel® workbook developed to introduce efficiencies into the timely and consistent production of cost estimates for response action alternatives (response actions can be remedial actions and/or removal actions). This tool combines costs derived from extensive site-specific runs of commercially available remediation cost models with site-specific and estimator-researched and derived costs, providing the best estimating sources available. TRACE also provides for common quantity and key parameter links across multiple alternatives, maximizing ease of updating estimates and performing sensitivity analyses, and ensuring consistency.

**INTRODUCTION**

In performing cleanup of releases of hazardous substances into the environment under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, 42 U.S.C. 9601 et seq.), and EPA's implementing regulation, the National Contingency Plan (NCP, 40 CFR Part 300), the selection of a particular short term Removal Action, or of a longer term and more comprehensive Remedial Action, from among various alternatives, requires the evaluation of the costs of each alternative. Those costs are documented in Engineering Evaluations and Cost Analyses (EE/CAs) for Non-Time Critical Removal Actions and in Feasibility Studies (FS) for Remedial Actions. These EE/CAs and FSs are published for public review and comment, which are then considered by the Federal agency implementing CERCLA at a contaminated site and the documents and public response placed in the formal Administrative Record which justified against future judicial review the choice of actions made by the CERCLA response action agency. At Federal facilities managed by the US Department of Energy (DOE), and placed on the CERCLA National Priorities List (NPL), DOE is that agency, with EPA oversight. It is vital in this decision process to ensure that evaluations

of the costs of alternatives are accurate and defensible, especially because there are other pending response actions that also need to be funded from the same limited Federal budgets. While the usual $2 million cost limit for Removal Actions does not apply to DOE-funded response actions, costs are also important because they can trigger review by the EPA national Remedy Review Board, which is concerned with preventing unnecessary escalation of the costs of response actions under CERCLA, and because Congress seeks accurate accounting of the use of appropriated funds. Issues with past cost estimates for Comprehensive Environmental Response, Compensation and Liability Act(CERCLA) feasibility studies at Hanford prompted the creation of TRACE:

Difficult to complete cost estimates on schedule due to a labor intensive cost generation and documentation system, key inputs provided very late in document development, and last minute project changes to remedial technologies and process options

Regarded by the customer as appearing to be: difficult to explain and defend, unrelated to recent actual costs, and inconsistent between estimates.

TRACE calculates capital and operations and management (O&M) costs for each alternative, as both life-cycle non-discounted and present value costs. Standardized unit costs are based on a combination of the commercially-available Remedial Action Cost Estimating and Risk (RACER™) cost model runs and actual Hanford costs from completed response actions, detailed post-feasibility study (FS) and (EE/CA) estimates, and contractor quotes and bids. Project-specific user-supplied costs are easily entered and automatically flagged for quality assurance (QA) checks. Key quantities, percentages, and project information are entered once, and then linked through capital and O&M cost spreadsheets to generate costs for each remedial alternative. TRACE modular design facilitates: alternative cost development, modification of cost elements, comparisons between multiple alternatives, itemization of costs for up to 95 sites for each alternative and cost sensitivity analyses.

TRACE was developed, documented, and implemented to be an improved and more responsive cost estimating tool, meeting project needs.


**METHOD**


TRACE was developed as an MS Excel workbook, documented by a series of Environmental Calculation Files (ECFs) that were independently validated and verified, checked against specific project and actual cost cases, and approved before implementation. Cost estimating methodologies and guidance from Association for the Advancement of Cost Engineering (AACE) EPA, DOE and CH2M HILL Plateau Remediation Company were followed in the development of TRACE. The TRACE master workbook is version-controlled, with documented updates following CHPRC procedures. Project cost estimates are initiated with the latest TRACE master workbook. The TRACE worksheets are locked, except for designated user entry fields

and designated fields for comments and references. Changes to standard unit costs, or additions of new user-defined cost items generate automatic flags that prompt review checks and approval signoffs.

## TRACE Spreadsheets

The TRACE workbook has five sets of five spreadsheets each, each set for a response action alternative, and six general spreadsheets used to generate the cost estimates and report results for all alternatives. Figure 1 provides an overview of the content in some of the TRACE spreadsheets and shows general and example-specific flow of information between the spreadsheets (NOTE: the group of spreadsheets that work together to itemize capital, annual O&M, periodic, total non-discounted, and total discounted costs for up to 95 sites for each alternative are not shown on this figure).

