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# TECHNICAL MEMORANDUM

## Utah Coal Regulatory Program

May 18, 2012

TO: Internal File

THRU: April Abate, Team Lead 5/30/2012

FROM: Priscilla Burton, CPSSc, Environmental Scientist III PWB hm SAS

RE: 2012 Midterm Permit Review, Nevada Electric Investment Company, Wellington Preparation Plant, Permit C/007/0012, Task 4043

**SUMMARY:**

The Wellington Preparation site is in temporary cessation (Sec 5.15 of the MRP). Section 5.15 describes buildings that were demolished and the 45 acres graded on the west side of the Price River in 1997; and describes the COVOL operations on the east side of the river that ceased operation in 1999 and the COVOL structures (Figure 5.12-1) that were reclaimed in 2004. Total acreage that was regraded and seeded on the east side is 3.81 acres. Interim reclamation was also completed at the River Pump House (Appendix M of the MRP). The Division initiated this mid-term review by letter on March 13, 3012. During the on-site inspection in April 2012, I was asked to determine whether the four foot of cover requirement over the slurry ponds was justified and if not, whether the bond could be reduced. As a result of this review, the Division finds, in accordance with **R645-301-553.260,** that the four foot of cover requirement is justified. Bonding might be reduced by removing the slurry, or by irrigation of the slurry to move the boron down through the profile and by subsequently demonstrating values in the surface four feet for boron and SAR that are below levels of concern. Alternatively, the cover may be reduced to 2.5 feet of the best available material within the permit area, if a capillary barrier, designed by a geotechnical soils engineer to prevent upward movement of boron, selenium and sodium is installed on top of the slurry ponds. A third suggestion is to minimize the foot print of the slurry ponds by remining the fines or grading the fines to a smaller footprint.

The Division requests the following updates to the MRP in accordance with: **R645-301-121.100,**

1. And, **R645-301-521.165**, Label the topsoil stockpiles and include them in the legend on Facilities Map E9-3341.
2. And **R645-301-112.600**, Update Surface ownership map Plate E9-3341A and Section 112.600 of the MRP.

3. And **R645-301-114**, Update Section R645-301-114.100 of the MRP, COVOL's Right of Entry.
4. And **R645-301-820.113**, Currently the Reclamation Agreement (dated 2000) references MRP Chap 1 Ex. A for the bonded area, which is the map included with the COVOL lease, is this reference still accurate? If not, please update the reference to the map illustrating the 392 bonded acres in the 2000 Reclamation Agreement. (Previous reclamation agreements have referred to Dwg. E9-3341 for the bonded/disturbed area. However Map E9-3341 shows a permit boundary that is significantly larger than 392 acres, but does not have a bonded/disturbed area boundary on the map or in the legend.)
5. And **R645-301-233.100,** The2008 bond describes soil salvage from Areas E, D, H, & I. This will not result in the best available soil in the permit area being utilized. Rather Areas B & C are the most preferable, followed by shallow soils in Area D and G. Compare borrow areas shown on Plates E9-3341 and E9-3511 and make adjustments to Plate E9-3341 to show Borrow Area B and reinstate Borrow Area B on p 4, Sec. 2.41 and make adjustments to the reclamation plan and bond, accordingly. (Area I is not designated or discussed as a borrow area in the MRP.)
6. And **R645-301-541.400,** Site operations have changed since 1998, when Section 2.41 (reclamation plan) was written. Please re-evaluate whether the best-case scenario described in Section 2.41 (removal of coarse refuse by re-mining) is still feasible and whether the potential for using Borrow Area B soils (Dwg E9-3511) is now possible, and make adjustments accordingly to the Reclamation plan described in Chapters 2 and 5 of the MRP.
7. And **R645-301-116.100** and **R645-300-154,** There has been no activity at the Wellington Preparation Plant since COVOL ceased operation in 1999. The Division received official notice of Temporary Cessation in 2007. Prior to permit renewal, please state the anticipated or actual phase of mining or reclamation to be undertaken, and number of acres of land to be affected by that phase in the next permit term and indicate whether the permit renewal will be reclamation only under R645-303-232.500.

