STRATA ENERGY INC

March 23, 2015

Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Strata Energy, Inc., Ross In Situ Recovery Project
Source Materials License SUA-1601, Docket No. 040-09091
Updated Annual Revised Bond Estimate

To Whom it May Concern:

By letter dated January 14, 2015 Strata Energy Inc. (Strata) submitted the annual surety estimate update for the remainder of CY 2015. On February 17, 2015 the Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD) submitted comments and questions on the annual surety estimate. Strata has completed our response to these LQD comments and questions and is enclosing the following updated estimate materials:

- *Response to Round 2 Review of 2013-2014 Annual Report* which provides the surety-related LQD questions and Strata responses;
- A revised Restoration Action Plan (RAP); and
- A revised surety estimate with the changes described in the Response and the revised RAP.

The revised estimate puts the costs of groundwater restoration, decommissioning and reclamation at $5,834,400 over a three year period during which the site would be decommissioned and reclaimed to meet the standards of the WDEQ LQD and the NRC. The estimate format implements the recommended format provided by the LQD.

Strata hereby requests that NRC approve the estimated bond amount and amend License SUA-1601. Strata respectfully requests that NRC review and approve this estimate in a timely manner as the current bond amount will limit well installation activities in the near future.

STRATA ENERGY INC

If you have any questions regarding the provided information, please contact me at 307-686-4066 or by email at mgriffin@stratawyo.com.

Sincerely,
STRATA ENERGY INC.

Mike Griffin
Vice President of Permitting, Regulatory and Environmental Compliance

Cc: John Saxton, NRC Project Manager **(via email)**

STRATA ENERGY INC

Attachment 1
Responses to Surety-Related WDEQ-LQD Questions and Comments

Strata Energy Inc.

Response to Round 2 Review of 2013-2014 Annual Report

a. Throughout the bond estimate Strata discusses on-site disposal of non-11E2 wastes, but neither the Mine Plan nor Reclamation Plan will allow on-site disposal. All solid wastes will be placed in dumpsters and hauled to a landfill, presumably in Moorcroft. All entries for solid waste disposal must be revised to show current disposal costs for landfill disposal. For non-11E2 wastes, Moorcroft landfill will charge $58/ton for sorted waste and $200/ton for unsorted waste. The LQD will also assume that transportation will be near $3.00 per mile. In order to allow on-site disposal, the permit must be revised to allow an on-site solid waste disposal facility that would meet solid and hazardous waste specifications for a permit waiver. Please revise the bond estimate to include landfill disposal. The LQD will not be able to provide a bond estimate until appropriate weights are provided to calculate applicable disposal costs for various wastes.

Strata Response: **The Restoration Action Plan (Section V) and the surety estimate have been revised to include disposal of non-salvageable building material and equipment at the Moorcroft Landfill. A new unit cost worksheet (UC-Landfill Disposal) for the cost of roundtrip transport (46 miles @ $3.00/mile) and the disposal fee for unsorted waste ($200.00/ton) is included. Typical density conversions for building type material (cubic feet of building space/volume to weight) were utilized to estimate tons of material requiring disposal. This revision increased the total surety estimate by approximately $64,800.**

Additionally, a Non-Significant Revision (NSR) request was submitted to LQD to revise the permit to clarify that concrete and asphalt could be disposed on site as "clean fill" in accordance with WDEQ-SHWD requirements.

b. Thank you for providing a detailed reclamation bond estimate. The estimate does not provide adequate details about the proposed disturbances associated with current and following year disturbances to allow the LQD District 3 staff to duplicate the bond estimate that has been provided. Strata only provided a single CD with the full set of spreadsheets for the bond estimate, but two copies were required. Though the details were provided in a separate document identified as a Revised Reclamation Action Plan, it was not submitted as part of the Annual Report Response. The same type of detailed information must be provided in the Annual Report, and two copies of the CD must also be provided. Also, we need a justification for each cost proposed in the bond estimates. Our records for restoration projects at various operations are quite variable, and the LQD staff would like to know how cost estimates are derived.

Strata Response: **Strata herein submits two CD's of the revised surety estimate. The estimate**

itself was included as Appendix E of the revised Annual Report submitted on January 23, 2015. The revised Annual Report also included the Revised Reclamation Action Plan (RAP) incorporated as Section V of the report.

Strata has provided unit cost estimates and other cost estimates based on LQD Guideline No. 12 where information was available and applicable. Other costs estimates are based on actual equipment costs and cost estimates derived from assumptions and actual materials costs (i.e. electricity, well plug gel etc.). Details for these estimates are provided in the unit cost estimate sheets included in the approved Noncoal ISL Bond Spreadsheet. Beyond the level of detail in the approved spreadsheet Strata did not provide additional justification for each cost included in the surety estimate. Strata questions whether this is necessary as long as the most significant cost components are adequately justified. Additionally, Strata has compared the more significant cost estimates (especially those related to groundwater restoration) with costs that other permitted and operating ISR facilities in Wyoming are utilizing in their surety estimates to ensure that the Strata estimates used are reasonable.

c. On page 17 of the annual report and again in the electronic bond estimate provided, Strata discusses only a single year required for groundwater restoration. Given that the range of restoration periods observed by the LQD could be from 3 to 8 years, and given that proposed EPA policy changes would make 3 years of monitoring mandatory which could require a minimum of four years to complete restoration, the LQD requires justification for use of one year in restoration bond calculations. The LQD estimate will use 4 years to estimate wellfield restoration. Changes to this will affect other sections of this bond as well.

Strata Response: **Strata did not propose a single year for groundwater restoration. The detailed discussion included in Section V of the Revised Annual Report (beginning at Description of Work on page 19) describes the active groundwater restoration phase (i.e., groundwater sweep, reverse osmosis treatment, and recirculation) as requiring 15 months to complete. This estimate was based on the pore volume estimate for the four modules at Mine Unit 1 and the processing capacity of the CPP restoration equipment.**

Although the water balance indicated that 15 months was adequate to complete active groundwater restoration, Section V notes *"Labor and operations costs have been included for 24 months to provide a conservative cost estimate for groundwater restoration"*. The estimate actually provides a total labor component of 3 years for active restoration and to provide one year for stability monitoring as discussed in Section 1.3.2 of the Reclamation Plan. These labor and material costs are discussed on page 21.

Strata believes that the assertion that "the LQD estimate will use 4 years to estimate wellfield restoration" is not appropriate for the following reasons:

- **Strata has proposed a three year period to complete groundwater restoration that is based on actual pore volume estimates, installed restoration capacity, and provides for 9 months of**

contingency for active restoration.

- **Strata believes that it is inappropriate to require any costs because *"proposed EPA policy changes would make 3 years of monitoring mandatory which could require a minimum of four years to complete restoration..."* Strata assumes that the cited "policy" is the proposed EPA rulemaking for 40 CFR Part 192, which was published in the Federal Register on January 26, 2015. Note that this is a proposed rule; as such it is not final, has not been adopted by NRC or WDEQ through rule changes, and therefore cannot be cited to modify the requirements in Strata's Permit to Mine.**

d. The bond estimate for restoration shows both wells occurring in Mine Units 1 and 2, but the bond estimate is only for restoration of wells in Mine Unit 1. In the electronic estimate that you provide, the total number of wells per wellfield incorrectly shows Mine Unit 2 wells included in the Mine Unit 1 column, which is not correct. The LQD staff only requires bonding estimates for wells drilled in both mine units to be calculated separately.

Strata Response: **Strata appreciates the reviewer identifying this error in the spreadsheet. The "Total Number of Wells" in the attached revision has been shown in bold text to assist in showing that this number of wells (643) is a total of all wells, in all wellfields, although it is contained in the column for MU-1. This summation has been previously requested by LQD. Nonetheless, the number in this cell is not used in any calculations, so this revision has not changed the surety estimate.**

e. Some discussion should be provided for reclamation of roads in wellfields, reclamation of staging areas, and pads for header houses and wellfield equipment. Even though the brief explanation of Earthwork under section 3.f., page 23 of the bond estimate, describes regrading, no discussion of removal of aggregates used to surface the areas is provided, and no further discussion of surface reclamation of field roads and other disturbances is provided. Please include such a discussion in the detailed reclamation action plan.

Strata Response: **New Section j of the Restoration Action Plan included in Section V has been revised to include a discussion the requested discussion.**

f. Deep well injection costs for the brine resulting from reverse osmosis has been ignored in the costs associated with Mine Units 1 and 2 restoration. Please explain why deep well injection costs have not been included in the bond estimate. The LQD estimates that an estimate for RO brine disposal should be based on 30% at a cost of $1.13 per Kgal of RO treated water unless justified otherwise by Strata staff.

Strata Response: **The deep well injection cost for the brine resulting from the reverse osmosis (RO) was not ignored but was included in the unit cost for RO treatment. Please see the worksheet "UC-RO". Note that because this unit cost was used as a component of the total RO unit cost per 1000**

gal (inclusive of the disposal of the brine) the cost for brine disposal was based on 10% of the cost of $1.37 per 1000 gallons to account for the RO efficiency of 90% permeate and 10% brine (bleed). Therefore, the cost of $1.37 per 1000 gallons for RO brine disposal is actually slightly greater than the $1.13 per 1000 gallons cited by the reviewer.

g. Monitoring and Sampling. Of the 218 monitoring wells shown in Mine Units 1 and 2, you show monitoring of only 46 sampled prior to and during restoration in Mine Unit 1. Then, you show only 72 wells used for UCL sampling only in Mine Unit 1. Please explain why so few monitoring wells will be used for restoration well sampling and why Mine Unit 2 sampling estimates have been excluded.

Strata Response: **As described in Section A - Introduction on page 15 of the Revised Annual Report, activities planned for Mine Unit 2 during the annual report/surety estimate period (Calendar Year 2015) only include the partial development of this wellfield and no injection (production) activities. This includes the installation of monitoring wells and a portion of the total number of production and injection wells.**

Since only Mine Unit 1 will be in production during the report/surety period, only Mine Unit 1 would require groundwater restoration. Therefore, the costs to monitor the monitoring wells associated with Mine Unit 1 are the only monitoring costs included in the surety estimate. Once production operations begin in Mine Unit 2 (next report/surety period) the applicable costs to monitor that wellfield during restoration will be added to the surety estimate.

h. No mechanical integrity testing cost is provided in the bond estimate. MIT is required on all wells on five-year intervals for this permit. At some point during restoration processes, MIT may likely be required on wells used during restoration. Unless justification can be given not to bond for potential MITs, this must be wells drilled on the permit during the first year. A cost used by the LQD to estimate MIT is $130.60 per well and will be used for our bond estimate unless acceptable justification for a different cost is made by Strata.

Strata Response: **Applicable regulations and Strata's LQD permit require MIT's to be completed every 5 years. Because the wells planned for Mine Unit 1 will be installed in 2015, the "5-Year MITs" will not be required until 2020. Assuming this surety was needed before the next update at the end of 2015, Section V estimates that groundwater restoration would be completed in less than two years (i.e., 15 months). The 24-month allowance would complete restoration by the end of 2017 for the current report/surety period. Stabilization would then be completed by the end of 2018. It is Strata's understanding that based on this timeline the wells would be plugged before the first 5 year MITs were required and that this cost should not be required in the surety estimate at this time.**

I. It appears that Strata plans to install any trunk lines during the reporting year. This needs to

be included in the explanation of activities for the next reporting year.

Strata Response: **Trunk lines are planned for installation during the report period and their removal and disposal is covered in Section III of the worksheet "WF BKDGS PIPE". Section V of the Annual Report has been revised to discuss the installation of the trunk lines associated with Mine Unit 1. A new Figure 8, Planned Construction Activities for 2015 has been added to the annual report to depict planned drilling areas, road installation, and trunk line installation.**

J. The equipment removal and on-site removal total shown on page 7 of the bond estimate does not include the $400 cost for removal of contaminated pipe from the DDW Building shown on page 6.

Strata Response: **Strata has revised the surety estimate accordingly, as well as another minor calculation oversight on the same worksheet. These changes increased the total surety estimate by approximately $1000.**

k. Page 9 of the bond estimate shows only 3,500 feet of the 14,520 square feet of wall space as requiring decontamination. Also, the concrete pad of the CPP is 14,280 square feet of which you plan only decontamination of 7,500 square feet. Please justify this reduced square footage in the text or correct the bond estimate.

Strata Response: **Because the CPP will only be utilized as a Satellite IX type facility and no elution, precipitation, and yellowcake drying will occur, the potential for radiological contamination of the walls and floor will be very limited. In addition, a portion of the CPP floor and building space will be maintained as clean, non-contaminated areas. This includes the truck bay and the control room. Strata did make a conservative assumption that approximately 25% of the wall area and 50% of the floor area of the CPP could require some level of decontamination and the estimated costs were included.**

Due to the small size of the DDW building, decontamination costs were included for the entire wall and floor area. Worksheet "BLDGS" Section I A. and B. have been revised to reflect the conservative assumptions for the potential decontamination costs for the CPP walls and floor.

l. Under disposal costs on page 9 of the bond estimate it appears that the volume of building materials for the CPP and Office are considerably lower than expected (1,587 vs. 15,867 cu. yds. and 724 vs. 7,241 cu. yds. respectively). Please justify or correct the bond estimate.