The following provides an overview of the TRACE workbook spreadsheets:

**General Spreadsheets 1 & 2: "Actual Costs" and "RACER Costs"** – These two spreadsheets hold cost results that form the basis for the standardized line item unit costs in the "Unit Costs" spreadsheet. Both of these were locked after review/validation, and only updated with new information on a periodic basis.

**"Actual Costs"** – This spreadsheet holds actual project costs for specific response action activities that had been documented with associated quantities and project parameters/site specifics. The actual costs are adjusted for comparability with other similar actual costs and with RACER generated costs for the same response action activity. Selected actual costs, which show a range around the standardized unit costs, and the standardized unit costs, are linked to the "Unit Costs" spreadsheet. Summary information used in developing standardized line item unit costs is also presented.

**"RACER Costs"** – This spreadsheet holds RACER modeled costs for specific response action activities and associated quantities and project parameters/site specifics. The RACER costs were either run to match standardized unit cost assumptions or adjusted for comparability with similar actual costs. Selected RACER costs, which show a range around the standardized unit costs, and standardized unit costs derived only from RACER costs are linked to the "Unit Costs" spreadsheet. In some cases RACER costs are linked to the "Actual Costs" spreadsheet to supplement the actual costs.
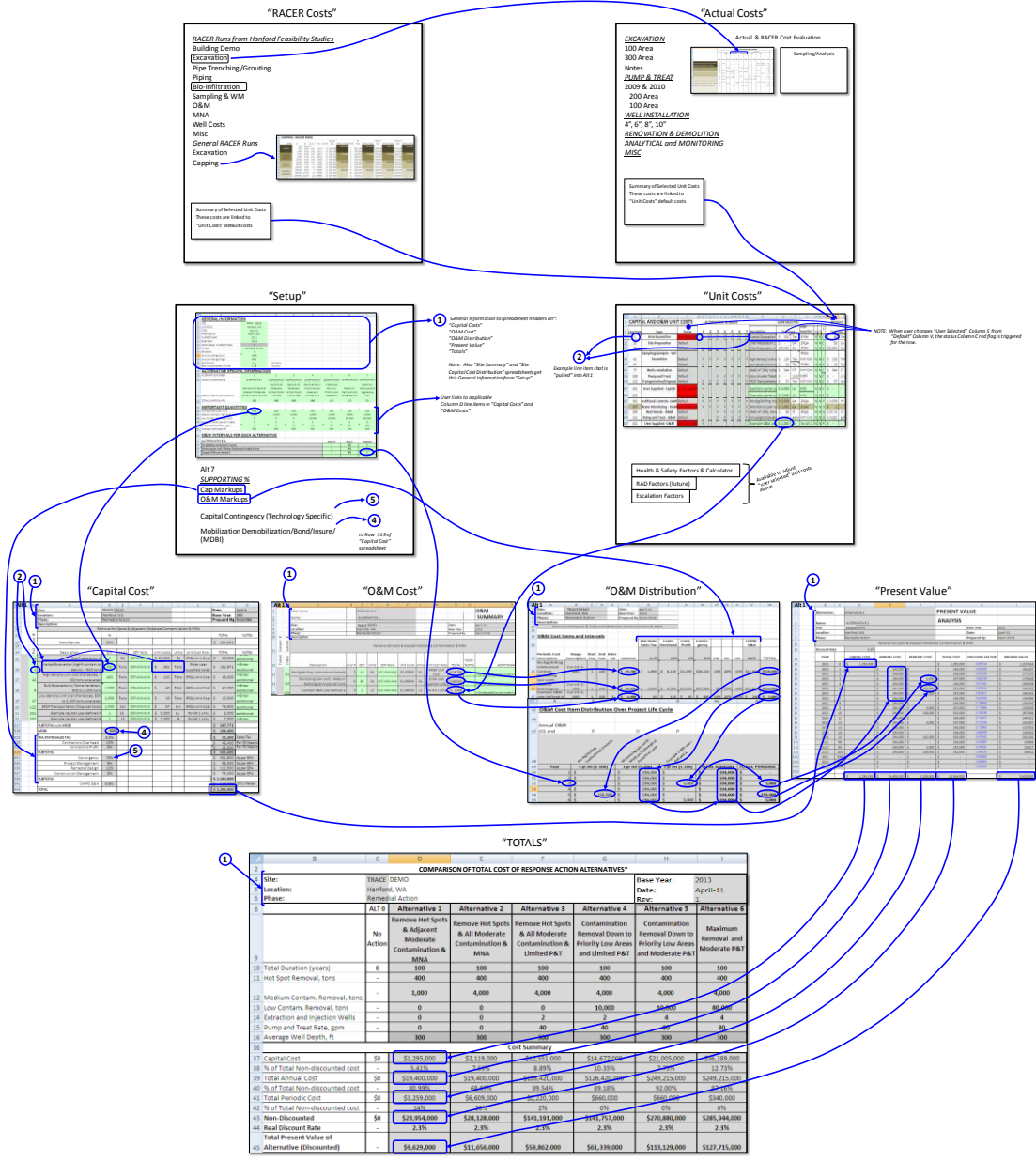
**Figure 1 TRACEV3 Workbook Overview**