**R645-301-121.200,**

1. And **R645-301-121.300,** The Table of Contents lists Tables 2-1 through 2-8, please provide page numbers for these tables in the Table of Contents.
2. And, **R645-301-243,** In addition to straw or hay mulch, the application of another form of organic matter was a variable in the 1991 test plot (Appendix A and Sec. 2.33, p. 2). The results of the 1994 test plot evaluation are reported in Section 3.41, but it is not clear what organic amendment was included as a variable. Please clarify.
3. And, **R645-301-244.200,** Section 3.41 p. 4a varies from the remainder of Section 3.41 and Section 2.41 with regard to the approach to seeding, surface roughening and mulch incorporation. Is ripping followed by green hay incorporation with drill seeding specific to a location within the permit area? If so, please specify on page 4a the area to receive the treatments described on page 4a.

**TECHNICAL ANALYSIS:**

# ENVIRONMENTAL RESOURCE INFORMATION

## SOILS RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 783.21, 817.200(c); R645-301-220, -301-411.

**Analysis:**

Section 2.22 provides a detailed history of soil sampling in the soil Borrow Areas D, E, F, G, H. Section 2.2 recounts the eight sampling studies conducted since 1970. These eight "periods" are presented with soil profile descriptions and laboratory analyses. The sampling locations are shown on Plates G9-3510 and G9-3511 and is summarized in the table on the following page.

The 2008 bond plans for soil salvage from Areas E, D, H, & I. This will not result in the best available soil in the permit area being utilized. Rather Areas B & C are the most preferable, followed by shallow soils in Area D and G.

Areas B, C & D appear to possess some of the best available substitute topsoil material within the permit area. Area B is mapped to the Greybull Series. As noted in section 2.22, page 97, 98, 108, and 122 of the MRP, the Greybull series is a fine-loamy, mixed, calcareous, mesic Typic Torriorthent. The 100 acres borrow area is represented by the NEICO 6 sample profile. It is entirely suitable for salvage. There are no limiting parameters. There are 10 to 15% gravels in this silty clay loam/ clay loam soil. The pH ranges from 7.9 to 8.1, the SAR values are 1.3 to 2.2; the EC ranges from 1.0 to 2.9 mmhos/cm. This soil is the best available substitute topsoil in the permit area. Earlier sample periods 2 and 3 report a few samples within Area B, see Table on the next page.

- 1983 Sample 12 WD was taken from 0 – 6 inches and reported clay loam, with pH 8.5, SAR = 2.2.
- 1989 samples 1 through 3 were taken to depths of 47 inches and reported clay to clay loam texture, pH 7.4 to 8.4 and SAR increasing down the profile.

These additional samples confirm the suitability of Area B to a depth of 24 inches for use as substitute topsoil. An unacceptable value of SAR was noted below 36 inches at sample location 1. Borrow Area B was removed from the permit area pending a sale of the land (Sec. 2.41 p 4). Area B is no longer identified as a borrow area on Plate E9-3341 Surface Facilities Map.

Areas D and G are limited in supply by steep slopes, shallow depth and clay content. Borrow Area E, F, and H rated poorly for clay content, pH, and/or SAR values. In general, the more sand content the soil has, the better the drainage and consequently, the better the SAR value. Loam soils are preferable to clay soils for instance.

