

# ADDENDUM 304A

SPRING CREEK COAL COMPANY

SODIC OVERBURDEN TEST PLOT STUDY

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### TEST PLOT CONSTRUCTION

As you will recall, final construction of the test plots was to be completed in the summer of 1994. However, due to delays in placement of suitable spoils in the eight foot block, the test plots were constructed in the late summer/early fall of 1995. The Company gained approval to proceed with surficial material laydown (soil/spoil/scoria) in the four foot cover plots in a letter dated June 28, 1994. The eight foot block spoil analytical data submitted by the Company on August 31, 1994 was deemed unacceptable, thus requiring removal and replacement with suitable material. This was accomplished by identifying suitable material in the Central Bluffs, correspondence dated April 24, May 1, and June 6, 1995, which was transported to the eight foot test block location. Subsequent sampling of this material, in-place, provided analytical data for Departmental review on September 19th via a FAX transmission (data submitted December 15, 1995). On the same date, approval from Mr. Lynn Woomer by telephone was given to proceed with surficial material laydown in the eight foot cover plots. The four foot and eight foot cover plots were then constructed with the appropriate surficial materials (soil/spoil/scoria). Construction was in accordance with Figure 2 of Spring Creek's letter of June 7, 1994. Buffer strip modifications, 12 foot buffer strips between plots and 20 foot buffer strips between replicates and a 12 foot buffer strip on either side of the resoiled (direct haul) buffer strip between the four foot and eight foot blocks, were approved by Department letter of September 11, 1995. See the attached Sodic Overburden Test Site and Locations Map for the design layout (items 4 and 6).

### TEST PLOT DESIGN

The Test Plot Design incorporates two large rectangular blocks with three subcompartments, each containing six individual treatment areas. Each treatment is replicated three times. The western block contains eighteen 4 foot plots of suitable fill and the eastern block contains eighteen 8 foot plots of suitable fill. As a point of clarification, a plot with no soil has 4 feet of suitable fill, whereas, a plot with eighteen inches of soil would have 2.5 feet of suitable fill in conjunction with the soil depth. Soil applied to the treatment plots was previously stockpiled in A-27 and B-38 (item 7). Each block measures 230' x 576' with individual plots measuring 89' x 48'. The corners of each plot are marked with orange 5/8" x 4' rebar stakes. The buffer strips within replicates measure 12' wide, the perimeter buffer strip and buffer strips between replicates measure 20' wide. The buffer strips are regrade quality spoil from the Central Bluffs. The

resoiled (direct haul) buffer between the two blocks measures 90' x 210'. The addition of the NO SOIL treatments (item 2), in the opinion of the Company, will provide pertinent results with respects to shallow/shaley and thin breaks reclamation. The treatment was added as a control and six treatments per replicate area complements the sample layout. The sample design was not a complete random design. Concessions were made to practical considerations regarding surface treatments and seed drilling. Scoria depths are uniform within replicate areas. The important feature is each treatment was replicated three times thus allowing the application of standard statistical evaluation techniques for randomized block designs.

#### SPOIL/SOIL MONITORING

The attached Schedule A details the spoil/soil monitoring requirements as approved by the Department. Spring Creek Coal commits to adding percent coarse fragments to the suite of analytical parameters utilized for physicochemical characterization of spoil and soil material associated with the spoil/soil monitoring requirements of the test study (item 1).

#### VEGETATION

The Company agrees with the Department's assessment of Seed Mix B (sagebrush/grassland) as the preferred mix for the NO SOIL plots. This mix is the most similar to the native vegetation on shallow/shaley sites (item 3). The sodic overburden plots were originally planted on September 17, 1995 thus, representing a dormant fall planting strategy. The seed mixtures were described in the Company's submittal of December 15, 1995. All mixtures were drill seeded, including the scoria plots. However, NON 96-12-01 was issued as a result of operator failure to seed the appropriate seed mix in eighteen of the test plots (six approved for seeding with the Silver Sagebrush/Drainage Bottom mix and twelve approved for seeding with the Sagebrush/Grassland mix). The Department accepted remedial action (interseeding of cool-season grasses at the approved rate on the twelve Sagebrush/Grassland test plots and topsoil replacement and reseeding of the entire seed mix on the six Silver Sage/Drainage Bottom test plots) was implemented April 10 and 16, 1996 under the direction of Departmental staffer, Mr. Dave Clark. The test plot seed mixes are described below.