Strata Response: **This estimate included in the worksheet "BLDGS" Section II- Demolition Costs is explained by the fact that the "Volume of the Building" is the total volume enclosed by the building dimensions, most of which is air. In accordance with LQD Guideline No.12 Appendix K this volume is used to estimate demolition costs. As included in Section III-Disposal Costs, it is noted that the**

"Volume of Building Materials" to be disposed constitutes "10% of the building full volume". This is a conservative assumption as calculations show that the actual building materials will comprise approximate 50% of this amount.

m. The subtotal and total building demolition costs on page 9 of the bond estimate excludes the costs for demolition of the Pot Water Building. Please correct the bond estimate.

Strata Response: **Strata has corrected the SUBTOTAL BUILDING DEMOLITION AND DISPOSAL COSTS line to include the subtotal of $5,556 for the Potable Water Building. The costs were already included in the TOTAL BUILDING DEMOLITION AND DISPOSAL COSTS line so there was no change to the estimated cost.**

n. Your bond estimate shows wells drilled in Mine Unit 2, but no wellfield building and equipment removal and disposal for Mine Unit 2 are included. Will no buildings or equipment be constructed and installed in Mine Unit 2? Without additional information in the description of activities, the LQD must assume that both mine units will have buildings and equipment installed.

Strata Response: **Construction of an ISR wellfield typically requires approximately 2 years to complete depending on the size of the wellfield, the extent of delineation drilling required, how quickly production and injection wells are installed and the extent of trunk line piping required. Therefore, this surety estimate covers the beginning of production operations at Mine Unit 1 and only initial well installation activities at Mine Unit 2. The next surety estimate (Calendar Year 2016) will cover those activities planned for the next annual report period which will include the infrastructure for Mine Unit 2 and any associated groundwater restoration costs.**

o. On page 10 of the bond estimate it appears that there is a discrepancy with the number of wells shown on the groundwater restoration page 2 of the estimate, and the wells drilled in Mine Unit 2 are excluded. Please explain why you show a reduction in the number of wells requiring pumps and tubing removal and disposal if 100% of production/injection wells will contain tubing.

Strata Response: **Strata appreciates the reviewer identifying this error regarding the number of production and injection wells for Mine Unit 1 that require pump and tubing removal and associated disposal costs in Section II. A. of worksheet "WF BLDGS PIPE". The link in the worksheet has been corrected. This resulted in a total increase to the surety estimate of approximately $2400.**

With respect to Mine Unit 2 as discussed in the previous response, it is assumed that construction at Mine Unit 2 is not completed during the report period and therefore pumps and tubing are not installed, nor are there any production (injection) activities with these wells. It should be noted that the installation of pumps and tubing is typically one of the last activities to occur prior to the start of production operations. Accordingly, it is anticipated that the costs to complete groundwater restoration in all, or part of, Mine Unit 2 will be included in the next surety estimate (Calendar Year

2016).

p. No trunk line removal is accounted for in Mine Unit 2 in the bond estimate even though the bond estimate shows wells drilled in this mine unit. Will trunk lines be placed in Mine Unit 2 that will require removal and disposal? The current LQD estimate will show approximately 1588 ft. of trunk lines installed in Mine Unit 2 based on the fact that 20% of the total wells drilled during the reporting year will occur in this Mine Unit.

Strata Response: **Please see the response to LQD review comment 7) n. above. The majority of the main trunklines for Mine Unit 2 are common with Mine Unit 1. The additional trunklines required for Mine Unit 2 are typically installed after well locations are completed. Therefore, Strata does not expect to install any trunklines in Mine Unit 2 during the period. The cost to decommission and reclaim trunklines for Mine Unit 2 are not required in this surety estimate and it is anticipated that these costs will be included in the next surety estimate (Calendar Year 2016). No revision of the current surety estimate is proposed.**

q. Guideline 12 has a table on page 40 that provide abandonment costs for wells which is $2.50 per foot for all monitor, injection and production wells. Based on this cost, the LQD estimates $1,250 per 500ft. average depth well and $1,050 for 420ft. average depth wells. Please make appropriate changes to your bond estimate.

Strata Response: **As allowed in Guideline 12 Strata requests that WDEQ accept estimates that are specific to the Ross project rather than require that Strata apply the estimated cost from Guideline 12. The hole plugging estimate included in the surety was determined by using the UC-WELL ABAND calculation sheet approved by the WDEQ-LQD. The unit costs used to arrive at the estimate are based on the actual costs for materials, equipment and labor determined by Strata from plugging holes in the Ross area. Since the cost per foot of well abandonment is affected by several factors including casing size and average well depth it is not appropriate to use a generic cost when local actual costs are available. In addition Strata has confirmed that the cost per foot for well plugging at most uranium facilities in Wyoming are based on actual site-specific estimates.**

r. The LQD Guideline 12A for noncoal operations estimates the cost for seeding at $350/acre, considerably lower than your estimated cost. I recommend using $350/acre.

Strata Response: **Strata has revised this cost to $350/acre. This change revised the total surety estimate by approximately minus $16,000.**

s. Please consider calculating well field road reclamation acreage and using the Guideline 12A cost estimate of $350/acre for reclamation instead of using cost per 1,000 ft. which is a highly variable

cost estimate between operations. Please explain why no well field roads in Mine Unit 2 will be reclaimed.

Strata Response: **Strata has revised the cost of seeding to $350/acre in the "Wellfield Road Reclamation" unit cost. Also in accordance with the response to Comment 7.v. the width of the gravel base was increased from 10 to 12 feet. Strata believes that the approach utilized ($/1000 feet of road) was part of the desired "standardized format". It will not be possible to have each operator exactly provide the same estimates for all surety components. The revised unit cost of $1203/1000 ft. of wellfield road can be equated to approximately $433/acre. These changes revised the total surety estimate by approximately minus $600.**

Strata has revised the cost to reclaim roads in Sheet WR_REC. The estimate now includes 2,800 feet of connecting road from the CPP to Mine Unit 1, 7,400 feet for Mine Unit 1, and 2,100 feet in Mine Unit 2. These roads are shown on the new Figure 8.

t. The asphalt ripping cost per acre Strata Shows on page 15 of the bond is not consistent with Guideline 12, Appendix I. The 2013-2014 cost estimate for ripping asphalt is $881.07/acre. You show $1.00 per acre. Also, the cost for hauling gravel as per Guideline 12, Appendix C for a 500ft. haul, 0% grade, is $1.08 per cubic yard, not $0.50/cubic yard. Please correct your bond estimate.

Strata Response: **Strata does not intend to install asphalt on any area at the project and no costs to rip asphalt were included in the surety estimate. The roads and parking areas will be graveled. Strata has removed the rows that pertain to "asphalt" on the "MISC REC" worksheet to eliminate this confusion.**

Section I. A of the "MISC REC" worksheet has been revised to reflect the cost to haul gravel from $0.50 to $1.08/ yd^3. This change increased the total surety estimate by approximately $1600.

u. The costs for material moving (topsoil or overburden) using scrapers are provided in Guidelines 12, Appendix B, and 12A. Guideline 12A uses smaller scrapers for the estimate and should probably be used for this calculation in your application of topsoil (CPP/Office Area Reclamation, Page 15). The average distance for topsoil moving is estimated to be 1000 ft. This cost is the cost would then be $0.99 per cubic yard of material moved. Also, the LQD suggests using the Guideline 12A cost for discing and seeding of $350/acre. Please correct your bond estimate.

Strata Response: **Section I. A of the "MISC REC" worksheet has been revised to include a topsoil haul distance 1000 ft. Accordingly, the unit cost for topsoil hauling has been changed to $0.99/ yd^3. This change decreased the total surety estimate by approximately $145. Additionally, Strata revised the average topsoil haulage distances for the various roads at the facilities area transported from Topsoil Stockpiles No's 2 and 3 to actual mapped average distances. Strata also revised the cost for disking and seeding from $600 to $350/acre. These minor revisions did not significantly change the surety estimate.**

v. Please provide average the grade of access roads for accurate use of Guideline 12 in material moving cost determination. The LQD estimate will assume a 0% grade. The LQD doesn't see any topsoil stockpiles (Figure 1) associated with established Strata roads, but it appears that you have applied gravel and will be removing it. The LQD requires topsoil salvage under all enhanced roads, so please show the locations of topsoil stockpiles for each road. Also, no access roads are shown for the Main Access road, the DDW road, the water supply well road or the MU-2 roads. The LQD needs to be able to establish haul distances for these roads which appear to be inaccurate, given that no topsoil stockpiles other than those at the CPP provide adequate topsoil for road application. Therefore, all roads and topsoil stockpiles must be shown on Figure 1. The widths of the road, especially those shown as 10 feet wide, seem very narrow for roads with a gravel base. Please verify road widths. At this time the LQD will use the widths provided in the bond estimate pending verification of road widths.

Strata Response: **All the topsoil currently salvaged from the CPP area (Main Access Road, CPP/Office, DDW pad and road, Sediment Pond, and Diversion) are stored in Topsoil Stockpiles Nos. 2 and 3 located north of the facilities area. The road to the water supply well has not been constructed. The locations of Topsoil Stockpiles Nos. 2 and 3 are shown on Figure 7 of the Annual Report.**

Topsoil stockpiles for topsoil salvaged from wellfield roads are not located until the roads are constructed. Wellfield roads are not constructed and graveled until the construction of the wellfield, including the Mod Buildings, is nearly completed in order that the optimum location for these roads can be determined. Topsoil stockpiles resulting from wellfield roads are typically located in several smaller stockpiles near the roadways, but away from operations, as described in the Mine Plan. During the report period it is not planned to construct any graveled wellfield roads at Mine Unit 2. It is anticipated that they will be constructed during the next report period.

Additionally, Strata revised the average topsoil haulage distances for the various roads at the facilities area transported from Topsoil Stockpiles No's 2 and 3 to actual mapped distances.

Lastly, Strata increased the width of gravel on the wellfield roads from 10 to 12 feet. This change did not significantly change the total surety estimate.

w. From the information provided in the annual report it appears that the maximum haul distance for topsoil hauling during reclamation of the haul roads to MU-1 and MU-2, if it exists, and the applicable average distance for CPP access road reclamation would be 1,500 feet. The distance from topsoil to the DDW and water supply well is not able to be determined from the information provided in the annual report, so the LQD will use 500 feet for the DDW and water supply well road reclamation.

Strata Response: **The final designs for the main roads to MU-1 and MU-2 and the location of the required topsoil stockpiles have not been finalized at this time. The stockpiles will be located relatively close to the roads to minimize haul distances. As discussed previously, all the topsoil salvaged from**

the CPP and CPP Access Road is stored in Topsoil Stockpiles Nos. 2 and 3. The average haul distance used for the CPP Access Road was 1250 feet. The average haul distance from Topsoil Stockpile No.2 to the DDW Road was determined to be 750 feet. The average distance for Topsoil Stockpile No.3 to the Water Supply Well Road was determined to be 1500 feet. These changes and the accompanying unit cost revisions did not significantly change the total surety estimate.

x. The volume of road base is not accurate for the CPP entrance road. The fill used to elevate that road must also be removed, and should be considered as road base for the purpose of road reclamation. Based on limited information provided in the annual report and Mine Plan, the LQD estimates the fill to be approximately 15 feet deep, or 39,600 cubic yards. The 2013-2014 Guideline 12, Appendix C cost for all road base and gravel removal and topsoil handling is $1.08 per cubic yard using larger equipment than would probably be used to reclaim Strata's disturbances. Guideline 12A, which assumes that smaller equipment will be used shows $0.82 per cubic yard and is recommended by the LQD.

Strata Response: **TREC Engineering, the design/build contractor for the CPP, estimated of the volume of fill for the Main Access Road that could require moving to the east where it came from the road cut. It is estimated that the fill volume is approximately 30,500 yds3 and the average haul distance would be 750 feet. Therefore, in accordance with LQD Guideline No. 12A a unit cost of $0.90/yd^3 was used to calculate the cost to potentially move this material. This revision is reflected in the worksheet "MISC REC" Section II.C "Move Road Material". This change increased the total surety estimate by approximately $34,300.**

y. The 2013-2014 Guideline 12, Appendix I cost for ripping road surfaces is $881.07, not $1,205. Please correct the road reclamation bond estimate.

Strata Response: **Section II. C. of the worksheet "MISC REC" has been revised to reduce the unit cost for ripping the road surface from $881.07 to $1,205/acre. This change decreased the total surety estimate by approximately $2100.**

z. Please justify the costs associated with pond polyethylene liner removal and loading.

Strata Response: **The cost for both removal of the liner and loading it for transport in Section V is based on a previous engineering estimate which determined that these costs approximate about 20% of the cost of liner installation. This is considered a conservative estimate and it is likely that the actual cost for these activities would be considerably less.**

It should be noted that Strata also revised the estimate such that the non-contaminated secondary liner is disposed at the offsite landfill instead of onsite. This change revised the total surety estimate by approximately $8500.

aa. Please correct the subtotal costs for transportation and disposal of 11E2 pond liner material that currently states that the cost ($1077) is equal to line volume, 1,077cubic feet. It should be $13,839.