**General Spreadsheets 3 & 4: "Setup" and "Unit Costs"** – These two spreadsheets are the heart of the TRACE workbook, taking key information in from the "RACER Costs" and "Actual Costs" spreadsheets and feeding estimating parameters and associated unit costs to the alternative specific costing spreadsheets (e.g., capital cost, O&M). Both of these spreadsheets collect and display consolidated information for up to five response action alternatives, providing centralized locations for building and reviewing cost estimates.

**"Setup"** – This spreadsheet contains the following information that is entered by the estimator to describe and define the cost estimate:

General Information – site name, location, base year, and other key information that is linked automatically to all of the alternative-specific spreadsheets.

Alternative Specific Information – alternative name and description, real discount rate, response action duration, mobilization/demobilization and contingency percentages, and user inputs specific to the response action alternative. This information feeds into alternative-specific "Capital Cost" and "O&M Distribution" spreadsheets.

"Important Quantities" - This matrix provides a centralized location for user-provided quantities for each response action alternative. This is particularly useful where quantities are used multiple times and/or are subject to change, and to compare key quantities between the different response actions. This also streamlines sensitivity analyses for the range of values used. The important quantities must be linked by the estimator into response action alternative-specific quantities in the "Capital Cost" and "O&M Cost" spreadsheets. The important quantities are subsequently linked into the "Totals" spreadsheet – these rows can be hidden or displayed as desired for the project.

O & M Intervals for Each alternative – A matrix is provided for each response action alternative that links from O&M and periodic cost line items in the "O&M Cost" spreadsheet. The entries for input are: start year, stop year, and occurrence interval in years for each O&M item for each alternative identified. This information links to the alternative-specific O&M Distribution spreadsheet.

**"Unit Costs"** – This spreadsheet contains the following information:

Numbered cost line items with separate standardized and user-defined matrices for capital costs and for O&M/periodic costs. The standardized cost line items have default unit costs that users can accept or override, and display supporting cost information compiled from the Actual Costs and RACER Costs spreadsheets. The line item descriptions, unit cost, units, and unit cost notes are linked to the alternative-specific "Capital Cost" or "O&M Cost" spreadsheets, depending on the line item cost type.

Each cost line item, whether standardized or user-defined, has a gray "pull" column for each project specific alternatives 1 to 5.

This column gets populated from the "Capital Cost" spreadsheet or "O&M Cost" spreadsheet, corresponding to the item type. After a cost line item is "pulled" into one of those spreadsheets, by typing the line item number into the alternative-specific "Capital Cost" spreadsheet, a "y" is automatically entered in the gray column in the "Unit Cost" spreadsheet for the specific line item and alternative. Note that this column is locked in the "Unit Costs" spreadsheet.