Mix A = Silver Sagebrush/Drainage Bottom. Application rate was 26.6 pounds PLS/acre.

Native Western Wheatgrass	15.1%
Critana Thickspike Wheatgrass	7.6%
Pryor Slender Wheatgrass	11.4%
Lodorm Green Needlegrass	7.6%
Trailhead Basin Wildrye	8.7%

Sodar Streambank Wheatgrass	11.5%
Durar Hard Fescue	4.2%
Forestburg Switchgrass.	8.8%
Sand Dropseed	2.0%
Appar Blue Flax	2.0%
Western White Yarrow	1.2%
Eski Sainfoin	1.3%
Yellow Prairie Coneflower	0.9%
Bandera Penstemon	0.8%
Silver Sage	2.5%
Winterfat	3.6%
Fourwing Saltbush	1.4%
Black Greasewood	0.9%
Gardner Saltbush	1.7%
Inert	6.5%

Mix B = Sagebrush Grassland. Application rate was 25.7 pounds PLS/acre.

Native Western Wheatgrass	9.9%
Critana Thickspike Wheatgrass	9.9%
Lodorm Green Needlegrass	9.9%
Nezpar Indian Ricegrass	6.6%
Durar Hard Fescue	9.1%
Needle-and-Thread	2.5%
Whitmar Bluebunch Wheatgrass	7.7%
Prairie Junegrass	1.5%
Native Blue Grama	5.8%
Dakotah Switchgrass	12.7%
Western White Yarrow	3.3%
Appar Blue Flax	3.3%
Yellow Prairie Coneflower	3.4%
Eski Sainfoin	2.3%
Winterfat	14.2%
Fourwing Saltbush	6.9%
Wyoming Big Sagebrush	7.2%
Gardner Saltbush	10.4%
Inert	30.4%

Mix C = sodic overburden shrub/forb/legume mixture. Application rate was 17.0 pounds PLS/acre.

Secar bluebunch wheatgrass	2.7%
Rosana western wheatgrass	1.6%
Barkoel prairie junegrass	0.6%
Wyoming big sagebrush	13.9%
Silver sagebrush	1.7%
Fourwing saltbush	1.6%
Winterfat	4.9%
Gardner saltbush	6.2%
Appar blue flax	1.3%
Western white yarrow	0.8%

Yellow prairie coneflower	0.8%
Eski sainfoin	7.0%
Inert	56.9%

## VEGETATION MONITORING

Vegetation monitoring will follow the attached Schedule B (item 5). Monitoring will utilize 20 meter long transects marked with permanent fenceposts of a color other than green. Transects will cross the seeded drill rows and the direction of topsoil application to the extent possible. The same plots will be sampled in the years shown for canopy coverage. The immediate vicinity of the treatment edges will not be sampled. Specific monitoring requirements are detailed below.

### Seedling Density

In this application, density is used as a measure of seedling establishment in the first year(s) after planting. One-square-foot quadrats will be used as they are standard for rangeland plantings. Eight samples will be taken along the permanent transect for a total of 24 samples per treatment (based on three replicates).

### Plant Canopy Coverage and Peak Standing Crop

In the years indicated on Schedule B, canopy coverage will be measured along 20 meter permanent transects in each treatment compartment shown on the enclosed map. Transects will cross drill rows and cover will be estimated by species in three or more 0.5 m<sup>2</sup> plots per transect. As a supplement, color photos of each transect will be taken at the time of the sampling.