Strata Response: **Strata has corrected this oversight. This change increased the total surety estimate by approximately $16,000.**

bb. During the review of Miscellaneous Reclamation items, why did Strata double the cost of backfilling the sediment pond at the CPP? The cost should be $0.16/cubic yard. Also, the subtotal for backfill costs provided in the bond estimate badly overestimate the backfill costs for WW storage ponds and the sediment pond. Please explain why the calculated subtotals are so high and correct the bond estimate if required. The LQD estimate provides the costs calculated from backfill volumes and $0.16 per cubic yard.

Strata Response: **Strata appreciates LQD's review of this section. Worksheet "MISC REC" has been revised to better reflect the backfill volumes for the WW Storage Ponds and the Sediment Pond. These revised volumes were verified by TREC Engineering, the site design/build contractor. It should be noted that since the Sediment Pond is entirely incised, the estimate to fill it to grade utilizes the fill material available from the existing nearby Main Access Road or Diversion berm. Line items were also added for the cost of topsoil application at the ponds. These changes decreased the total surety estimate by approximately $47,000.**

Additionally, Strata added the estimated costs to complete the earthwork, topsoil application and seeding of the diversion berm to the surety estimate. Please see Workbook "MISC REC" Section VII. This change increased the total surety estimate by approximately $17,500.

cc. Please provide an approximation of yards of materials that will be removed from the CBW and the cost of purchasing and trucking those materials to the CPP. If road gravel will be used in place of purchasing gravel, it will need to be screened to remove undesirable fines. The LQD would also like to know the Guideline 12 or 12A costs for moving the excavated materials from the CBW and gravel addition into the finger drains.

Strata Response: **To adequately breach the CBW, Strata estimates that it will take approximately 100 yds^3 of gravel/scoria type material to fill five finger drains with 20 yds^3 each. Given a cost of approximately $30/$yds^3$ for delivered gravel/scoria, Strata has increased the cost of the gravel for finger drains in Worksheet "MISC REC" from $2000 to $3000. Strata believes that the estimated $7650 amount attributed to labor and equipment to excavate the finger drains is more than adequate for moving the estimated 100 yds^3 of material from the excavations to another nearby location as fill material.**

dd. The Guideline 12, Appendix J cost for removal of culverts is 137.83 for the 1023-2014 reporting year. Please correct the bond estimate.

Strata Response: **The cost for removal of culverts in Worksheet "MISC REC" Section VII has been revised from $139.10 to $137.83. This change slightly decreased the total surety estimate.**

ee. The 2013-2014 Guideline 12 Appendix H cost for fence removal is $0.32 per linear ft. Please correct the bond estimate.

Strata Response: **The cost for fence removal in Worksheet "MISC REC" Section VII has been revised from $0.39 to $0.32 per linear foot. This change reduced the total surety estimate by approximately $1200.**

STRATA ENERGY INC

Attachment 2
Revised Restoration Action Plan – March 23, 2013

RESTORATION ACTION PLAN

A. INTRODUCTION

The following summarizes the Restoration Action Plan (RAP) for the first year of development and operation of the Ross ISR Project (calendar year 2015). The accompanying surety estimate is based on this RAP and it covers the potential decommissioning and reclamation of facilities planned for construction and operation during the period. In summary, the surety estimate includes the estimated costs by a third party to decommission and complete final reclamation of the first four (4) wellfield modules at Mine Unit 1 (MU-1), the Central Processing Plant (CPP), water storage ponds and all other related facilities anticipated to be constructed during the first year. The estimate also includes the costs to complete final reclamation for limited well installation activities in a portion of MU-2 (the plugging of all wells) and reclamation of approximately 2100 feet of secondary access road in MU-2. It is not planned to construct any Module Buildings or trunklines at MU-2 during the report period. It is anticipated that these facilities will be added to the next annual surety update. The estimate also includes approximately 2,800 feet of connecting road from the CPP to MU-1.

The estimate puts the costs of groundwater restoration, decommissioning and reclamation at $5,834,400 over a three year period during which the site would be decommissioned and reclaimed to a condition agreed upon by the Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD) and the US Nuclear Regulatory Commission (NRC) that would return the site to unrestricted use. The RAP encompasses the full cycle of activities necessary for:

Aquifer restoration and well plugging;
Building and equipment decontamination, dismantling and disposal;
Pond and wellfield removal and reclamation of the entire site;

Radiological surveying and environmental monitoring;
Project management and miscellaneous costs; and
Contingency of 25%.

Strata's surety estimate presented herein employs assumptions that are based on best professional judgment given the data currently available. This estimate is presented in the Excel format specified by the WDEQ-LQD. Although this format is different than that originally submitted with the Permit to Mine/NRC License applications the major components of the estimate are the same. This surety estimate is less than that originally submitted ($9,822,600) due to the following major changes over the plans for facility construction and operation and some revisions to the RAP:

- Yellowcake processing and drying will not be done at the CPP during the first year. The CPP will only be used as a "Satellite" IX facility with loaded IX resin shipped to another licensed facility for toll processing. Uranium elution, precipitation and drying equipment will not be installed. Therefore, there is considerably less equipment that will require decontamination and disposal as 11e.(2) waste or non-contaminated solid waste.
- The size of the CPP is reduced such that it initially will only house IX type equipment. Uranium elution, precipitation and drying equipment will not be installed. This substantially lessens the surety estimate costs for building decontamination, decommissioning, and demolition costs.
- The operation of the facility as a Satellite eliminates the need for a chemical storage building and separate warehouse/maintenance building. This lessens the costs for building demolition and disposal.
- Two deep disposal wells (DDW) may be installed instead of three. This lessens the cost of final abandonment and reclamation of one deep disposal well.

- Only one waste water pond (Pond 1 with 3 cells) will be initially constructed. This reduces the costs for decontamination, decommissioning and disposal of the pond liner and associated reclamation work.
- The original surety estimate included the costs to transport and dispose of all non 11e.(2) building material (steel, concrete, wood) from demolition activities at the Moorcroft Municipal Landfill which is located 23 miles from the site. Due to the fact that Strata owns the land at the CPP site and the local municipalities do not desire that concrete be disposed at municipal landfills, concrete will be disposed on site as "clean fill". Accordingly, the costs for on-site disposal have been included in accordance with WDEQ/LQD Guideline 12. This change reduces the disposal costs for concrete as the costs to transport the waste 23 miles and the dumping fees at the Moorcroft Municipal Landfill (approximately $57 to $200/ton for concrete) are eliminated. All other non-construction related solid waste (e.g., trash) will be disposed at the Moorcroft Municipal Landfill.

The surety estimate is considered conservative as although no salvage value is considered, significant salvage value would exist for the CPP and Office buildings (e.g., steel), motors and electrical switch gear, gravel road base, etc.

B. CONSOLIDATION OF STATE AND NRC SURETY INSTRUMENTS

In addition to being crafted to comply with NRC criteria in 10 CFR Part 40, Appendix A, Criterion 9 (Financial Criteria), Strata's proposed surety estimate is designed to address the Wyoming Environmental Quality Act requirements for a reclamation performance bond. The surety estimate is provided in the format specified by the WDEQ-LQD and accepted by NRC staff.

C. COST DETAILS FOR GROUNDWATER RESTORATION, RECLAMATION, AND DECOMMISSIONING ACTIVITIES

1. Introduction

The following tabulation summarizes the costs necessary to hire an independent contractor to assume all groundwater restoration, decommissioning and reclamation activities required for the CPP (only IX system), the first four (4) wellfield modules, and associated facilities. Descriptions of the work are provided below, and detailed costs estimates for each major item of work are provided in the attached Excel spreadsheet entitled Ross 2015 Bond Estimate.

Item	Cost
Groundwater Restoration Cost	$ 2,931,998
Equipment Removal and Disposal Cost	$ 76,868
Building Demolition and Disposal Cost	$ 432,797
Wellfield Building, Pipe and Equipment Removal and Disposal Cost	$ 275,122
Well Abandonment Cost	$ 662,265
Wellfield Surface Reclamation Cost	$ 34,327
Total Miscellaneous Reclamation Cost	$ 254,124
Subtotal	**$4,667,501**
Administrative, Overhead and Contingency (25%)	$1,166,875
Total (Calculated in 2014 Dollars)	**$5,834,400**

2. Aquifer Restoration

2.1. Introduction

The Groundwater Restoration worksheet (GW REST) and supporting unit cost worksheets (UC-GWS, UC-RO, UC-RECIRC, and UC-WDW) contain details concerning cost basis figures and assumptions, calculations and methodologies used in deriving cost estimates for the full cycle of groundwater restoration. It is assumed that active restoration will be completed in 15 months and that an additional 12 months will be necessary for final site decommissioning and reclamation following the stabilization monitoring period and regulatory approval of groundwater restoration. This estimate is designed to be descriptive

enough for the NRC and WDEQ staff to determine the acceptability of Strata's proposed cost figures and is based on the estimated costs for an independent contractor to perform the decommissioning and reclamation work in accordance with 10 CFR Part 40, Appendix A, Criterion 9 and the Wyoming Environmental Quality Act and its accompanying rules and regulations and guidelines. Strata has developed its cost estimates to address all items in Appendix C of the NRC's "Standard Review Plan for In Situ Leach Uranium Extraction License Applications" (NUREG-1569, dated June 2003).

Among other items, the groundwater restoration costs are broken down into separate phases of work:

Groundwater sweep;
Reverse osmosis (RO) with permeate injection;
Groundwater recirculation;
Monitoring; and
Vehicles and Labor

For each phase of work, the estimated number of pore volume displacements (PVDs) required to complete that phase is provided (0.5 PVD for Groundwater Sweep, 7 PVD for Reverse Osmosis and 1 PVD for Recirculation). The worksheets also provide the assumptions and unit prices for all the work necessary to complete each phase of work for the first four wellfield modules.

Restoration progress is typically measured on the basis of the number of pore volumes (PVs) processed during each phase of groundwater restoration. A pore volume is a term used by the ISR industry to define an indirect measurement of a unit volume of aquifer affected by ISR recovery or restoration (NUREG-1910, NRC 2009). Following industry standards, Strata calculates a PV as follows:

PV = thickness x wellfield area x porosity x flare x conversion factor

The **thickness** is the average completion thickness for the recovery and injection wells. Based on exploration and delineation drilling, the ore zone

thickness averages approximately 8 feet across the area of the first 4 modules in Mine Unit 1.

The **wellfield area** is the surficial area of the injection and recovery well patterns for each wellfield module. Based on the delineation of recoverable resources within Mine Unit 1 (MU-1) the average area per wellfield module is estimated to be 390,011 square feet. Therefore, the total area of injection and recovery well patterns for the first 4 modules that would be potentially injected into during the surety period is approximately 1,560,044 square feet.

The **porosity** or pore space is defined as the collective open spaces of the formation or a measure of the amount of liquid or gas that may be absorbed or produced by a particular formation (NUREG-1910). The porosity of the ore zone within the Ross project area was determined by laboratory analysis of core samples collected during exploration drilling. The porosity is estimated to average 34% across the Ross Project area.

The **flare** is a proportionality factor that estimates the amount of aquifer water outside of the pore volume that has been affected by lixiviant flow during the recovery phase (NUREG-1910). Flare estimates usually include a horizontal and vertical flare factor. The horizontal flare is the volume of water affected by lixiviant outside the edge of the wellfield pattern. The vertical flare is the volume of water affected by lixiviant above and below the completion interval. Based on groundwater modeling of expected operational conditions completed by WWC Engineering to support the permit and license applications for the Ross Project it was determined that the horizontal flare would be approximately 32% and the vertical flare would be approximately 20%. Therefore, the overall flare, which is dependent on the geometry of the affected area, is approximately 58%. This is consistent with other ISR operating facilities.

An estimate of the PV of the four (4) Modules in MU-1 is calculated as follows:

PV = 8.0 ft. x 1,560,044 ft^2 x 0.34 x 1.58 x 7.48 gal/ft3 = 50.15 million gallons

Where:

Porosity = 0.34 (dimensionless)

Flare Factor (overall) = 1.58 (dimensionless)

The aquifer restoration phase was based on the processing and circulation of 9.5 pore volumes of groundwater. Because the cost for restoration equipment such as wellfield pumps, lined retention ponds, the deep disposal well, one RO unit, restoration IX columns, laboratory equipment, trucks, and field equipment will have been incurred for uranium production operations, they are considered operational capital and are not included as capital requirements in any of the RAP budget items. It should be noted that the estimated cost of purchasing and installing an additional high efficiency RO unit ($750,000) is included in the groundwater restoration cost estimate (worksheet GW REST, item VI). This additional RO would be used to augment the RO included with the construction and initial operation of the CPP. As with other operating ISR operations, the NRC and the WDEQ will be able to verify the availability of the restoration equipment during routine inspections.

The surety will be maintained at this calculated level until the number of pore volumes required to satisfactorily complete each phase has been demonstrated. Strata will adjust the surety estimate for aquifer restoration during each annual update review to reflect experience gained from actual work completed and the associated costs.