| mpling iod" | MRP Sec. 2.2 pages | DATE | MAP | DEPTH | Corresponding Borrow Areas |
|---|---|---|---|---|---|
| 1 | pp. 34 - 38 | 1970's | Dwg E9-3510 | to 24 in. | sample 1 = Area D |
| 1 | | | | to 18 in. | sample 2 = lower slurry pond |
| 1 | | | | to 12 in. | sample 3 = Prep Plant loadout/screening area |
| 1 | | | | to 12 in. | sample 4 = river pump house |
| 1 | | | | to 35 in. | samples 5 thru 8 = Area A |
| 1 | | | | to 32 in. | samples 9 and 10 = Area H |
| 2 | pp. 39 – 43 | 1983 | Dwg F-178/F179 | to 6 in. | sample 1 WT =Area D |
| 2 | | | | to 6 in. | sample 2 WD = slurry |
| 2 | | | | to 12 ft. | samples 3, 4, 5 WS = south of clear water pond |
| 2 | | | | to 6 in. | sample 6 WD = slurry |
| 2 | | | | to 6 in. | samples 7, 8 WT = Area G |
| 2 | | | | to 6 in. | sample 10 WT = Area D |
| 2 | | | | to 6 in. | sample 11 WP = Area A |
| 2 | | | | to 6 in. | sample 12 WD = Area B |
| 3 | pp. 44 – 49 | 1989 | Dwg 4067-6-8B | to 15 cm (6 in.) | samples 1 -3 = combined topsoil piles 1, 2, & 3 |
| 3 | | | | to 120 cm (47 in.) | samples 1 -3 = Area B |
| 3 | | | | to 120 cm. (47 in.) | samples 4 -9 = loadout/screening area |
| 4 | pp. 50-56 | 1990 | Ex. A on p. 52 | to 13 ft. | samples 1, 2 = upper slurry pond |
| 5 | pp. 57 – 77 | 1994 | Dwg.G9-3510 | to 48 in. | sample B1 = Area A |
| 5 | | | | to 96 in. | samples CR 1 & 2 = coarse refuse |
| 5 | | | | to 96 in. | samples SP 1 - 6 = upper and lower slurry ponds |
| 5 | | | | to 96 in. | samples CS 1 &2 = upper coarse slurry pond |
| 5 | | | | to 48 in. | samples N 1 &2 = Area G |
| 6 | pp. 78 – 128 | 1995 | Dwg. G9-3511 | to water at 7 - 11 ft. | NEICO 1 - 4 = Area A |
| 6 | | | | to 10 ft. | NEICO 5 = Area C |
| 6 | | | | to 8 ft. | NEICO 6 = Area B |
| 6 | | | | to 7 ft. | NEICO 7 = Area D |
| 7 | p. 129 – 162 | 1996 | Dwg G9-3511 | to 10 ft. | NEICO 8 - 12 = Area E |
| 8 | p. 162 – 168 | 1997 | Figure 2.40-1 | 18 – 36 in. | Pits #3 - 5 = COVOL operations area |
| 8 | pp. 162-8 | 1997 | Figure 2.40-1 | 10 – 17 in. | Pits #1 - 2 = COVOL topsoil stockpile #4 |

| | | | | | |
|---|---|---|---|---|---|
| | | 1997 | G9-3511 | 3 to 7 ft. | Samples D1 - D6 = Area D |
| | | | | 2.5 to 10 ft. | 12 Samples = Area H |
| 9 | p. 271 – 279 | 1999 | Figure p. 273 | to 51 in. | 5 samples reclaimed Coal Storage Area |

**Findings:**

**R645-301-121.100,** Please update Surface ownership map Plate E9-3341A.

**R645-301-121.100**, The 2008 bond plans for soil salvage from Areas E, D, H, & I. This will not result in the best available soil in the permit area being utilized. Rather Areas B & C are the most preferable, followed by shallow soils in Area D and G. Compare borrow areas shown on Plates E9-3341 and E9-3511 and make adjustments to Plate E9-3341 to show Borrow Area B and reinstate Borrow Area B on p 4, Sec. 2.41. and make adjustments to the reclamation plan and bond, accordingly. (Area I is not shown on Map G9-3511 Potential Topsoil Borrow Areas.)

# OPERATION PLAN

## TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

**Analysis:**

**Topsoil Removal and Storage**

MRP Section 2.31 describes the salvage and storage of topsoil in stockpiles with slopes not exceeding 2h;1v, depth not exceeding five feet, and protected from erosion with vegetation and berms and protected from disturbance with signs on the piles and pile locations on facilities maps (Sec. 2.31 pp. 2 - 3).

Three topsoil stockpiles on the west side of the Price River were consolidated with stockpile #3 in 1998 and seeded with the mix shown on page 5, Section 2.31. The location of combined stockpile #3 and the two former stockpile locations are shown on Dwg. 4067-6-8B, each approximately 150ft. X 75 ft. (1/4 acre). (This combined topsoil stockpile is shown, but not labeled on map E9 3341.) The combined topsoil pile 1,2,3 was formed from Map Unit 35 (Gerst- Badland Complex) and shown as disturbed area west of the Price River on Dwg E9-3333.