There is a separate matrix for each alternative with intermediate logic and values supporting "Pull" operations

A section of the spreadsheet is dedicated to health and safety factors, providing a calculation methodology for factoring cost line items based on health and safety levels and showing a range of results using different levels of assumptions for health and safety Levels A, B, C, and D.  A blank set of factors is reserved for calculation results based on different levels of protection, which are to be defined, for dealing with different levels of radioactive wastes.  These factors are available to scale default unit costs to account for different health and safety protection levels and conditions than assumed.

A section of the spreadsheet is dedicated to Engineering News Record Construction Cost Index (ENR CCI) factors dating from 1995 to recent.  These factors are used to convert past costs into current costs.

**Alternative-Specific Spreadsheets 1 & 2:  "Capital Cost" and "O&M Cost".**  There is five of each of these spreadsheets in the workbook identified as Alternatives 1 to 5, as needed for the project.  These spreadsheets are where the capital and O&M costs are respectively assembled for each alternative, based on pull operations for all standardized and user-selected cost line items.

**"Capital Cost"** – This spreadsheet receives the alternative-specific pulled unit cost line items.  Capital costs are summed in the spreadsheet and markups from the "Setup" spreadsheet are applied to give a total capital cost for each alternative.  The alternative-specific total capital cost is linked into the alternative-specific present value "PV Cost" spreadsheet.  The optional "Site #' column can be used to assign site numbers from 1 up to 95 to segregate and track sequential blocks of capital costs.

**"O&M Cost"** – This spreadsheet receives the alternative-specific pulled unit cost line items.  Since this spreadsheet contains line items with different time intervals, these costs are not summed.  The cost line items are linked into the "Setup" spreadsheet for user entry of time interval information, and the costs from alternative-specific "O&M Cost" spreadsheet are linked into "O&M Distribution" spreadsheet. The optional "Site #' column can be used to assign site numbers from 1 up to 95 to segregate and track sequential blocks of O&M costs.


**Alternative-Specific Spreadsheets 3, 4 & 5: "Capital Cost Distribution", "O&M Distribution" and "Present Value".**  There is five of each of these spreadsheets in the workbook, identified as Alternatives 1 to 5, as needed for the project.  These spreadsheets are where the costs get allocated to sites within each alternative (if any), distributed over time and then totaled.

**"Capital  Cost Distribution"** – The site numbers in the "Capital Cost" spreadsheet for each line capital cost line item are used to group the capital costs into site-specific capital costs.  Site 0 begins the sequence and is the designation reserved for assigning costs that can get distributed among Sites 1 through 95 for an alternative; e.g., mobilization/demobilization costs, site preparation costs.

**"O&M Distribution"** – The alternative-specific O&M and periodic cost line items are listed in this spreadsheet along with the line-item specific interval information. Markups from "Setup" are applied to each line item. Then, in a separate matrix, the costs for each marked up line item are distributed over the specific years of occurrence, from 1 up to 1000 in Alternative 1 and from 1 to 200 in Alternatives 2 through 5. The individual site annual and periodic costs are summed for each year in separate cost arrays for each site.

**"Present Value"** – The alternative-specific "PV" spreadsheet receives all values from the corresponding "Capital Cost" and "O&M Distribution" spreadsheets (for all sites), summing by the year-specific distribution and displaying an overall cost distribution over 1 up to 200 years (1 to 1000 years for Alternative 1) in separate columns for capital, O&M and periodic costs. Each column is totaled individually to provide the total non-discounted cost. Each row from the three columns is then totaled to show total costs in each year from 1 up to 200 (1 to 1000 years for Alternative 1). A separate column displays year-specific discount factors that are calculated using the discount rate percent that is transferred in from the "Setup" spreadsheet. A final column shows the calculated year-by-year present value, which is then totaled to give a single overall present value cost for the alternative. The "PV" spreadsheet results are then transferred to the "Totals" spreadsheet.

**General Spreadsheets 5 & 6: "Site-Summary" and "Totals"**

**"Site-Summary"** – This spreadsheet presents the site specific costs listed below for each site evaluated within an alternative, and calculates the total of each cost for all sites which represents the totals for each alternative. Inputs to this spreadsheet are from links to other spreadsheets; such as, the Setup, Site Capital Cost Distribution, and O&M Cost Distribution spreadsheets and include the Capital, Annual, and Periodic Costs from each. The total costs for each alternative in this spreadsheet can be compared to the costs calculated in the "Totals" spreadsheet. The two sets of costs are calculated independently, and when all capital and O&M cost line items in an alternative are assigned site numbers, the two sets of total Alternative costs will match.