2.2 Description of Work

The first stage of aquifer restoration is groundwater sweep, in which groundwater is pumped from the wellfield module with no reinjection. This causes water from the formation surrounding the wellfield module to sweep through the wellfield toward the recovery wells and remove the high TDS production fluids. Based on the anticipated aquifer restoration schedule, during most aquifer restoration normal operations, when some wellfield modules are undergoing groundwater sweep while others are in RO treatment

with permeate injection, the water removed from the groundwater sweep is taken to the RO units (see below) and the purified water (RO permeate) is reinjected into the wellfield module(s) undergoing RO treatment with permeate injection. The brine from the RO units is taken to the lined retention ponds and then to a deep disposal well. For the first wellfield module undergoing groundwater sweep, it is assumed there are no wells concurrently in RO treatment with permeate injection. Thus, the groundwater from the groundwater sweep will be taken to the RO units, the high-quality permeate will be discharged or used for other purposes and the brine will be disposed via the deep disposal well. It is estimated that the groundwater sweep will remove about 0.5 PV from the wellfield at a rate of 200 gpm (20 gpm at 10 wells) per module. The duration of the groundwater sweep will be about one month per module. Groundwater sweep at one module may be done concurrently with RO at another module.

RO is a water treatment process whereby the majority of dissolved ions, which are too large to pass through a filter that passes pure water molecules, are concentrated into brine. The product water that passes through the filter (permeate) typically meets drinking water standards and during most restoration activities is reinjected back into the wellfield. This reinjection of relatively pure water permeate mixes with formation water and helps bring the quality of the underground solutions toward baseline quality. During restoration the RO brine is pumped to a lined retention pond to level out flow rates and is then pumped to the disposal well. Groundwater recovered from a depleted portion of the ore zone will be treated with an antiscalant and/or corrosion inhibitor to prevent fouling; these are the only pretreatment chemicals budgeted. The water will also pass through a restoration IX system for removal of uranium and a pre-filtration system for particulate removal. To achieve RO purification, the pretreated solution is pressurized and directed to the first step of a two-stage RO process. Approximately 70 percent of the total feed volume will be converted to product water (permeate) in the first stage. The

brine water of the first stage will then act as the feed for the second stage, which yields an overall permeate recovery rate of approximately 90 percent. The RO equipment provided for in the capital budget discussed above is sized to operate at a nominal capacity of 700 gpm when combined with the RO system that will be installed for uranium recovery operations. This is sufficient to treat one module in the RO treatment phase and one to three modules in the groundwater sweep phase. It is estimated that RO treatment for Module 1 will require four months due to concurrent groundwater sweep operations. RO treatment for Modules 2 through 4 will require three months each, resulting in a combined RO treatment period of 13 months.

The third phase of aquifer restoration is groundwater recirculation, which begins after completion of the RO treatment with permeate injection phase. In this phase, water from the production zone will be pumped from recovery wells and recirculated into injection wells in the same module. This recirculation will homogenize the groundwater and help reduce the risk of "hot spots," or areas of unusually high concentrations of dissolved constituents. The only treatment that will potentially occur during recirculation will be the filtration of particulates and/or uranium removal. It is expected that one PV will be circulated from, or within, the wellfield during this phase, at a rate of 500 to 800 gpm per module. This recirculation can be completed concurrently during the overall RO phase once RO is completed at a particular module. The total duration of active aquifer restoration (groundwater sweep, RO treatment with permeate injection, and groundwater recirculation) is estimated to be 15 months for the first four wellfield modules. Labor and operations costs have been included for 24 months to provide a conservative cost estimate for groundwater restoration.

During maximum uranium production operations and the operation of precipitation and yellowcake drying circuits there may be up to five deep disposal wells at the Ross ISR Project used for disposal of brine and any other waste water that does not meet criteria for discharge or other uses. Only one

deep disposal well is planned to be installed during the first year of licensed activities as the volume of wastewater is substantially reduced without yellowcake precipitation and drying circuits. The capital costs of the well will have been borne by Strata during construction of the plant facilities. The cost to plug and abandon this well are included. Additionally, Strata has included the costs to plug and abandon an additional deep disposal well in the unlikely case that a second well needed to be installed due to poor performance of the original well upon completion and testing. The lined retention ponds will be used to store the water until it is ready for deep well disposal. Ponds will have excess capacity to handle variations in water production.

The final step in aquifer restoration will be the stability monitoring phase, which will be used to ensure that chemical species of concern do not increase in concentration to unacceptable levels subsequent to restoration. The stability monitoring phase is described in Section 1.2.1.5 of the WDEQ Reclamation Plan (Section 6.1.2.5 of the NRC Technical Report) and includes well sampling, data analysis and reporting.

2.3 Labor Staffing Plan for Groundwater Restoration

The majority of labor costs for decommissioning the Ross Project would be associated with groundwater restoration. This would include the operation of the wellfield production and injection wells and the CPP and ancillary facilities to complete the groundwater restoration commitments in accordance with the WDEQ permit and NRC license. Therefore, the bulk of the labor requirement is for the initial 15 month period when active groundwater restoration is occurring. Strata has conservatively included 24 months of labor to cover this period.

The stability period requires one year of sample collection and an indeterminate period for regulatory approval of groundwater restoration. During this period the manpower requirements lessen significantly as activities at the site are limited to groundwater monitoring and maintenance of the CPP.

Once the stability period is completed the actual facility decommissioning, demolition and disposal occurs. The associated labor costs are included in the surety estimate details for the particular activity. The labor estimate also included 12 months of Environmental Manager/RSO and Environmental Technician for this period.

Given the above, Strata has included the labor costs associated with groundwater restoration in section IX of the groundwater restoration worksheet (GW REST):

Position	Years
Environmental Manager/RSO	3
Restoration Manager	2
Environmental Technician	3
Operators/Laborers (4)	2
Maintenance Technician	2.5

3. Facilities Area Decommissioning and Reclamation

Following wellfield restoration and stability monitoring, when the water treatment equipment is no longer needed, reclamation can begin on the surface facilities. Detailed cost estimates for the facilities area decommissioning and reclamation are provided in the following worksheets and supporting unit costs worksheets:

CPP Equipment - EQUIP

Main Facility Buildings- BLDGS

Wellfield Buildings and Pipelines- WF BLDGS PIPE

Well Abandonment- WELL ABAN

Wellfield Reclamation- WF REC

Miscellaneous Reclamation Items- MISC REC

3.1 Equipment and Buildings

Unlike the original RAP and surety estimate that included the decommissioning, demolition and disposal of a full scale CPP including yellowcake precipitation and drying equipment, the revised Operations Plan results in the CPP that will only be used as a "Satellite" IX facility. Therefore, uranium elution, precipitation and drying equipment will not be installed. This results in considerably less equipment that will require decontamination and disposal as 11e.(2) waste or solid waste. Additionally, the lack of yellowcake processing will make it easier to decontaminate limited portions of the CPP walls and floor. Buildings to be removed include the CPP, Administration building, the Deep Disposal Well (DDW) building, the Potable Water building and the wellfield module buildings. Decontamination of salvageable building materials, equipment, pipe, and other materials to be released for unrestricted use will be accomplished by completing a preliminary radiological survey to determine the location and extent of the contamination and to identify any hazards. Processing and water treatment equipment, including tanks, filters, IX columns, pipes, and pumps, will be decontaminated as necessary and disposed of in accordance with applicable regulations. Decontaminated and non-contaminated equipment and materials with the exception of concrete will be disposed will be disposed at the Moorcroft Landfill. A salvage percentage of 60 percent for clean building material (steel) is assumed. This salvage is assumed at no value with the remaining 40 percent disposed at the Moorcroft Landfill. Contaminated equipment and materials will be disposed at a licensed 11e.(2) byproduct disposal facility.

The disposal of concrete from floors and foundations on site as "clean fill" is desired by both the State of Wyoming (WDEQ), Crook County and local municipalities due to the limited space for such material in municipal landfills. This is appropriate due to the benign character of concrete and safety concerns with transporting this material via large trucks on rural and single lane roadways. Additionally, Strata owns the land at the CPP site and adequate

areas exist to bury the materials in an on-site permitted solid waste facility. Also, it is likely that due to the relatively large quantity of concrete it would be recycled rather than buried.

3.2 Ponds

Work required to reclaim the ponds will include brine disposal in the deep disposal well, removal of the liner and brine residue to a licensed 11.e(2) disposal site, disposal of all non-11.e(2) solid waste to an approved landfill or on-site solid waste facility, backfilling and regrading to restore an acceptable topography, topsoil replacement and revegetation. These reclamation costs are provided in the worksheet MISC REC.

3.2 Earthwork

After the buildings and ponds are demolished and removed, the entire site will be regraded to restore the original topography, topsoil will be replaced to approximate its original depth, and the area will be seeded with the approved seed mix. Earthwork costs to complete the regrading of the CPP, parking areas, and access roads are provided in the worksheet MISC REC.

3.3 Containment Barrier Wall

The containment barrier wall (CBW) at the CPP will be reclaimed to the extent necessary to restore the flow pattern of shallow groundwater. Reclamation of this wall will be accomplished by creating a series of breaches, also known as finger drains, along the CBW. Each finger drain will consist of a 1.5 ft. wide by ~25 ft. long trench that is cut through the CBW at a right angle and to a depth that is ~2 ft. below the lowest historical ground water level. Gravel will be placed in the trench from the bottom to a point ~2 ft. above the highest recorded ground water level such that a highly permeable flow path is created through the CBW. The remaining trench will be backfilled with topsoil and seeded.

This method of CBW reclamation was selected as a means of effectively restoring the ground water flow system in the CPP area, while minimizing surface and environmental disturbance. The cost estimate for this phase of work is included in the worksheet MISC REC.

4. Wellfield Equipment Removal and Disposal

Decommissioning and reclamation of the wellfields will include removal of any staging or laydown areas, the module buildings and all pipes and utilities connecting the wells to the module buildings and the CPP, shredding or chipping the solid materials to reduce the volume, and disposing of these materials in a permitted landfill or licensed 11e.(2) waste site as appropriate, and reclaiming the surface as described for the other surface facilities. All pumps and tubing will be removed from production, injection and monitoring wells to permit well plugging. The estimated costs for each item of work in this task are included in the worksheet WF BLDGS PIPE.

5. Well Abandonment

All injection, recovery and monitor wells will be abandoned (plugged) with high solids bentonite in accordance with WDEQ LQD Rules and Regulations Chapter 8. After the well casing is cut off below grade a cement hole plug will be installed prior to backfill above the plug with soil. This work includes abandonment and reclamation of 118 monitor wells and 340 production and injection wells anticipated for use in uranium recovery in MU-1. It also includes an estimated 100 monitor wells in MU-2 and estimated 85 production and injection wells that will be installed in MU-2 but will not be operated (it is anticipated that MU-2 will be in development during the period). It also includes 59 existing baseline monitor wells. The deep disposal well that will be constructed during initial facilities construction will also be plugged and abandoned. For conservative purposes, in the case two deep disposal wells are installed during the period, an additional $115,000 is included to plug and

abandon that well (DDW-2). The estimated costs to abandon and reclaim all wells are included in worksheet WELL ABAN.

6. Reclamation of Wellfields, Roads, CPP Area

Once all wells are plugged at the wellfield and pipelines, module buildings and utilities have been removed, a radiological survey (Section 7) will be completed prior to any topsoil application and final seeding with the approved seed mix. If deemed necessary, high traffic areas and/or compacted areas will be ripped or chisel plowed prior to seeding. Gravel from main roads, the CPP area, wellfield roads and other areas will be salvaged with scrapers and either used as clean fill material or more likely recycled for use on adjacent private or county roads. If necessary, compacted areas will be ripped or chisel plowed prior to the application of topsoil and final seeding. Procedures are fully described in Sections 6.2 and 6.3 of the NRC Technical Report and the applicable sections of the Mine Plan.

Cost estimates are included for the removal of 7000 feet of main trunk line (that consists of two 16-inch and two 8-inch diameter HDPE pipelines and 1500 feet of feeder pipelines (two 6-inch diameter HDPE pipelines) in MU-1. Cost estimates are also included to remove and reclaim approximately 7400 feet of existing and planned wellfield roads associated with MU-1 and the connecting road from MU-1 to the CPP area. Cost estimates are also included to remove and reclaim approximately 2100 feet of planned wellfield roads in MU-2.

6. Radiological Surveys

During equipment decontamination, contamination surveys of building and equipment surfaces will be performed and analyzed. The results of these surveys will drive decontamination efforts. Following removal of all structures and regrading of the site to approximate original contours, and before topsoil is spread on the regraded area, a gamma survey and soil sampling will be conducted as described in Section 2 of the WDEQ Reclamation Plan (Section

6.4 of the NRC Technical Report). Soils will be cleaned up in accordance with the requirements of 10 CFR Part 40, Appendix A, including consideration of ALARA goals. The proposed limits and ALARA goals for cleanup of soils are summarized in the approved WDEQ Reclamation Plan and NRC Technical Report. Any areas which do not meet these limits will be remediated by removing contaminated soils and disposing at a licensed site. The site will then be regraded. This process will be repeated until all sites meet the ALARA goals for cleanup. The costs and areas subject to these surveys are provided in worksheets EQUIP, BLDGS, WF BLDGS PIPE and MISC REC.