The volume of soil in the combined stockpile 1 - 3 was surveyed as 2,445 cy (Sec. 2.31 p. 4 and App. F). During the mid-term inspection on April 16, 2012, the attendees commented on

the minimal vegetation established on the topsoil stockpile, the cemented surface of the stockpile and its principle surface protection by stones and cobbles. Gouges have been retained on the flat surface of the pile and grasses were noted growing in the gouges. Seeded species, predominantly *Atriplex canescens*) have established in the ditch beside the topsoil berm, indicating that water harvesting will be a key to establishing vegetation on the reclaimed site. No evidence of the following seeded species was found: *Linum lewisii*, *Melilotus officinalis*, or *Medicago sativa.* A few grasses were noted on the stockpile but their species was not definitely determined. The grasses *Elymus junceus*, *Agropyron cristatum*, *Elymus lanceolatus* and *Sitanion hystrix* were seeded.

Topsoil pile #4 is located along the Siaperis Ditch. It was created in 1991, when the coal cleaning plant was in operation and has an estimated volume of 2,490 yd3. (Sec. 2.31 and App. F). Sec. 2.40 states that COVOL's wash plant was located on an old test plot site where topsoil depths ranged from 3 – 10 inches over refuse. The site was sampled and soil and refuse was analyzed (8th Sampling Period, Sec. 2.22, pp. 162-168 and Sec. 2.40). High boron (12 – 14 ppm) in the soil limited recovery of topsoil to only 183 CY which was placed on top of the "north stockpile" in 1998. (North stockpile = topsoil pile 4, topsoil #4 is shown (but not labeled) on Dwg. E9-3341. Mulch was not likely applied.

The road access between stockpile #4 and the Siaparas ditch was surface roughened in the spring of 2011 to eliminate the need for silt fence maintenance (Task 3670). Some leftover seed (purchased for the Wellington Pumphouse reclamation in 2007) was scattered on the reclaimed road some time after roughening. The vegetation established on topsoil pile #4 or on the recently roughened access road was not evaluated during the mid-term inspection in 2012.

**Findings:**

**R645-301-121.100,** Please label the topsoil stockpiles and include them in the legend on Facilities Map E9-3341.

## SPOIL AND WASTE MATERIALS

Regulatory Reference: 30 CFR Sec. 701.5, 784.19, 784.25, 817.71, 817.72, 817.73, 817.74, 817.81, 817.83, 817.84, 817.87, 817.89; R645-100-200, -301-210, -301-211, -301-212, -301-412, -301-512, -301-513, -301-514, -301-521, -301-526, -301-528, -301-535, -301-536, -301-542, -301-553, -301-745, -301-746, -301-747.

**Analysis:**

**Coal Mine Waste**

Boron levels in the slurry and SAR values in the Coarse Refuse and Coarse slurry have been demonstrated to be at unsuitable levels and require four feet of cover in accordance with R645-301-553.260. Within the four foot root zone, the level of concern for SAR is greater than 14 for clay textured or greater than 20 for sandy textured soils. Unsuitable boron concentrations are greater than 5 ppm. The Division Guidelines for Topsoil and Overburden refers to the Joint Selenium Task Force Statement of Best Available Technology, 1994, and list as suitable, levels below 0.15 ppm Se as measured by water soluble selenium values. The Wyoming DEQ subsequently updated their selenium based on the 1996 position paper by the Subcommittee on Soils, Vegetation, Overburden, and Wildlife (SVOW). This Subcommittee recommends levels below 0.3 ppm in the surface four feet are suitable. Where higher levels (up to 0.8 ppm Se) are in the surface four feet, a vegetation monitoring program is required.

The fine slurry, coarse slurry and coarse refuse have been sampled over the years showing boron and SAR to be the main concerns, as discussed below. Coal mine waste sampling locations are shown on Dwg. G9-3510 and G9-3511 (and Dwg #4067-6-8B for 1989 samples).