Off transect, three random harvest plots of the same size will be clipped each sample year. Sample locations will be randomly located by constructing a grid using meter intervals in each compartment and randomly selecting coordinates. Records will be maintained to assure the same plots are not harvested in more than one year. Treatment edges will be avoided.

In summary, a total of at least nine cover and nine harvest plots per treatment (three per replicate) will be taken in each sample year. Sample size may be increased to achieve sample adequacy to facilitate reasonably powerful statistical comparisons. This depends on how uniform plant parameters are within treatments.

### Shrub Density

Shrub density will be determined by using the center of each permanent transect as the center of a 20 m<sup>2</sup> belt transect. In practice, this is done by running a 1 m long dowel along the

transect tape and counting all shrubs within one-half meter of the tape.

### Diversity

Diversity will be measured in three ways:

- 1) Species richness is the number of species per set of cover samples per treatment.
- 2) Species density is the average number of species per 0.5 m<sup>2</sup> sample plot.
- 3) The Shannon value, a measure of heterogeneity that compounds richness with evenness, will be calculated for each treatment using summary canopy coverage data for each treatment.

SPOIL/SOIL MONITORING REQUIREMENTS  
SODIC OVERBURDEN PLOT  
Schedule A

The Sodic Overburden Test Plot Study area was completed during the spring of 1996. The following spoil/soil monitoring and analysis is required:

1998

1999

- 2000
1. Collect and analyze cores as noted below in "NOTE 1".
  2. Collect and weigh all noticeable root abundance from spoil/soil intervals to evaluate rooting as a function of cover depth.

2001

2002

2003

2004

2005

2006

- 2007
1. Collect and analyze cores as noted below in "NOTE 1".
  2. Collect and weigh all noticeable root abundance from spoil/soil intervals to evaluate rooting as a function of cover depth. Determine bulk density and, using SCS method, rate root abundance.

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**NOTE 1:** Cores to 6" below interface of suitable and unsuitable materials. Two 6" samples followed by a 1' increment will be collected above the interface as follows:  
4 foot core samples to be taken at the following depths:  
0-1, 1-2, 2-3, 3-3 1/2, 3 1/2-4, and 6" spoil surface.  
  
8 foot core samples to be taken at the following depths:  
0-1, 1-2, 2-4, 4-6, 6-7, 7-7 1/2, 7 1/2-8, and 6" spoil surface.

Analyze cores for pH, EC, Saturation %, SAR, Coarse fragment % and Texture.

**NOTE 2:** Report all monitoring and analysis in Annual Mining Report.



~~REVEGETATION ANALYSIS REQUIREMENTS~~  
~~SODIC OVERBURDEN PLOTS~~  
~~Schedule B~~

The Sodic Overburden Test Plot Study area was completed during the spring of 1996. The following revegetation analysis is required:

- 1998 Density (seedling establishment)
- 1999 Density or cover
- 2000 Cover, diversity, peak standing crop and shrub density
- 2001
- 2002
- 2003 Cover, diversity, peak standing crop and shrub density
- 2004
- 2005
- 2006 Cover, diversity, peak standing crop and shrub density
- 2007 Cover, diversity, peak standing crop and shrub density
- 2008 Final Report

**Plant cover and production:** 20 meter transects with at least 3 0.5m<sup>2</sup> quadrats will be used for quantitative analysis (photos included).