7. Revegetation

At the completion of the previous tasks, and after topsoil has been spread across all regraded areas, all of the disturbed lands will be seeded with vegetation species that will return the lands to their pre-project conditions. The surface reclamation plan goals will be to return the land to equal or better condition than existed prior to uranium recovery, thus making it available for "unrestricted use." The reclaimed land will be capable of supporting livestock grazing, dry land farming and wildlife habitat. Baseline soils, vegetation, and radiological data will be used to guide the reclamation activities. The costs and the areas to be revegetated are provided in worksheets WF REC and MISC REC and are based on actual costs for revegetation at the Ross site.

8. Miscellaneous Reclamation Activities

Costs for miscellaneous reclamation activities, some of which were discussed in the preceding sections, are provided in MISC REC. This includes:

Item
CPP/Office surface reclamation
Access road reclamation
Wastewater pipeline reclamation
Pond reclamation
Containment Barrier Wall (CBW) reclamation
Culver removal and disposal
Fence removal
Monitoring site removal and disposal

Radiologic surveys
Miscellaneous 11e.(2) soil transport and disposal

STRATA ENERGY INC

Attachment 3
Revised Annual Bond Estimate – March 23, 2013

Ross Uranium Project Surety Update March 2015

Total Restoration and Reclamation Cost Estimate

I.	GROUNDWATER RESTORATION COST	$2,931,998
II.	EQUIPMENT REMOVAL & DISPOSAL COST	$76,868
III.	BUILDING DEMOLITION AND DISPOSAL COST	$432,797
IV.	WELLFIELD BUILDINGS, PIPE & EQUIPMENT REMOVAL & DISPOSAL COST	$275,122
V.	WELL ABANDONMENT COST	$662,265
VI.	WELLFIELD SURFACE RECLAMATION COST	$34,327
VII.	TOTAL MISCELLANEOUS RECLAMATION COST	$254,124
	SUBTOTAL RECLAMATION AND RESTORATION COST ESTIMATE	$4,667,501
	CPI ESCALATOR- _____ to _____ (__%)	$0
	SUBTOTAL	$4,667,501
	ADMINISTRATIVE, OVERHEAD, AND CONTINGENCY ITEMS (25%)	$1,166,875
	TOTAL	$5,834,376
	TOTAL CALCULATED SURETY (IN 2014 DOLLARS)	**$5,834,400**

Ross Uranium Project Surety Update March 2015

Ground Water Restoration	MU-1	MU-2
PV Assumptions		
Wellfield Area (ft2) (4 Mods injected, 1 Mod no inj)	1560044	390011
Wellfield Area (acres)	35.81	8.95
Affected Ore Zone Area (ft2)	1560044	390011
Avg. Completed Thickness	8	8
Porosity	0.34	0.34
Flare Factor (H=1.32, V=1.20, Overall= 1.58)	1.58	
Affected Volume (ft3)	19718956	0
Kgallons per Pore Volume	50149	0
Number of Wells in Unit(s)		
Production Wells		
Current	0	0
Estimated next report period	124	31
Total Estimated	124	31
Injection Wells		
Current	0	0
Estimated next report period	216	54
Total Estimated	216	54
Monitor Wells		
Current	31	0
Estimated next report period	87	100
Total Estimated	118	100
Restoration Wells		
Current		
Estimated next report period		
Total Estimated	0	0
Number of Wells per Wellfield	458	185
Total Number of Wells	**643**	
Average Well Depth (ft)	500	500
I. Ground Water Sweep Costs (includes brine disposal)		
PV's Required	0.5	
Total Kgals for Treatment	25075	0
Ground Water Sweep Unit Cost ($/Kgal)	$0.67	$0.00
Subtotal Ground Water Sweep Costs per Wellfield	$16,885	$0
Total Ground Water Sweep Costs	**$16,885**	
II. Reverse Osmosis Costs (includes brine disposal)		
PV's Required	7	
Total Kgals for Treatment	351045	0
Revei Percentage salvage -no value (60%)	$0.81	$0.00
Subtotal Reverse Osmosis Costs per Wellfield	$283,258	$0
Total Reverse Osmosis Costs	**$283,258**	

Ground Water Restoration	MU-1	MU-2
III. Recirculation		
PV's Required	1	
Total Kgals for Treatment	50149	0
Recirculation Unit Cost ($/Kgal)	$0.39	$0.00
Subtotal Recirculation Unit Costs per Wellfield	$19,383	$0
Total Recirculation Costs	**$19,383**	
IV. Monitoring and Sampling Costs		
A. Restoration Well Sampling		
Estimated Restoration Period (Years)	1	
1. Well Sampling prior to restoration start		
# of OZ BL Wells	46	
$/sample	$330	
2. Restoration Progress Sampling		
# of OZ BL Wells	46	
$/sample	$30	
Samples/Year	6	
3. UCL Sampling		
# of UCL Wells	72	
$/sample	$20	
Samples/Year	6	
Sub-total Restoration Analyses	$32,100	
B. Short-term Stability		
Estimated Stabilization Period (Months)	12	
# of OZ BL Wells	46	
Samples/Year	368	
$/sample	$330	
# of UCL Wells	72	
Samples/Year	6	
$/sample	$30	
Sub-total Short-term Stability Analyses	$134,400	$0
Subtotal Monitoring and Sampling Costs per Wellfield	$166,500	$0
Total Monitoring and Sampling Costs	**$166,500**	
V. Mechanical Integrity Test (MIT) Costs		
Five Year MIT Unit Cost ($/well)	NA	NA
Number of Wells (30% of Inj. and Rest. Wells)	NA	NA
Subtotal Mechanical Integrity Testing Costs per Wellfield		
Total Mechanical Integrity Testing Cost		
TOTAL RESTORATION COSTS PER WELLFIELD	$486,026	$0
TOTAL WELLFIELD RESTORATION COST	**$486,026**	
VI. Purchase/Install Additional High Eff. RO Unit (550 gpm)		
Cost for Additional High Eff RO Unit (includes installation)	$750,000	
Total Cost for Additional High Eff RO Unit	**$750,000**	

Ground Water Restoration	MU-1	MU-2
VII. Building Utility Costs	**CPP**	**Office**
Electricity ($/Month) estimate	$2,500	$300
Propane ($/Month)		
Natural Gas ($/Month) estimate	$2,000	$500
Number of Months	36	36
Subtotal Utility Costs per Building	$162,000	$28,800
Total Building Utility Costs	**$190,800**	
VIII. Vehicle Operation Costs		
Number of Pickup Trucks/Pulling Units (Gas)	6	
Unit Cost in $/hr (WDEQ Guideline No.12, Table D-1)	$28.52	
Average Operating Time (Hrs/Year)	200	
Total Number of Years (Average)	3	
Total Vehicle Operation Costs	**$102,672**	
IX. Labor Costs		
Number of Environmental Managers/RSOs	1	
$/Year	$125,000	
Number of Years	3	
Number of Restoration Managers (during active restoration)	1	
$/Year	$75,000	
Number of Years	2	
Number of Environmental Technicians	1	
$/Year	$65,000	
Number of Years	3	
Number of Operators/Laborers (reduced durng stabilization)	4	
$/Year	$65,000	
Number of Years	2	
Number of Maintenance Technicians (reduced during stabilizat	1	
$/Year	$65,000	
Number of Years	2.5	
Total Labor Costs	**$1,402,500**	
TOTAL GROUND WATER RESTORATION COSTS	**$2,931,998**	

Equipment Removal Onsite Disposal and Loading	CPP	DDW Building
I. Removal and Loading Costs		
A. Tankage		
Number of Uncontaminated FG Tanks to be Cut Up	4	
Volume of Uncontaminated Tank Construction Material (ft^3)	246	
Weight of Uncontaminated Tank Construction Material @ 1000 lb/yd3 (tons)	5	
1. Labor for Dismantling		
Number of Persons	3	
Ft^3/Day	50	
Number of Days	5	
$/Day/Person	$200	
Subtotal Labor Costs	$3,000	
2. Equipment		
Number of Days	5	
$/Day	$500	
Subtotal Equipment Costs	$2,500	
3. Off site tranport and disposal at Moorcroft Landfill Unit Cost ($/ton)	$338.00	
Off site transport and disposal cost	$1,540	
Subtotal Uncontaminated tankage Removal, Loading, Disposal Costs	$7,040	
Number of Contaminated FG Tanks to be Cut Up	4	
Volume of Contaminated Tank Construction Material (ft^3)	283	
1. Labor for Dismantling		
Number of Persons	3	
Ft^3/Day	50	
Number of Days	6	
$/Day/Person	$200	
Subtotal Labor Costs	$3,600	
2. Equipment		
Number of Days	6	
$/Day	$500	
Subtotal Equipment Costs	$3,000	
Subtotal Tankage Removal and Loading Costs	$6,600	

Equipment Removal Onsite Disposal and Loading	CPP	DDW Building
B. Number of IX Columns to be Decontaminated, Cut Up and Salvaged (no value)		
Number of 11,000 gal IX Columns	8	
Number of 5,500 gal Guard IX Columns	1	
Weight of 11,000 gal IX Column (lbs)	24,000	
Weight of 5,500 gal Guard IX Column (lbs)	5500	
Assume 90% steel salvage (no value)		
Weight of 11,000 gal IX column for disposal (tons)	1.2	
Weight of 5,500 gal IX column for disposal (tons)	0.275	
1. Labor for Decontamination and Dismantling		
Number of Persons	3	
Number of Days	18	
$/Day/Person	$200	
Subtotal Labor Costs	$10,800	
2. Equipment		
Number of Days	18	
$/Day	$500	
Subtotal Equipment Costs	$9,000	
3. Off site tranport and disposal at Moorcroft Landfill Unit Cost ($/ton)	$338.00	
Off site transport and disposal cost	$3,338	
Subtotal Decontaminated IX Columns Removal and Offsite Disposal Costs	$23,138	
C. Contaminated PVC/HDPE Pipe		
PVC/HDPE Pipe Footage	1000	30
Average PVC Pipe Diameter (inches)	5	2
Shredded PVC Pipe Volume Reduction (ft^3/ft)	0.6	0.2
Volume of Shredded PVC Pipe (ft^3)	600	6
1. Labor for Shredding		
Number of Persons	2	1
Ft/Day	350	350
Number of Days	3	1
$/Day/Person	$200	$200
Subtotal Labor Costs	$1,200	$200
Subtotal PVC Pipe Removal and Loading Costs	$1,400	
D. Contaminated Pumps		
Number of Contaminated Pumps	28	1
Average Volume (ft^3/pump)	4	6
Volume of Pumps (ft^3)	112	6
1. Labor		
Number of Persons	3	2
Pumps/Day	10	1
Number of Days	3	1
$/Day/Person	$200	$200
Subtotal Labor Costs	$1,800	$400
Subtotal Pump Removal and Loading Costs	$2,200	

Equipment Removal Onsite Disposal and Loading		**CPP**	**DDW Building**
E. Contaminated Dryer			
Dryer Volume (ft^3)	NA		
1. Labor			
Number of Persons	NA		
Ft^3/Day	NA		
Number of Days	NA		
$/Day/Person	NA		
Total Labor Cost	NA		
Total Dryer Dismantling and Loading Cost		$0	
F. Contaminated RO Units			
Number of RO Units			
Current		0	
Planned (One RO installed with CPP, one installed later for restoration)		2	
Average Volume (ft^3/RO Unit)		1000	
1. Labor			
Number of Persons		3	
Number of Days		1	
$/Day/Person		$200	
Subtotal Labor Costs		$1,200	
Subtotal RO Unit Removal and Loading Costs		$1,200	
Total Equipment Removal and Loading Costs		**$41,578**	
II. Transportation and Disposal Costs (NRC-Licensed Facility)			
A. Tankage			
Volume of Tank Construction Material (ft^3)		283	
Volume for Disposal Assuming 10% Void Space (ft^3)		311	
Transportation and Disposal Unit Cost ($/$ft^3$)		$12.85	
Subtotal Tankage Transportation and Disposal Costs		$3,997	
B. PVC/HDPE Pipe			
Volume of Shredded PVC/HDPE Pipe (ft^3)		600	
Volume for Disposal Assuming 10% Void Space (ft^3)		660	
Transportation and Disposal Unit Cost ($/$ft^3$)		$12.85	
Subtotal PVC/HDPE Pipe Transportation and Disposal Costs		$8,481	
C. Pumps			
Volume of Pumps (ft^3)		112	6
Volume for Disposal Assuming 10% Void Space (ft^3)		123	7
Transportation and Disposal Unit Cost ($/$ft^3$)		$12.85	$12.85
Subtotal Pump Transportation and Disposal Costs		$1,581	$90
D. Dryer			
Dryer Volume (ft^3)	NA		
Volume for Disposal Assuming Dryer Remains Intact (ft^3)	NA		
Transportation and Disposal Unit Cost ($/$ft^3$)		$12.85	
Total Dryer Transportation and Disposal Costs	NA		
E. RO Units			
Volume of RO Units (ft^3)		1000	
Volume for Disposal Assuming 50% Volume Reduction (ft^3)		1000	
Transportation and Disposal Unit Cost ($/$ft^3$)		$12.85	
Subtotal RO Unit Transportation and Disposal Costs		$12,851	
Subtotal Equipment Transportation and Disposal Costs per Facility		**$26,910**	$90
Total Equipment Transportation and Disposal Costs		**$27,000**	**$90**
III Health and Safety Costs			
Radiation Safety Equipment		$8,000	200
Total Health and Safety Costs		**$8,000**	**$200**
SUBTOTAL EQUIPMENT REMOVAL AND DISPOSAL COSTS PER FACILITY		$76,578	$290
TOTAL EQUIPMENT REMOVAL AND DISPOSAL COSTS		**$76,868**	