- 1970's sample #2 near the lower coarse slurry dike was sampled to a depth of 18 in. in 6 in. increments and reportedly had SAR/EC values from 5.2 – 7.1, EC values near 1 mmhos/cm, and pH values between 7.8 and 8.4. There was no further acid/toxic information was analyzed.
- 1983 four locations were sampled to a depth of six inches in the slurry and coarse slurry:
  2WD: SAR = 22.5, EC= 19.9 $mmhoscm^{-1}$, pH = 8.3;
  6WD: SAR = 0.7, EC= 10.2 $mmhoscm^{-1}$, pH = 6.7
  8WT: SAR = 61.8, EC= 17 $mmhoscm^{-1}$, pH = 7.9;
  2WD: SAR = 59.5, EC= 75 $mmhoscm^{-1}$, pH = 8.5;
  No further acid/toxic information was analyzed.
- 1989 samples 4 – 9 were located on the west side of the Price River in the loadout/Screening area. Samples were taken from 6 to 12 inch depths down to 47 inches. All samples have unsuitable SAR, but samples taken from the center of the loadout location were sodic to the extreme. For example:
  Sample #7 A (0 – 15 cm or 6 in.), SAR = 59.9, EC = 10.4, pH 8.7, down the profile to Sample#7E (90 – 120 cm or 47 in.), SAR = 32.1, EC = 10.5, pH 8.2. No further acid/toxic information was analyzed.
- In 1999, the above referenced screening area was re-sampled after grading. Five composite samples taken to a depth of 51 in. revealed boron concentrations between 5.08 and 6.53 ppm. AB-DTPA selenium values were below the level of concern.
- 1990 samples #1 & #2 were taken from 0 – 6 in., 6 – 12 in., and 12 in. depth increments thereafter to the depth of the upper slurry pond, which was 13 ft. The analyses for the first foot of soil were as follows:
  Site #1: SAR = 7.12, EC = 6.4, pH 7.8, Boron = 8.9 ppm, AB-DTPA Se = 0.26

Site #2: SAR = 4.67, EC = 5.4, pH 7.6, Boron = 10.49 ppm, AB-DTPA Se = 0.25
SAR declined with depth to median values of 4 and 3. Boron values declined through the profile to 4 ppm at four ft. depth. AB-DTPA extracted Selenium was between 0.15 and 0.4 in the surface four feet.

- 1994 samples of the coarse refuse, coarse slurry, and slurry ponds showed the concentration of boron to be between 7 and 26.74 ppm in the surface foot at the six sample locations of slurry ponds. The boron concentration remains higher than the 5 ppm level of concern at a depth of four feet. The two sample locations of the coarse slurry and the two coarse refuse sample locations did not have this same high concentration of boron, but do have SAR values which would limit vegetation establishment. The AB-DTPA selenium indicates that selenium may be of concern at depth in the coarse slurry (a value of 0.52 at 4 ft in 1 of the 2 samples).
- Two 1994 sampling locations in Area G soils indicate that selenium values exceeding 0.3 were also noted in Area G native soil at the 4 ft depth and that there are pockets of native soils with high levels of SAR to be avoided during soil borrow activity (sample #1 SAR values were 22 on the surface and reached values over 70 at a depth of 4 ft. Whereas, the second native soil sample reflected SAR values from < 1 to 2 throughout the surface four feet.) (A soil description form, with an evaluation of the plant cover and species that established in the vicinity of sample #1 would have been useful.)
- 1997 sampling of the coarse refuse vegetation test plots prior to development of the COVOL flotation cell confirmed elevated boron concentrations in the coarse refuse (33 – 62 ppm) that contaminated the topsoil applied in either 6 inch or 12 inch depths to test plots. Testplot topsoil boron was reported as 12 - 14 ppm. (The topsoil was discarded and was not salvaged before COVOL began their operations. The coarse refuse had AB-DTPA selenium values of < 0.8 to 1.1 ppm.

In conclusion, the main concern for reclamation is high boron content in the coarse refuse, coarse slurry and fine slurry. Samples also indicate high SAR values in the coarse refuse and coarse slurry. Selenium, when analyzed by hot water extraction, does not appear to be a major concern in the slurry or refuse. The difference between the coarse refuse and slurry and the surrounding native soil is the texture. The refuse (fine and coarse) has a sandy texture and most surrounding soils are clay textured. The reclamation plan calls for irrigation of the slurry ponds to establish vegetation at final reclamation. It may be worthwhile to install a French drain at a depth of several feet and irrigate the slurry to flush the boron and sodium salts through the soil. If boron and SAR can be reduced, placement of lesser cover could be authorized.