Capital costs and discounted capital costs
Annual costs and discounted annual costs
Periodic costs and discounted periodic costs
Total non-discounted costs
Total discounted (PV) costs

**"Totals"** – This spreadsheet presents the summary of results obtained from the other spreadsheets for each of the seven alternatives:

General site and alternative-specific description and duration are linked from the "Setup" spreadsheet.

Important quantities for each alternative are presented from the "Setup" spreadsheet.

Separate totals are presented from "Present Value" spreadsheet for each alternative for:

Capital cost
Annual O&M cost
Periodic cost
Non-discounted cost
Present value cost

## TRACE Environmental Calculation Files (ECFs)

More detailed steps, calculation approaches, and equations/basis for each TRACE spreadsheet are presented in the ECF's (see References at end).  Each ECF consists of the following:

Purpose
Background
Methodology
Assumptions and Inputs
Software Applications
Calculation
Results/Conclusions
References

## RESULTS AND DISCUSSION

TRACE has proven to significantly enhance response action cost estimating:

**Transparency** –Generates alternative cost spreadsheets that are uniformly formatted to clearly and consistently present cost items, cost descriptions, quantities, and unit cost references. All standardized unit costs are fully referenced from their sources.

**Relevancy** –Uses standardized unit costs based on a combination of RACER cost model runs and actual Hanford costs from completed response actions, detailed post-FS and EE/CA estimates, and contractor quotes and bids.

**Speed** – Allows cost estimates to be generated and reviewed significantly faster than the previous system. Generally, for well-scoped and planned alternatives, initial cost estimates are competed with a 20% to 50% time reduction. Similarly, cost estimate modifications are completed with a 50% to 90% time reduction.

**Consistency** –Allows for consistent application of costs, from a master list of unit costs, throughout all alternatives in a cost estimate and between estimates.  Project supplied unit costs can also be entered into the master list further assuring consistent use.

**Flexibility** – Provides for quick unit cost master list updates and supplements to reflect new information or alternative-specific conditions. Key quantities for each alternative are entered once, and are systematically linked to their respective capital and O&M cost spreadsheets, allowing quick changes and cost sensitivity analyses.

**Defensibility** – Facilitates use of unit costs and linking these costs to multiple remedial alternatives for a single cost estimate. When a standardized default cost is changed, an automatic flag is displayed indicating the need for a review and an appropriate reference.

**Usefulness –** Calculates capital and O&M costs as both life-cycle non-discounted and present value costs.

**Cost effectiveness** – TRACE has paid for itself based on the savings of three cost estimates and the significant reduction of time needed for system maintenance due to its modular design.

The structured input of key project general information and scope quantities facilitates setup, review, and project discussions (see Figure 2).

**Title: TRACE Setup Spreadsheet**

**Purpose: General and specific setup for response action alternative cost estimates**

| | | | | Date of Review | 1/12/2012 |
| --- | --- | --- | --- | --- | --- |
| **GENERAL INFORMATION** | | | | Reviewer's Name | |

| | | UNITS | NOTES |
| --- | --- | --- | --- |
| SITE | DOE Example | | |
| LOCATION | Hanford, WA | | |
| DATE | January-12 | | |
| PREPARED BY | K. Klink | | |
| CURRENT YEAR | 2012 | | |
| BASE YEAR | 2016 | | |
| DELTA (BASE - CURRENT YEAR) | 4 | | |
| PHASE | Soil & GW Alt Scoping | | |
| REVISION | 0 | | |
| Accuracy Range (Low) | -30% | | |
| Accuracy Range (High) | 50% | | |
| Soil Density | 1.5 | tons/bcy | |
| Bank to excavated volume | 1.15 | ecy/bcy | |