Building Demolition and Disposal	CPP 140'x102'x30'	Office 115'x100'x17'	DDW Building 15'x15'x10'	Pot Water Building 15'x15'x10'
I. Decontamination Costs				
A. Wall Decontamination				
Assumption: Approx 25% of CPP walls require decontamination				
Area to be Decontaminated (ft^2)	3500	0	600	0
Application Rate (Gallons/ft^2)	1		1	
HCl Acid Wash, including labor ($/Gallon)	$0.50		$0.50	
Subtotal Wall Decontamination Costs	$1,750	$0	$300	$0
B. Concrete Floor Decontamination				
Assumption: Approx 50% of CPP floor requires decontamination				
Area to be Decontaminated (ft^2)	7200	0	225	0
Application Rate (Gallons/ft^2)	2		2	
HCl Acid Wash, including labor ($/Gallon)	$0.50		$0.50	
Subtotal Concrete Floor Decontamination Costs	$7,200	$0	$225	$0
C. Deep Well Injection Costs				
Total Kgals for Injection	17.9	0	1.05	0
Deep Well Injection Unit Cost ($/Kgals)	$1.37	$1.37	$1.37	$1.37
Subtotal Deep Well Injection Costs	$25	$0	$1	$0
Subtotal Decontamination Costs per Building	$8,975	$0	$526	$0
Total Decontamination Costs	**$9,501**	0		0
II. Demolition Costs				
A. Building				
Assumptions:				
Limited contamination of CPP as there is no Precip/Dryer				
Volume of Building (ft^3)	428400	195500	2250	2250
Demolition Unit Cost per WDEQ Guideline No.12,App K ($/$ft^3$)	$0.287	$0.287	$0.287	$0.287
Subtotal Building Demolition Costs	$122,951	$56,109	$646	$646
B. Concrete Floor				
Area of Concrete Floor (ft^2)	14280	11500	225	225
Demolition Unit Cost per WDEQ Guideline No.12,App.K ($/$ft^2$)	$5.55	$5.55	$5.55	$5.55
Subtotal Concrete Floor Demolition Costs	$79,254	$63,825	$1,249	$1,249
C. Concrete Footing				
Length of Concrete Footing (ft)	484	430	60	60
Demolition Unit Cost per WDEQ Guide. No.12,App.K ($/lin. ft)	$20.46	$20.46	$20.46	$20.46
Subtotal Concrete Footing Demolition Costs	$9,903	$8,798	$1,228	$1,228
Subtotal Demolition Costs per Building	$212,108	$128,732	$3,123	$3,123
Total Demolition Costs	**$347,086**			

Building Demolition and Disposal	CPP 140'x102'x30'	Office 115'x100'x17'	DDW Building 15'x15'x10'	Pot Water Building 15'x15'x10'
III. Disposal Costs				
A. Building				
Volume of Building Materials-no concrete. 10% of building full volume (yd3)	1587	724	83	83
Weight of Building Materials @ 405 lb/yd3 (ton)	321	147	17	17
1. Moorcroft Land Fill				
Assumptions:				
Percentage salvage -no value (60%)	0.4	0.4	0.4	0.4
Weight for Disposal (tons)	129	59	7	7
Disposal Unit Cost ($/ton)	$338.00	$338.00	$338.00	$338.00
Subtotal Landfill Disposal Costs	$43,440	$19,824	$2,282	$2,282
2. NRC-Licensed Facility				
Percentage (%)	0	0	0	0
Volume for Disposal (ft^3)	0	0	0	0
Volume for Disposal Assuming 10% Void Space (ft^3)	0	0	0	0
Transportation and Disposal Unit Cost ($/$ft^3$)	$12.85	$12.85	$12.85	$12.85
Subtotal NRC-Licensed Facility Disposal Costs	$0	$0	$0	$0
Subtotal Building Disposal Costs	$43,440	$19,824	$2,282	$2,282
B. Concrete Floor				
Area of Concrete Floor (ft^2)	14280	11500	225	225
Average Thickness of Concrete Floor (ft)	0.5	0.5	0.5	0.5
Volume of Concrete Floor (ft^3)	7140	5750	112.5	112.5
Volume of Concrete Floor (cy)	264	213	4	4
1. On-Site				
Percentage (%)	100	100	100	100
Volume for Disposal (cy)	264	213	4	4
Disposal Unit Cost per WDEQ Guideline No.12.App.K ($/cy)	$8.64	$8.64	$8.64	$8.64
Subtotal On-Site Disposal Costs	$2,285	$1,840	$36	$36
2. NRC-Licensed Facility				
Assumptions:				
Percentage (%)	0	0	0	0
Volume for Disposal (ft^3)	0	0	0	0
Segregation and Loading Unit Cost ($/$ft^3$)	$0.00	$0.00	$0.00	$0.00
Transportation and Disposal Unit Cost ($/$ft^3$)	$12.85	$12.85	$12.85	$12.85
Subtotal NRC-Licensed Facility Disposal Costs	$0	$0	$0	$0
Subtotal Concrete Floor Disposal Costs	$2,285	$1,840	$36	$36
C. Concrete Footing				
Length of Concrete Footing (ft)	484	430	60	60
Average Depth of Concrete Footing (ft)	2	2	2	2
Average Width of Concrete Footing (ft)	3	3	3	3
Volume of Concrete Footing (ft^3)	2904	2580	360	360
Volume of Concrete Footing (cy)	108	96	13	13
Disposal Unit Cost per WDEQ Guideline No.12.App.K ($/cy)	$8.64	$8.64	$8.64	$8.64
Subtotal Concrete Footing Disposal Costs	$929	$826	$115	$115
Subtotal Disposal Costs per Building	$46,654	$22,490	$2,433	$2,433
Total Disposal Costs	**$74,010**			
III. Health and Safety Costs				
Radiation Safety Equipment	$2,000		$200	
Total Health and Safety Costs	**$2,200**			
SUBTOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	$269,737	$151,222	$6,282	$ 5,556
TOTAL BUILDING DEMOLITION AND DISPOSAL COSTS	**$432,797**			

Wellfield Buildings and Equipment Removal and Disposal	**MU-1**
I. Wellfield Piping	
Assumptions:	
Number of Header Houses per Wellfield	4
Length of Piping per Header House (ft)	50600
Total Length of Piping (ft)	202400
A. Removal and Loading	
Wellfield Piping Removal Unit Cost ($/ft of pipe)	$0.44
Subtotal Wellfield Piping Removal and Loading Costs	$89,056
B. Transport and Disposal Costs (NRC-Licensed Facility)	
Average Diameter of Piping (inches)	1.5
Chipped Volume Reduction (ft^3/ft)	0.0069
Chipped Volume per Wellfield (ft^3)	1396.56
Volume for Disposal Assuming 10% Void Space (ft^3)	1536
Transportation and Disposal Unit Cost ($/$ft^3$)	$12.85
Subtotal Wellfield Piping Transport and Disposal Costs	$19,739
Wellfield Piping Costs per Wellfield	$108,795
Total Wellfield Piping Costs	**$108,795**
II. Well Pumps and Tubing	
Assumptions:	
Pump and tubing removal costs included under ground water restoration labor costs	
100% of production/injection wells contain pumps and/or tubing	
A. Pump and Tubing Transportation and Disposal	
Number of Production Wells (operating wells only)	124
Number of Injection Wells (operating wells only)	216
1. Pump Volume	
Number of Production Wells with Pumps	124
Average Pump Volume (ft^3)	2
Pump Volume per Wellfield (ft^3)	248
2. Tubing Volume	
Assumptions:	
Average tubing length/wellfield based on average well depth minus 25 ft	
Number of Production Wells with Tubing	124
Number of Injection Wells with Tubing	216
Average Tubing Length per Well (ft)	475
Tubing Length per Wellfield (ft)	161500
Diameter of Production Well HDPE Tubing (inches)	1.5
Diameter of Injection Well HDPE Tubing (inches)	1.5
Chipped Volume Reduction (ft^3/ft)	0.0069
Chipped Volume per Wellfield (ft^3)	1114
Volume of Pump and Tubing (ft^3)	1362
Volume for Disposal Assuming 10% Void Space (ft^3)	1498
Transportation and Disposal Unit Cost ($/$ft^3$)	$12.85
Subtotal Pump and Tubing Transport and Disposal Costs	$19,253
Pump and Tubing Costs per Wellfield	$19,253
Total Pump and Tubing Costs	**$19,253**

Wellfield Buildings and Equipment Removal and Disposal	**MU-1**	
III. Buried Trunk Line	**From CPP to MU-1**	**MU-1**
Number of pipes	2 each	2
Size of pipes (diameter in inches)	16	6
Size of pipes (diameter in inches)	8	
Length of Trunk line Trench (ft)	7000	1500
A. Removal and Loading		
Main Pipeline Removal Unit Cost ($/ft of trench)	$3.33	$3.33
Subtotal Trunk line Removal and Loading Costs	$23,310	$4,995
B. Transport and Disposal Costs (NRC-Licensed Facility)		
1. 3" HDPE Trunk line		
Piping Length (ft)		
Chipped Volume Reduction (ft^3/ft)	0.022	
Chipped Volume (ft^3)	0	
2. 6" HDPE Trunk line		
Piping Length (ft)		3000
Chipped Volume Reduction (ft^3/ft)	0.078	0.078
Chipped Volume (ft^3)	0	234
3. 8" HDPE Trunk line		
Piping Length (ft)	14000	
Chipped Volume Reduction (ft^3/ft)	0.141	
Chipped Volume (ft^3)	1974	
4. 12" HDPE Trunk line		
Piping Length (ft)		
Chipped Volume Reduction (ft^3/ft)	0.293	
Chipped Volume (ft^3)	0	
5. 14" HDPE Trunk line		
Piping Length (ft)		
Chipped Volume Reduction (ft^3/ft)	0.359	
Chipped Volume (ft^3)	0	
6. 16" HDPE Trunk line		
Piping Length (ft)	14000	
Chipped Volume Reduction (ft^3/ft)	0.486	
Chipped Volume (ft^3)	6804	0
Total Trunk line Chipped Volume (ft^3)	6804	234
Volume for Disposal Assuming 10% Void Space (ft^3)	7484	257
Transportation and Disposal Unit Cost 11E2 ($/$ft^3$)	$12.85	$12.85
Subtotal Trunk line Transport and Disposal Costs	$96,175	$3,303
Trunk line Decommissioning Costs per Wellfield	$119,485	$8,298
Total Trunk Line Decommissioning Costs	**$127,783**	

Wellfield Buildings and Equipment Removal and Disposal	**MU-1**
IV. Well Head Covers	
Total Quantity (operating wells)	340
Average Well Head Cover Volume (ft^3) (2'x2'x3')	12
A. Removal	
Total Volume (ft^3)	4080
Demolition Unit Cost per WDEQ Guideline No.12,App.K ($/ft^3$)	$0.287
Subtotal Well Head Cover Demolition Costs	$1,171
B. Survey and Decontamination	
Assumptions:	
Cost per Well Head Cover	
Subtotal Survey and Decontamination Costs	$0
C. Disposal	
Total Volume (cy)	151
Volume for Disposal Assuming 10% Void Space (cy)	166
Disposal Unit Cost 11E2 ($/cy)	$12.85
Subtotal 11E2 Disposal Costs	$2,133
Well Head Cover Removal and Disposal Costs per Wellfield	$3,304
Total Well Head Cover Removal and Disposal Costs	**$3,304**
VI. Header Houses	
Total Quantity (operating)	4
Average Header House Volume (ft^3) (10'x36'x8')	2880
A. Removal	
Total Volume (ft^3)	11520
Demolition Unit Cost per WDEQ Guideline No.12,App.K ($/ft^3$)	$0.287
Subtotal Building Demolition Costs	$3,306
B. Survey and Decontamination	
Assumptions:	
Cost per Header House	$1,000
Subtotal Survey and Decontamination Costs	$4,000
C. Volume of Building Materials-no concrete,40% of full building volume (yd3)	171
1. Moorcroft Land Fill	
Assumptions:	
Weight for Disposal @405 lb/yd3 (tons)	35
Disposal Unit Cost ($/ton)	$338.00
Subtotal Landfill Disposal Costs	$11,681
Total Header House Removal and Disposal Costs	**$15,987**
TOTAL REMOVAL AND DISPOSAL COSTS PER WELLFIELD	$275,122
TOTAL WELLFIELD BUILDINGS AND EQUIPMENT REMOVAL AND DISPOSAL COSTS	**$275,122**