Alternatively, the surrounding soils are shallow and several analyses indicate they area saline at depth. (Although none to the degree found in the coarse refuse or coarse slurry). So, there may be room to reduce cover on the slurry ponds to 2.5 feet if that soil is placed on top of a capillary barrier, such as a three inch layer of pea gravel over 12 in. layer of coarse cobble-size rock on top of 6 in. compacted clay over the slurry modeled after the following websites. see http://www.sandia.gov/Subsurface/factshts/ert/capbarr.pdf and

http://www.caee.utexas.edu/prof/zornberg/pdfs/CP/Williams_Hoyt_Dwyer_Hargreaves_Zornberg_2011.pdf

The capillary barrier would prevent upward mobility of the boron, selenium and sodium salts. The bond already describes placement and compaction of soil to create a capillary barrier, so this idea is not new. However a designed barrier could allow lesser borrow material to be used as surface cover. A geotechnical engineer should design the capillary barrier. The adjacent land is used as Neilson's gravel pit, so there is plenty of gravel and angular rock available...or NEICO could set up their own screening operation in one of the borrow soil locations.....

A third suggestion is to minimize the foot print of the slurry ponds by remining the fines or regrading the fines to reduce the area of storage.

**Findings:**

Boron levels in the slurry and SAR values in the Coarse Refuse and Coarse slurry have been demonstrated to be at unsuitable levels and require four feet of cover in accordance with R645-301-553.260. Bonding might be reduced by removing the slurry, or by irrigation of the slurry to move the boron down through the profile and by subsequently demonstrating values in the surface four feet for boron and SAR that are below levels of concern. Alternatively, the surrounding soils are shallow and several analyses indicate they area saline at depth. (Although none to the degree found in the coarse refuse or coarse slurry). So, there may be room to reduce cover on the slurry ponds to 2.5 feet if that soil is placed on top of a capillary barrier designed by a geotechnical engineer to prevent upward mobility of the boron, selenium and sodium salts. A third suggestion is to minimize the foot print of the slurry ponds by remining the fines or grading the fines to a smaller footprint.

# RECLAMATION PLAN

## TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR 817.22; R645-301-240.

**Analysis:**

Section 2.41 contains a detailed account of soil resources available for reclaiming the Wellington site. Soil borrow areas are mapped on Plates G9 3510, and G9 3511.

**Testplots**

A surface facility test plot location shown on F9-177 near main access road pond and spoil pile (rectangular in shape), described in Appendix A.

Another test plot is shown on Dwg. 4067-6-8A adjacent to the stoker coal storage area. This Test plot was triangular in shape. As-builts are in Appendix A.

A third test plot east of the Price River in vicinity of COVOL wash plant is shown fenced off in center of Dwg. F9-177 2 of 2. This plot was decommissioned in 1994 for construction of the COVOL facility. The information on the soil quality of the topsoil layer removed from the test plot is provided in (8th Sampling Period, Sec. 2.22, pp. 162 – 168 and Sec. 2.40). Sec. 2.40 refers to Table 2-8 which was difficult to find, because page numbers are not included in the table of contents.

One ton/ac straw mulch is a specified treatment for all topsoil stockpiles (Section 2.34 p. 1). Application of **two tons**/acre straw or hay mulch is a recommended management practice for soils in the permit area (see Section 2.22, p. 15). Section 3.41 states that **two tons of green alfalfa hay** will be chopped and blown on to each acre of prepared seedbed, incorporated by the seed drill. I have seen success on other reclaimed sites with the application of 2 tons/ac straw mulch, with 1 ton/ac incorporated into the surface and 1 ton/ac applied as a surface treatment and seeding Triticale (sterile rye) which acts as a standing mulch after the first year.

The application of a form of organic matter was a variable in test plots (Appendix A and Sec. 2.33, p. 2) and the results of the 1994 test plot evaluation is reported in Section 3.41.

**Redistribution**

Dwg. E9-3339, Soils Map and Disturbed Area, indicates 392 disturbed acres for entire site in 1983. Reclamation grading of the entire site is shown on Dwg. E9-3342, 1 of 2 and 2 of 2.
Grading of the coarse refuse is shown on Dwg. 536a. Dwg 4067-6-10A indicates the coarse refuse is 7.7 acres of disturbance. In sampling of the refuse, the slurry, and the graded coal storage area, unacceptable levels of boron and selenium in the slurry ponds (1990 and 1994 sampling periods 4 & 5) and in the graded coal stockpile yard (1999 sampling period 9), and unacceptable SAR values on the coarse refuse (1994 sampling period 5). In accordance with R645-301-553.252, the redistribution plan requires four feet of cover over the coarse refuse, the coarse slurry pond and the fine slurry pond. The redistribution plan is described in Section 2.41 including best and worst-case scenarios.