**ALTERNATIVE SPECIFIC INFORMATION**

NOTES

| | | | | | | NOTES |
| --- | --- | --- | --- | --- | --- | --- |
| ALTERNATIVE NUMBER | 1 | 2 | 3 | 4 | 5 | |
| NAME OF ALTERNATIVE | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 | Alternative 5 | |
| DESCRIPTION OF ALTERNATIVE | Monitored Natual Attenuation (MNA) and Institutional Controls (IC) | Hot Spot Soils Excavation w/ Disposal and IA plus Limited P&T | Hot Spot Soils Excavation w/ Disposal and IA plus Moderate P&T | Excavation w/ Disposal to 10 feet depth and IA plus Moderate P&T | Excavation w/ Disposal to Risk-Based Limits and IA plus Aggressive P&T | |
| DISCOUNT RATE | 2.0% | 2.0% | 2.0% | 2.0% | 1.9% | represents OMB's |
| TOTAL DURATION (YRS) | 300 | 100 | 30 | 30 | 25 | |

**IMPORTANT QUANTITIES (linked to Totals - see ROW 1300 for additional Important Quantity space)**

| | 1 | 2 | 3 | 4 | 5 |
| --- | --- | --- | --- | --- | --- |
| Hot Spot Soil Removal/Disposal, tons | 0 | 4,000 | 4,000 | 4,000 | 4,000 |
| Incremental Soils Removal/Disposal to 10ft., tons | 0 | 0 | 0 | 50,000 | 50,000 |
| Incremental Risk-Based Soils Removal/Disposal, tons | 0 | 0 | 0 | 0 | 440,000 |
| Uranium Flow, gpm | NA | 50 | 150 | 150 | 300 |
| Uranium P&T Years | NA | 100 | 25 | 25 | 20 |
| Uranium MNA Years; or Compliance Monitoring Years After P&T | 300 | 5 | 5 | 5 | 5 |
| Chromium Flow, gpm | NA | 100 | 150 | 150 | 200 |
| Chromium P&T Years | NA | 60 | 25 | 25 | 20 |
| Chromium MNA Years; or Compliance Monitoring Years After P&T | 120 | 5 | 5 | 5 | 5 |

**O&M INTERVALS FOR EACH ALTERNATIVE**

| Site # | **ALTERNATIVE 2** | | | Start Yr | End Yr |
| --- | --- | --- | --- | --- | --- |
| 0 | | | | 0 | 0 |

**Figure 2 Selected TRACE "Setup" Worksheet Information**

Side-by-side cost summaries with "site" itemization for each alternative are provided in the TRACE "Site Summary" spreadsheet (Figure 3). The example in Figure 3 shows a Site Summary itemization for each of five remedial action alternatives for two plumes and soil excavation and disposal (cost breakout as three separate sites within each alternative). Figure 2 provides key scope parameters corresponding to the Figure 3 results, including tons of soil excavated/disposed, and plume-specific groundwater pumping rates and corresponding projected timeframes to meet target cleanup levels. Reviewing the Figure 3 results provides some insights to how the TRACE tool can be used to support optimizing cost-effectiveness of remedial actions. For this example,

which is not an actual Hanford site but has similarities to Hanford sites, review of Figures 2 and 3 shows that there are some annual and periodic cost reductions achieved for some level of increasing groundwater pumping and treatment rates (and then increasing rates increases capital and annual/periodic costs), Looking at both non-discounted and discounted costs indicates the alternative-specific sensitivity to the real discount rate used for present value (PV) calculations.  The TRACE spreadsheets can be quickly modified by changing key parameter inputs, and provides excellent support for project sensitivity analyses and decision making meetings.