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Well Abandonment	MU-1	MU-2	Existing Baseline Wells
I. Well Abandonment (Wellfields)			
# of Production Wells (operating and/or installed)	124	31	0
# of Injection Wells (operating and/or installed)	216	54	0
# of Monitoring Wells (operating and/or installed)	118	100	59
#of Restoration Wells (operating and/or installed)	0	0	0
Total Number of Wells	458	185	59
Average Diameter of Casing (inches)	4.5	4.5	5
Average Depth (ft)	500	500	420
Well Abandonment Unit Cost ($/well)	$614	$614	$633
Subtotal Abandonment Cost per Wellfield	$281,313	$113,631	$37,321
Total Wellfield Abandonment Costs	**$432,265**		
II. Waste Disposal Well Abandonment	**DDW- 1**	**DDW-2 (If needed)**	
Estimated Well Abandonment Cost per Well	$115,000	$115,000	
Subtotal Waste Disposal Well Abandonment Costs per Well	$115,000	$115,000	
Total Waste Disposal Well Abandonment Costs	**$230,000**		
TOTAL WELL ABANDONMENT COSTS	**$662,265**		

Wellfield Surface Reclamation	Connecting Road from CPP	MU-1	MU-2
I. Wellfield Pattern Area Reclamation			
Pattern Area (acres)		35.8	20
Disking/Seeding Unit Cost ($/acre)		$350	$350
Subtotal Pattern Area Reclamation Costs per Wellfield		$12,530	$7,000
Total Wellfield Pattern Area Reclamation Costs		**$19,530**	
II. Wellfield Road Reclamation			
A. Road Reclamation			
Length of Wellfield Roads (1000 ft)	2.8	7.4	2.1
Wellfield Road Reclamation Unit Cost ($/1000 ft)	$1,203	$1,203	$1,203
Subtotal Road Reclamation Costs per Wellfield	$3,368	$8,902	$2,526
Total Wellfield Road Reclamation Costs	**$14,797**		
SUBTOTAL SURFACE RECLAMATION COSTS PER WELLFIELD	$3,368	$21,432	$9,526
TOTAL WELLFIELD SURFACE RECLAMATION COSTS	**$34,327**		

Miscellaneous Reclamation

I.	**CPP/Office Area Reclamation**			
	Assumptions			
	Concrete used to backfill low areas as Clean Fill			
A.	Ripping and Hauling Gravel			
	Assumptions			
	Average haul distance (ft)	500		
	Surface grade (%)	0%		
	Average Thickness of Gravel (ft)	0.33		
	Surface Area (acres) (minus building floor area)	4.1		
	Ripping Unit Cost per WDEQ Guideline No.12AI ($/acre)	$1.00		
	Volume of gravel (cy)	2183		
	Hauling Unit Cost per WDEQ Guideline No.12, App.C ($/cy)	$1.08		
	Total Gravel Ripping and Hauling Cost	$2,362		
B.	Topsoil Application			
	1. Topsoil Replacement			
	Assumptions			
	Average haul distance (ft)	1000		
	Surface area (acres)	4.82		
	18 inches of topsoil removed and replaced at borrow area			
	Volume of topsoil (cy)	11664.4		
	Topsoil Removal/Replacement Unit Cost per WDEQ GL No. 12 a($/cy)	$0.99		
	Total Topsoil Removal/Replacement Cost	$11,548		
C.	Disking/Seeding			
	Assumptions			
	Surface Area (acres)	4.82		
	Disking/Seeding Unit Cost ($/acre)	$350		
	Total Disking/Seeding Costs	$1,687		
	Total CPF/Office Area Reclamation	**$15,597**		

	II. Access Road Reclamation	**Main Access Road**	**Water Supply Well Road**	**DDW Road**
A.	Assumptions			
	Surface grade			
	Length of road (miles)	0.45	0.085	0.246
	Average road width (ft)	30	12	24
B.	Gravel Percentage salvage -no value (60%)			
	Assumptions			
	Average haul distance (ft)	500	500	500
	Gravel Road Base Width (ft)	30	12	24
	Gravel Road Base Area (acres)	1.6	0.1	0.7
	Average Road Base Depth (ft)	0.33	0.33	0.33
	Volume of Road Base (cy)	871	66	381
	Removal Unit Cost per WDEQ Guideline No.12A ($/cy)	$0.82	$0.82	$0.82
	Subtotal Gravel Road Base Removal Costs	$714	$54	$312
C.	Move Road Fill Material			
	Assumptions			
	Estimated volume to move (cy)	30,500		
	Average haul distance (ft)	750		
	Removal Unit Cost per WDEQ Guideline No.12A ($/cy)	$0.90		
	Subtotal Gravel Road Fill Removal Costs	$27,450		
D.	Ripping Overburden with Dozer			
	Overburden Surface Area (acres)	1.6	0.1	0.7
	Ripping Unit Cost per WDEQ Guideline No.12, App. I ($/acre)	$881.07	$881.07	$881.07
	Subtotal Ripping Overburden Costs	$1,442	$109	$631

Miscellaneous Reclamation

E. Topsoil Application			
Assumptions			
Average haul distance (ft)	1250	1500	750
Topsoil Surface Area (ft^2) (Road surface width x 1.1)	78408	5924	34290
Depth of Topsoil (ft)	1.5	1.5	1.5
Volume of Topsoil (cy)	4356	329	1905
Topsoil Unit Cost per WDEQ Guideline No.12A ($/cy)	$1.06	$1.14	$0.90
Subtotal Topsoil Application Costs	$4,617	$375	$1,715
F. Disking/Seeding			
Assumptions			
Surface Area (acres)	1.6	0.1	0.7
Disking/Seeding Unit Cost ($/acre)	$350	$350	$350
Subtotal Disking/Seeding Costs	$573	$43	$250
Subtotal Reclamation Costs per Road	$34,796	$581	$2,908
Total Access Road Reclamation Costs	**$38,285**		

III. Wastewater Pipeline Reclamation	**DDW-1 Pipeline**
A. Pipeline Removal and Loading	
Length of HDPE Pipe Trench (ft)	1600
Main Pipeline Removal Unit Cost ($/ft of trench)	$3.33
Subtotal Pipeline Removal Costs	$5,328
B. Pipeline Transportation and Disposal (NRC-Licensed Facility)	
Pipe Diameter (inches)	2
Chipped Volume Reduction (ft^3/ft)	0.014
Subtotal Volume of Shredded PVC Pipe (ft^3)	24.64
Transportation and Disposal Unit Cost ($/ft^3)	$12.85
Subtotal Pipeline Disposal Costs	$317
C. Disking/Seeding	
Assumptions:	
Width of Pipeline Trench (ft)	2
Area of Pipeline Trench (acres)	0.1
Disking/Seeding Unit Cost ($/acre)	$350
Subtotal Disking/Seeding Costs	$26
Subtotal Reclamation Costs per Pipeline	$5,671
Total Wastewater Pipeline Reclamation Costs	**$5,671**

Miscellaneous Reclamation

		WW Storage Pond 1 (3 cells)	Sediment Pond
IV. Pond Reclamation (Pond 1,comprised of 3 cells)			
A. HDPE Liner Removal and Disposal			
Assumptions:			
HDPE Primary liner for Pond 1 constitutes 11E2 waste			
Thickness of HDPE Primary liner (mil)		60	60
HDPE Secondary liner for Pond 1 and Sediment pond not contaminated			
Thickness of HDPE Secondary liner (mil)		40	
Liner swell factor (50%)		1.5	1.5
Width of Pond (ft)		240	130
Length of Pond (ft)		545	130
Depth of Pond (ft)		15	15
Surface area of pond (ft^2)		130800	16900
Surface area of liner (ft2)		143616	6600
Volume of HDPE Liner (cy)	0	40	6
1. Removal and Loading			
Removal and Loading Unit Cost based on engineer's estimate		$30,000.00	$1,000.00
Sub Total Liner Removal and Loading Costs		**$31,000**	
2. Transportation and Disposal 11E2			
Volume of HDPE Primary Liner (ft^3)		1077	
Transportation and Disposal Unit Cost 11E2 ($/ft^3$)		$12.85	
Sub Total Liner Transportation and Disposal Costs 11E2		**$13,842**	
3. Transportation and Disposal Non Contaminated			
Volume of HDPE Secondary Liner (ft^3)		718	33
Assume loose liner weighs 1500 lbs/yd3			
Offsite Transport and Disposal Unit Cost ($/ton)		$338	$338
Subtotal Liner Transportation and Disposal Costs		$6,742	$310
Total Liner Transportation and Disposal Costs		**$7,052**	
B. Removal and disposal pond leak detection system			
Labor/equipment estimate		$5,000	
Volume of material estimate (ft3)		500	
Transportation and Disposal Unit Cost 11E2 ($/ft^3$)		$12.85	
Sub Total Leak Detection Removal and Disposal Costs		**$11,425**	
C. Backfill Pond			
Assumptions per cell (3):			
Estimated volume to approx natural grade (yd3)		10080	13600
Average push distance with dozer (ft)		50	
Approx haul for scraper from road fill (ft)			500
Surface grade (%)		0%	0%
Volume of WW Pond backfill for 3 cells (cy)		30,240	
Backfill Unit Cost per WDEQ Guideline No.12., ($/cy)		$0.16	$0.82
Subtotal Backfill Costs		$4,838	$11,152
Subtotal Backfill Costs		**$15,990**	
D. Topsoil Application			
Assumptions			
Average haul distance (ft)		750	1,000
Topsoil Surface Area (ac)		3.20	0.99
Depth of Topsoil (ft)		1.50	1.50
Volume of Topsoil (cy)		7,744	2,396
Topsoil Unit Cost per WDEQ Guideline No.12, App.C ($/cy)		$0.90	$0.82
Subtotal Topsoil Application Costs		$6,970	$1,965
Total Topsoil Application Costs		**$8,934**	
E. Soil Sampling and Analysis Costs			
Number of samples		12	
Cost per sample ($)		$150	
Subtotal Soil Sampling Costs ($)		**$1,800**	
Total Pond Reclamation Costs		**$90,043**	

Miscellaneous Reclamation

V. Diversion Berm Earthwork and Reclamation	
Assumptions	
Estimated volume to move (cy)	10800
Average haul distance (ft)	1000
Removal Unit Cost per WDEQ Guideline No.12A ($/cy)	$0.99
Subtotal Berm Fill Removal Costs	$10,692
Topsoil Application	
Assumptions	
Average haul distance (ft)	750
Topsoil Surface Area (ac)	1.50
Depth of Topsoil (ft)	1.50
Volume of Topsoil (cy)	3,630
Topsoil Unit Cost per WDEQ Guideline No.12, App.C ($/cy)	$0.90
Subtotal Topsoil Application Costs	$3,267
TOTAL DIVERSION BERM EARTHWORK AND RECLAMATION	**$13,959**
VI. Containment Barrier Wall (CBW) Reclamation	
Assumptions	
Labor/equip to excavate/install finger drains (estimate)	$7,650
Gravel for finger drains (estimate)	$3,000
Total Containment Barrier Wall (CBW) Reclamation Costs	**$10,650**
VII Main Trunk Line Reclamation	
Assumptions	
4300 feet requires seeding (located outside wellfield area) (ft)	4300
Assume 20 feet wide (ft)	20
Disking/Seeding Unit Cost ($/acre)	$350.00
Total Trunk Line Reclamation	**$691**
VII Culvert Removal and Disposal	
Assumptions	
Number	10
Removal Unit Cost per WDEQ Guideline No.12., App J (each)	$137.83
Transport and on-site disposal cost (estimated for each)	$100.00
Total Culvert Removal and Disposal	**$2,378**
IX. Fence Removal and Disposal	
Assumptions	
Length 4-Strand Barbwire Fence (MU-1 50 acres)	6000
Unit Cost per WDEQ Guideline No.12., App H ($/ft)	$0.32
Length CPP Fence	8500
Unit Cost per WDEQ Guideline No.12., App H ($/ft)	$0.32
Total Fence Removal and Disposal Costs	**$4,640**
X. Monitoring Site Removal and Disposal	
Assumptions	
3 Surface Water Sites (estimated at $2400 each)	$7,200
7 Air Mon Sites (estimated at $500 each)	$3,500
1 Met Station (estimated at $2500 each)	$2,500
Total Monitoring Site Removal and Disposal Costs	**$13,200**

Miscellaneous Reclamation

XI. Radiologic Surveys

Assumptions	
Misc meter/smear surveys buildings/equipment (100 at $55 each)	$5,500
Decomm area gamma surveys (est based on baseline survey costs	$15,000
Misc soil samples (Ra-226/U)	$13,000
Total Radiologic Surveys Costs	**$33,500**

XII Misc Soil 11E2 Soil Transport/Disposal

Soil from Mod Buildings (assume 50 yd3)	
Soil from spills (assume 25 yds3)	
11E2 soil transport and disposal volume (yd3)	75
11E2 soil transport and disposal cost ($/ft3)	$12.85
Total Soil 11E2 Soil Transport/Disposal	**$26,023**