Section 2.41 states that about 4,000 yd3 of topsoil are stockpiled for reclamation. (The surveyed piles actually contain 4,935 yd3.). To cover the upper and lower refuse ponds with 4 ft

of cover will require 1,034,400 yd3 (p. 1, Sec 2.41). Section 2.41 states that under the best-case, the need for borrow can be reduced down to 539,300 yd3 by using the soil in the Clearwater pond and the lower Refuse Dike. According to the Division's calculations, see CALCULATION NOTES below, these dikes will provide 152,478 $yd^3$ of additional soil cover and the remainder of the reduction in cover was to come from complete removal of the coarse slurry by COVOL.

Cover Requirements are outlined in Section 2.41 are as follows:

- 44.6 acre main plant area will receive no topsoil.
- River pumphouse area will receive 6 inches of borrowed topsoil (3,000 yd3)...imported from borrow area G or the lower refuse dike.
- Coarse refuse pile will be graded to reduce the area by 7%. After grading will require 43,300 $yd^3$of Stormitt soil from borrow area H for 4 ft. cover.
- Worst-case scenario requires the Upper (81.2 acres) and Lower (71.5 acres) slurry ponds to be covered with 985,000 $yd^3$ total. The first two feet of cover is fine grained subsoil from Topsoil Borrow Area E (492,500 cu yd) followed by two ft of coarse-grained topsoil from Topsoil Borrow Areas D, G, and H as well as from both of the dikes. The difference in texture will help to provide a capillary barrier.
- Best-case scenario assumes mining of most of the Coarse slurry pile by COVOL, and in the remaining Coarse slurry would be graded over the top of the Upper Slurry Pond. Soils beneath the coarse slurry would be used as the first two feet of cover for the upper slurry pond. Uncovered subsoil in the 71.5 acre coarse slurry pile location would be used as the final reclamation surface, reducing the four foot cover requirement by 461,413 $yd^3$.
- Clearwater dike will be removed and suitable soil materials used for cover. Unsuitable material in outer layer of dike and pond bottom sediments will be removed to upper slurry pond and covered. There is a commitment in the plan that dike materials will be sampled on site during excavation for pH, EC, SAR, and texture to determine suitability.
- Lower refuse dike will be regraded to a 5:1 slope making 29,700 $yd^3$ material available. Two feet of surface will be removed for topsoil cover over slurry ponds.

Under the best-case scenario, the four foot cover requirement is reduced from 985,000 $yd^3$ down to 583,527 $yd^3$ over an area 81.2 acres due to remining (Sec. 2.41, p. 2). App. J, Bonding Item 2.06 outlines this approach, but the 2008 Bonding Earthwork Item 9 reflects the worst case scenario of placing 4 ft of cover over both upper and lower slurry ponds at a cost of $1,564,899.)

The Division notes that the Clearwater Dike and Lower Refuse Dike will provide 152,478 $yd^3$ of soil cover as calculated below, leaving 371,109 $yd^3$ of soil to be recovered from borrow areas. This equates to one foot from a 230 acre area or 2 ft. from a 115 acre area.

**CALCULATION NOTES:** Clearwater Dike construction is provided in E9-1764 showing a trapezoid with a 20 ft wide top, a 155 ft wide base, a height of 35 ft. Length of 1,200 ft is shown on Dwg D9-515. **The volume in the Clearwater Dike is therefore 3,315,000 $ft^3$ or 122,778 $yd^3$.**

The Lower Refuse Dike was originally planned as a trapezoid with a 20 ft wide top, a 140 ft wide base, a height of 30 ft. (Dwg. E9 1764 original (1957) detail). But, the As-Constructed Dwg. E9-3460 indicates the soil material within the dike is a trapezoid with a 20 ft wide top, a 75 ft wide base, a height of 15 ft. Dwg. D9-515 indicates the length of the dike is 1,500 ft. **Based upon the as-built drawing, the volume of the soil material in the dike is likely 1,218,750 $ft^3$ or 45,138 yd3. The reclamation does not indicate total removal of the dike, but reduction of the slope of the dike to 5h:1v which could provide the 29,700 yd3 volume, but would first require removal of the coarse refuse slurry which is shown covering the soil of the original dike on Map E9-3460 Lower Refuse Dike As Constructed.**