| Title: TRACE V3 Site Summary | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Purpose: Example Soil & Groundwater Alt Scoping** | | | | | | | | | | |
| Site: | | DOE Example | | | | Date: | | January-12 | | |
| Location: | | Hanford, WA | | | | Base Year: | | 2016 | | |
| Phase: | | Soil & GW Alt Scoping | | | | Prepared By: | | K. Klink | | |
| Description: | | | | | | | | | | |
| | | | | | | | | | | |
| | | **Alternative 1** | | **Alternative 2** | | **Alternative 3** | | **Alternative 4** | | **Alternative 5** |
| Site number 1 | | | | | | | | | | |
| Site name | | | | | Uranium Plume | | | | | |
| Capital Cost | $ | 9,191,186 | $ | 20,008,480 | $ | 25,731,545 | $ | 25,731,545 | $ | 33,942,544 |
| Annual | $ | 50,794,100 | $ | 85,085,100 | $ | 58,678,200 | $ | 58,678,200 | $ | 84,037,100 |
| Periodic | $ | 133,503,381 | $ | 195,533,000 | $ | 153,458,500 | $ | 153,458,500 | $ | 243,526,800 |
| Individual Site (Non Discounted) | $ | 193,488,667 | $ | 300,626,580 | $ | 237,868,245 | $ | 237,868,245 | $ | 361,506,444 |
| Discounted (PV) | $ | 41,493,054 | $ | 143,854,205 | $ | 175,382,525 | $ | 175,382,525 | $ | 281,373,783 |
| | | | | | | | | | | |
| Site number 2 | | | | | | | | | | |
| Site name | | | | | Chromium Plume | | | | | |
| Capital Cost | $ | 3,063,729 | $ | 10,360,381 | $ | 13,109,892 | $ | 13,109,892 | $ | 15,994,744 |
| Annual | $ | 12,187,500 | $ | 22,527,200 | $ | 13,038,600 | $ | 13,038,600 | $ | 13,369,200 |
| Periodic | $ | 32,486,419 | $ | 147,480,500 | $ | 83,776,300 | $ | 83,776,300 | $ | 89,632,200 |
| Individual Site (Non Discounted) | $ | 47,737,648 | $ | 180,368,081 | $ | 109,924,792 | $ | 109,924,792 | $ | 118,996,144 |
| Discounted (PV) | $ | 16,165,608 | $ | 95,986,148 | $ | 80,029,395 | $ | 80,029,395 | $ | 91,413,812 |
| | | | | | | | | | | |
| Site number 3 | | | | | | | | | | |
| Site name | | | | | Soil Excavation and Disposal | | | | | |
| Capital Cost | $ | - | $ | 659,033 | $ | 659,033 | $ | 5,870,554 | $ | 54,019,648 |
| Annual | $ | - | $ | - | $ | - | $ | - | $ | - |
| Periodic | $ | - | $ | - | $ | - | $ | - | $ | - |
| Individual Site (Non Discounted) | $ | - | $ | 659,033 | $ | 659,033 | $ | 5,870,554 | $ | 54,019,648 |
| Discounted (PV) | $ | - | $ | 608,844 | $ | 608,844 | $ | 5,423,484 | $ | 50,200,451 |
| | | | *<Sites 4 through 95 not used & hidden>* | | | | | | | |
| | | | | | | | | | | |
| **Total Capital (Non-discounted)** | $ | 12,255,000 | $ | 31,028,000 | $ | 39,501,000 | $ | 44,712,000 | $ | 103,957,000 |
| **Total Annual (Non-discounted)** | $ | 62,982,000 | $ | 107,613,000 | $ | 71,717,000 | $ | 71,717,000 | $ | 97,407,000 |
| **Total Periodic (Non-discounted)** | $ | 165,990,000 | $ | 343,014,000 | $ | 237,235,000 | $ | 237,235,000 | $ | 333,159,000 |
| **Total Non Discounted** | $ | 241,227,000 | $ | 481,655,000 | $ | 348,453,000 | $ | 353,664,000 | $ | 534,523,000 |
| **Total Discounted (Discounted)** | $ | 57,659,000 | $ | 240,450,000 | $ | 256,021,000 | $ | 260,836,000 | $ | 422,989,000 |

**Figure 3 TRACE Site Specific Cost Results for Example Site with Two Plumes and Soil Contamination**

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11. ECF-Hanford-11-0100, Environmental Calculation File for TRACEV3 - RACER Costs

12. ECF-Hanford-11-0101, Environmental Calculation File for TRACE V3 -Setup

13. ECF-Hanford-11-0102 Environmental Calculation File for TRACEV3 Unit Costs

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16. ECF-Hanford-11-0105, Environmental Calculation File for TRACEV3-O&M Distribution

17. ECF-Hanford-11-0106, Environmental Calculation File for TRACEV3-Present Value

18. ECF-Hanford-11-0107, Environmental Calculation File for TRACEV3-Totals

19. ECF-Hanford-11-0176, Environmental Calculation File for TRACE V3 Site Summary

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