TOTAL MISCELLANEOUS RECLAMATION COSTS	**$254,124**

GROUNDWATER SWEEP (GWS)

Assumptions:

1. All pumps are 5 hp pumping at 20 gpm
2. Cost of electricity = $0.06/kwh
3. All wastewater brine pumped to DDW for injection at $1.37/1000 gallons. with 90% permeate/10% brine split
4. Repair and maintenance costs estimated at $0.10/1000 gallons
5. Process sampling and analysis costs estimated at $0.25/1000 gallons at 200 GPM flow rate
6. Labor costs are covered in GW REST

Wellfield Pumping Costs per 1000 Gallons

$$\frac{1000\ gal}{} \times \frac{5\ hp}{20\ gpm} \times \frac{1\ hr}{60\ min} \times \frac{0.746\ kwh}{hp} \times \frac{\$\ 0.06}{kwh} = \$\ 0.1865$$

Repair and Maintenance Costs per 1000 Gallons	= $ $0.10
Process Sampling and Analysis Costs per 1000 Gallons	= $ $0.25
RO Wastewater Brine to DDW per 1000 Gallons **Note: only 10% of RO Volume Requires DDW Disposal**	= $ $0.14
TOTAL GWS COSTS PER 1000 GALLONS	**= $ 0.67**

REVERSE OSMOSIS (RO)

Assumptions:

1 Cost of electricity = $0.06/kwh
2 90% permeate/10% brine split
3 Membrane life of 4 years.
4 Includes cost of pumping from wellfield to RO Unit
5 The 10% reject is disposed at the DDW at a cost of $1.37/1000 gallons
6 Process sampling and analysis costs estimated at $0.17/1000 gallons at 700 GPM flow rate
7 Labor costs are covered in GW REST

Reverse Osmosis Costs per 1000 Gallons

Electricity	= $ 0.15
Chemicals	= $ 0.10
Membrane Replacement	= $ 0.00
Repair and Maintenance	= $ 0.10
Pumping from Wellfield	= $ 0.15
Process Sampling and Analysis	= $ 0.17

RO Wastewater Brine to DDW per 1000 Gallons = $ 0.137
Note: only 10% of RO Volume Requires DDW Disposal

TOTAL RO COSTS PER 1000 GALLONS **= $** 0.81

RECIRCULATION (REC)

Assumptions:

1. All pumps are 5 hp pumping at 20 gpm
2. Cost of electricity = $0.06/kwh
4 Repair and maintenance costs estimated at $0.10/1000 gallons
5 Process sampling and analysis costs estimated at $0.10/1000 gallons
6 Labor costs are covered in GW REST

Wellfield Pumping Costs per 1000 Gallons

$$\frac{1000\ \text{gal}}{} \times \frac{5\ \text{hp}}{20\ \text{gpm}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{0.746\ \text{kwh}}{\text{hp}} \times \frac{\$\ 0.06}{\text{kwh}} = \$\ 0.1865$$

Repair and Maintenance Costs per 1000 Gallons = $ 0.10

Process Sampling and Analysis Costs per 1000 Gallons = $ 0.10

TOTAL GWS COSTS PER 1000 GALLONS **= $ 0.39**

DEEP WELL INJECTION

Assumptions:

1. Pump 75 hp pumping at 50 gpm
2. Cost of electricity = $0.06/kwh
3 Repair and maintenance costs estimated at $0.10/1000 gallons
4 Labor costs are covered in GW REST

Waste Disposal Pumping Costs per 1000 Gallons

$$\frac{1000\ gal}{} \times \frac{75\ hp}{50\ gpm} \times \frac{1\ hr}{60\ min} \times \frac{0.746\ kwh}{hp} \times \frac{\$\ 0.06}{kwh} = \$\ 1.12$$

Repair and Maintenance Costs per 1000 Gallons = $ 0.10

Chemical Costs per 1000 Gallons = $ 0.15

Scale Inhibitor	= $	0.10
Corrosion Inhibitor	= $	0.05

TOTAL DEEP WELL INJECTION COSTS PER 1000 GALLONS = $ 1.37

WELL ABANDONMENT

Materials	500 ft Well/4.5 Inch Casing (4.36 inch ID)	420 ft Well/5.0 Inch Casing (4.91 inch ID)	Comments
Volume of high solids bentonite required (ft3)	51.8	56.7	Calculated
Bentonite Sacks Required per Well	16	18	Based on actual quantities used during exploration drill hole plugging
Bentonite Sack Cost	$9.17	$9.17	Based on actual prices during exploration drill hole plugging
Bentonite Cost per Well	$146.72	$165.06	Calculated
Cement hole plug	$5.00	$5.00	Estimate
Total Materials Cost Per Well	$151.72	$170.06	
Equipment Rental			
Hours required per well	2.5	2.5	Based on actual quantities used during exploration drill hole plugging
Backhoe cost per hour	$85.00	$85.00	Based on actual prices during exploration drill hole plugging
Cementer cost per hole	$250.00	$250.00	Based on actual prices during exploration drill hole plugging
Total Equipment Cost Per Well	$462.50	$462.50	
Total Cost to Plug & Abandon Recovery, Injection & Monitor Wells (500 ft)	**$614.22**	**$632.56**	

FIVE YEAR MECHANICAL INTEGRITY TESTS (MIT)

Assumptions:

1. Based on actual operating costs
2. Use Pulling Unit for __ hr/well at cost of $__/hr.
3. Use MIT Unit for __ hr/well at cost of $__/hr.
4. Labor for operation of pulling unit will require __ workers at $__/hr
5. Labor for operation of MIT Unit will require __ worker at $__/hr

MIT Costs per Well

Equipment:

Pulling Unit
hours X $ per hour =$ 0.00

MIT Unit
hours X $ per hour =$ 0.00

Labor:

Pulling Unit
hours X $ per hour X workers =$ $0.00

MIT Unit
hours X $ per hour =$ 0.00

MIT COST PER WELL =$ 0

MAIN PIPELINE REMOVAL

Assumptions:

1. Trenching with track hoe at 400 ft/day
2. Pipeline extraction and backfilling with track hoe at 300 ft/day
3. Trackhoe rental: $1280/week
4. Fuel cost: $18.00/operating hour
5. Trackhoe operation requires 1 worker at $25/hour
6. Pipeline extraction requires 2 workers at $25/hour (in addition to trackhoe operator)
7. Pipelines removed simutaneously
8. Includes removal of manholes
9. Operating schedule: 8 hrs/day, 5 days/week

Main Pipeline Removal Costs per ft of Trench

Equipment

Trackhoe

$$\frac{\$\ 1280}{\text{week}} \times \frac{1\ \text{week}}{5\ \text{days}} \times \frac{1\ \text{days}}{300\ \text{ft}} = \$\ 0.85$$

Fuel

$$\frac{\$\ 18}{\text{hour}} \times \frac{8\ \text{hrs}}{1\ \text{day}} \times \frac{1\ \text{days}}{300\ \text{ft}} = \$\ 0.48$$

Labor

Track hoe Operation

$$\frac{\$\ 25}{\text{man hr}} \times \frac{8\ \text{man hrs}}{1\ \text{day}} \times \frac{1\ \text{days}}{300\ \text{ft}} = \$\ 0.67$$

Pipeline Extraction

$$\frac{\$\ 25}{\text{man hr}} \times \frac{16\ \text{man hrs}}{1\ \text{day}} \times \frac{1\ \text{day}}{300\ \text{ft}} = \$\ 1.33$$

MAIN PIPELINE REMOVAL COST PER FT OF TRENCH =$ 3.33

WELLFIELD PIPING REMOVAL

Assumptions:

1. Trenching with backhoe at 2000 ft/day
2. Pipeline extraction and backfilling with backhoe at 2000 ft/day
3. Backhoe rental: $800/week
4. Fuel cost: $12.40/operating hour
5. Backhoe operation requires 1 worker at $25/hour
6. Pipeline extraction requires 1 workers at $25/hour (in addition to backhoe operator)
7. Operating schedule: 8 hrs/day, 5 days/week

Wellfield Pipe Removal Costs per ft of Pipe

Equipment

Backhoe

$$\frac{\$\ 800}{\text{week}} \times \frac{1\ \text{week}}{5\ \text{days}} \times \frac{1\ \text{days}}{1500\ \text{ft}} = \$\ 0.11$$

Fuel

$$\frac{\$\ 13.00}{\text{hour}} \times \frac{8\ \text{hrs}}{1\ \text{day}} \times \frac{1\ \text{days}}{1500\ \text{ft}} = \$\ 0.07$$

Labor

Backhoe Operation

$$\frac{\$\ 25}{\text{man hr}} \times \frac{8\ \text{man hrs}}{1\ \text{day}} \times \frac{1\ \text{days}}{1500\ \text{ft}} = \$\ 0.13$$

Pipeline Extraction

$$\frac{\$\ 25}{\text{man hr}} \times \frac{8\ \text{man hrs}}{1\ \text{day}} \times \frac{1\ \text{day}}{1500\ \text{ft}} = \$\ 0.13$$

WELLFIELD PIPE REMOVAL COST PER FT OF PIPE =$ 0.44

WELLFIELD ROAD RECLAMATION

Assumptions

1. Gravel road base removed at cost of $111/cy/1000 ft (WDEQ Guideline No. 12, App. C, Level Ground, 500 ft haul)
2. Gravel road base: average depth = 0.3 ft, average width =12 ft
3. Roads scarified prior to topsoil application at cost of $68.69/acre (WDEQ Guideline No. 12, Appendix P)
4. Grading of scarified roads prior to topsoil application at cost of $74.90/acre (WDEQ Guideline No. 12, Appendix G)
5. Topsoil applied at cost of $1.00/cy/1000 ft (WDEQ Guideline No. 12, App. C, Level Ground, 500 ft haul)
6. Stripped topsoil: average depth = 1.5 ft, average width = 16 ft
7. Disking/seeding cost of $350 acre is based on LQD recommendattion and LQD Guideline 12A.

Gravel Road Base Removal Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{0.30\ ft}{} \times \frac{12\ ft}{} \times \frac{1\ cy}{27\ ft^3} \times \frac{\$1.00}{cy} = \$\ 133$$

Scarification Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{16\ ft}{} \times \frac{1\ acre}{4.356E{+}04\ ft^2} \times \frac{68.69}{} = \$\ 25$$

Grading Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{16\ ft}{} \times \frac{1\ acre}{4.356E{+}04\ ft^2} \times \frac{\$74.00}{acre} = \$\ 27$$

Topsoil Application Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{1.50\ ft}{} \times \frac{16\ ft}{} \times \frac{1\ cy}{27\ ft^3} \times \frac{\$1.00}{cy} = \$\ 889$$

Disking/Seeding Costs per 1000 ft of Road

$$\frac{1000\ ft}{} \times \frac{16\ ft}{} \times \frac{1\ acre}{4.356E{+}04\ ft^2} \times \frac{\$350}{acre} = \$\ 129$$

TOTAL WELLFIELD ROAD RECLAMATION COSTS PER 1000 FT OF ROAD = $ 1,203

NON CONTAMINATED WASTE TRANSPORT AND DISPOSAL AT MOORCROFT LANDFILL

Assumptions:

1. 20 yd3 per load
2. 46 miles to Moorcroft Landfill roundtrip
3. Transportation at $3.00 per mile
4. Disposal fee at $200/ ton

Non Contaminated Waste Transport $\frac{46 \text{ miles}}{} \times \frac{\$3.00}{1 \text{ mile}}$	$138.00	20 tons
Non Contaminated Waste Disposal Cost	$4,000.00	20 tons
Total NON CONTAMINATED WASTE TRANSPORT AND DISPOSAL	$338.00	per ton

11E2 BY PRODUCT CONTAMINATED WASTE TRANSPORT AND DISPOSAL

Assumptions:

1. 30 yd3 per load
2. 470 miles to Shirley Basin 11E2 disposal facility (round trip)
3. Transportation at $3.00 per mile
4. Disposal fee at $300/yd3 ($11.11/ft3)

11E2 By Product Waste Transport

$$\frac{470 \text{ miles}}{} \times \frac{\$3.00}{1 \text{ mile}} \qquad \$1,410.00 \quad 30 \text{ yd3}$$

11E2 By Product Waste Disposal Cost $11.11 ft3

Total 11E2 BY PRODUCT CONTAMINATED WASTE TRANSPORT AND DISPOSAL **$12.85 ft3**

Abbreviations/Acronyms

$	Dollars
$/Kgal	Dollars per 1000 gallons
avg	average
ft	feet
ft2	square feet
ft3	cubic feet
gal	gallon
gpm	gallons per minute
H&S	Health and Safety
H2S	Hydrogen Sulfide
H2SO4	Sulfuric Acid
HCl	Hydrochloric Acid
Hp	Horsepower
Kgal	1000 gallons
Kwh	Kilowatt-hours
NaOH	Caustic Soda
OD	Outside Diameter
PPE	personal protective equipment
PV	Pore Volume Estimate
reqm't	requirement
RO	Reverse Osmosis
WDW	Waste Disposal Well
yd3	cubic yards
yr	year

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