Dwg E9-1764 dated 1957 states that the dike is of sandy or silty loam texture and refers reader to Dames and Moore Report and Plate 7. Approximate ground level shown on Dwg. E9-3460 as 5,365 – 5,355 feet in the vicinity of the dike between lower refuse and clear water ponds.

**Proposed Topsoil Borrow Areas described in Section 2.41**

Borrow Area B was removed from the permit area based upon the sale of the land (Section 2.41 p. 4) however, this did not occur. Area B is no longer identified as a borrow area on Plate E9-3341 Surface Facilities Map. Area B has long held promise for the reclamation of NEICO, see "Future topsoil salvage and borrow areas" shown on archived map Dwg. E9-3339 (1983) Soils Map and Disturbed Area. Borrow areas shown on this archived map were just west of the main access road on the western edge of the permit area and a smaller area downstream of the coarse refuse pile. Future topsoil salvage was in the vicinity of the coarse refuse pile and on the north east side of the upper slurry pond.

Site operations have changed since the reclamation plan in Section 2.41was written. The potential for removal of coarse refuse should be re-evaluated, the soils of Borrow Area B should be included in the plan and the reclamation plan re-written.

**Findings:**

**R645-301-122.100,** The Table of Contents lists Tables 2-1 through 2-8, please provide page numbers for these tables in the Table of Contents.

**R645-301-122.100,** Site operations have changed since 1998, when Section 2.41 (reclamation plan) was written. Please re-evaluate the best-case scenario (removal of coarse refuse by remining) and the potential for using Borrow Area B soils (Dwg E9-3511) in reclamation.

**R645-301-122.100,** In addition to straw or hay mulch, the application of another form of organic matter was a variable in the 1991 test plot (Appendix A and Sec. 2.33, p. 2). The results of the 1994 test plot evaluation are reported in Section 3.41, but it is not clear what organic amendment was included as a variable. Please clarify.

**R645-301-122.100,** Section 3.41 p. 4a varies from the remainder of Section 3.41 and Section 2.41 with regard to the approach to seeding, surface roughening and mulch incorporation. Is ripping followed by green hay incorporation by drill seeding specific to a location within the permit area? If so, please specify on page 4a the area to receive the treatments described on page 4a.

**RECOMMENDATIONS:**

The main concern for reclamation is high boron content in the coarse refuse, coarse slurry and fine slurry. Samples also indicate high SAR values in the coarse refuse and coarse slurry. Selenium, when analyzed by hot water extraction, does not appear to be of concern in the slurry or refuse. The difference between the coarse refuse and slurry and the surrounding native soil is the texture. The refuse (fine and coarse) has a sandy texture. The reclamation plan calls for irrigation of the slurry ponds to establish vegetation at final reclamation. It may be worthwhile to install a French drain at a depth of several feet and irrigate the slurry to flush the Boron salts through the soil. If Boron could be reduced, placement of lesser cover could be authorized.

Alternatively, the surrounding soils are shallow and several analyses indicate they area saline at depth. (Although none to the degree found in the coarse refuse or coarse slurry). So, there may be room to reduce cover on the slurry ponds to 2.5 feet if that soil is placed on top of a capillary barrier (such as three inch layer of pea gravel over 12 in. layer of coarse cobble-size rock on top of 6 in. compacted clay) over the slurry. The capillary barrier should be designed by a geotechnical engineer to prevent upward mobility of the boron, selenium and sodium salts. A third suggestion is to minimize the foot print of the slurry ponds by remining the fines or grading the fines to a smaller footprint.

The reclamation plan should be re-evaluated as site conditions have changed. The best available soil in the permit area is in Areas B & C. These areas should be re-instated in the reclamation plan.

Surface ownership shown on Plate E9-3341A (dated 1993) requires updating of surface owners within and adjacent to the permit area, in accordance with R645-301-121.100 and R645-301-112.600.

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