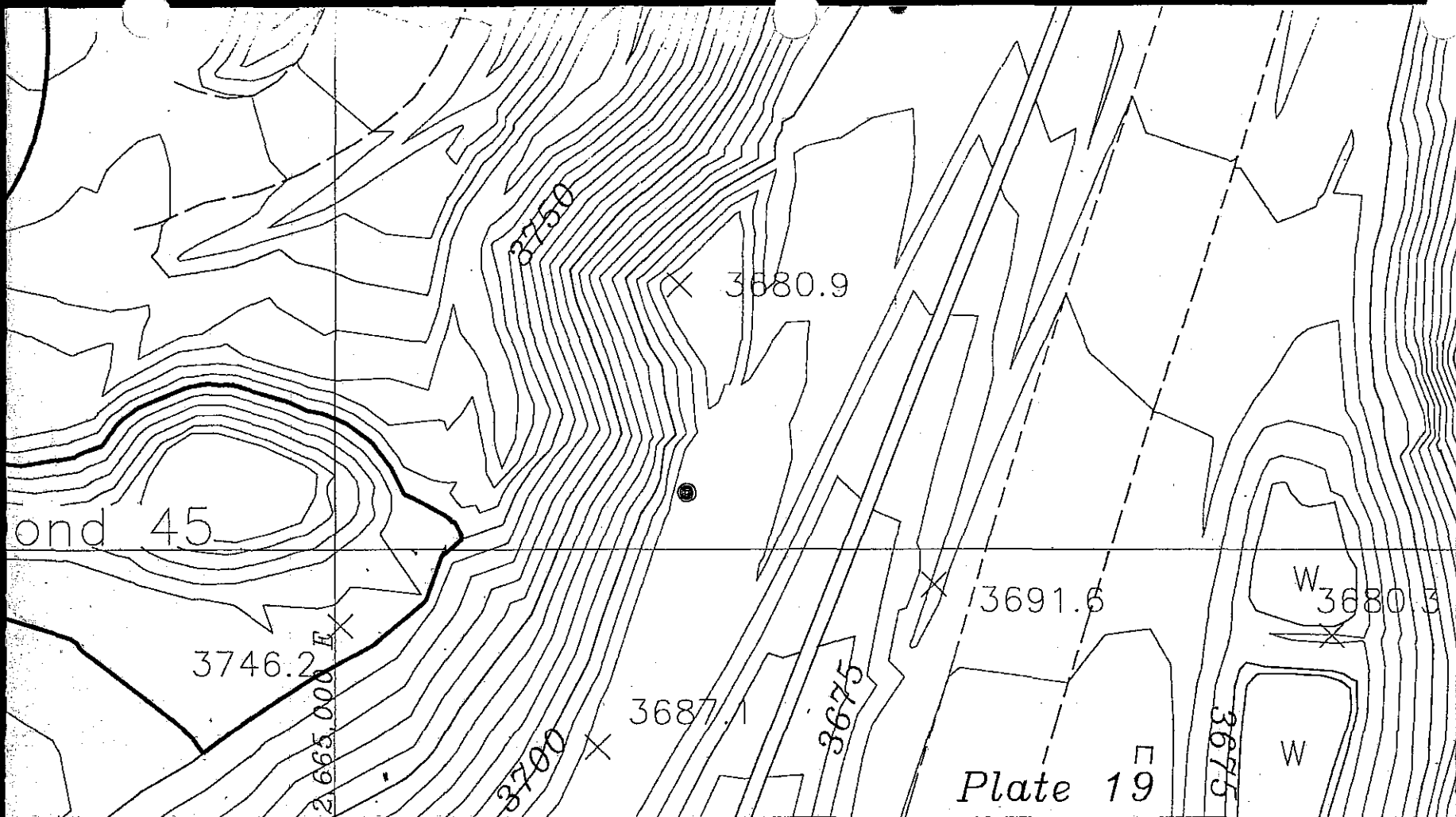
**Diversity:** will be evaluated using the Shannon index.

**Shrub density:** will be determined using 1 x 20m belt transects centered on the permanent cover transects.

**Seedling density:** will be measured in eight one-square foot quadrats per plot.

**NOTE:** Production and diversity data, as well as, density and cover data from both 4 foot and 8 foot plots will be collected.

Report all monitoring and analysis in Annual Mining Report.



DATE	REVISIONS
BY	

SPRING CREEK COAL COMPANY

SODIC OVERBURDEN TEST SITE  
AND SAMPLE LOCATIONS

*MR 8-12-16 Info Letter of 12-16-95*

DESIGN: AN      DRAWN: PJW      DATE: 12/4/95

SCALE: 1"=100'      FILE NUMBER: PC-9504-D

*map accompanies App 304 A*