Section 2.7.3.45 Wyoming State Lease 42804 (WSL04) Amendment Soils Report

This section and associated Soils Map and Data Table comprise the soils baseline data for the WY State Lease 42804 Amendment. The methodology and data presented conform to those specified in Section 2.7.2.

This State Lease includes lands as follows (also refer to the Amendment Boundary Map 1.7-1)

Amendment Areas	Legal	Total Acres
	SE4SW4, SW4SE4 Section 30 T57N R62W	80
Wyoming State Lease 42804	NE4, E2NW4, SW4, NW4SE4 Section 31T57N R62W	440
	W2NW4 Section 32 T57N R62W	80
		600

The soils information for this Amendment was prepared by Lyle King, PhD Soil Scientist (University of Wyoming, 2005), during late summer and fall of 2014 (fieldwork and write-up).

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Section 2.7.3.45 Wyoming State Lease 42804 (WSL04) Amendment Area Soil Report

This section and associated Soils Map and Addenda comprise the soils baseline study for the Wyoming State Lease 42804 Amendment Area, Permit 267C.

TABLE OF CONTENTS

ADDENDA

1.0 INTRODUCTION

1.1 Objectives

The objective of this soil inventory is to provide essential soil data for mine and reclamation planning. Specific tasks for the soil resource inventory are to:

1. Develop soil map units and delineate boundaries on appropriate aerial images.
2. Define soil physical and chemical characteristics.
3. Determine suitability and recommend soil salvage depths for each affected soil map unit.

1.2 Project Area

Bentonite Performance Mineral's Wyoming State Lease 42804 Amendment to Permit 267 (Project area) consists of approximately 600 acres located ten miles west of Colony in Crook County, Wyoming. It includes portions of sections 30, 31 and 32; T57N R62W (Soil Map 2.7.3.45-1).

The Project area is positioned on upland topography associated with the intersection of Black Hills uplift and rolling plains of southeastern Montana. It is characterized by rolling uplands and hills with areas of rough, eroded and broken terrain. Drainage is generally southwesterly to the Belle Fourche River. Geomorphology and soil development within the Project area has been influenced by tertiary deposits of inter-bedded, shale, sandstone and bentonite clay beds. Underlying formations are Lower Cretaceous shales and sandstones. Soils are influenced by dominant local geologic conditions, varying in chemical and physical properties accordingly.

Western Regional Climate Center summaries (1915 to 2005) from the Colony, WY (481905) reporting station (WRCC; http://www.wrcc.dri.edu/summary/climsmwy.html: accessed November 10, 2014) indicate an annual average of 15.07 inches precipitation with average total snowfall of 41.1 inches. Maximum temperatures average 75°F for the growing season months of April-September. The soil moisture regime is Ustic. The soil temperature regime is mesic.

Vegetation communities in the Project area are dominated by P\ponderosa pine (*Pinus ponderosa*) and several native perennial grass species. Elevations within the study area range from approximately 3,600 to 3,800 feet above sea level.

2.0 METHODS

2.1 Compilation of Available Information

Series descriptions and interpretive records for soils potentially occurring within the Project area were obtained from the Natural Resource Conservation Service (NRCS) Web Soil Survey for Crook County, Wyoming (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm). This information was also utilized to assist with soil identification, mapping, and interpretations in the field. Soils were identified based on field observations and laboratory results and, where possible, classified to soil series using NRCS web descriptions (Table 2.7.3.45.1).

2.2 Field Methods

Fieldwork was conducted by Lyle King in August, 2014. This survey approximates an order 2 level survey as defined in WY-LQD Guideline 1A, Page A-1. Soil map units were delineated on satellite imagery scaled at 1 inch to 400 feet. Typical profiles were described and sampled by soil horizon using hand-dug and hand-augered exposures. A total of 37 soil samples from 11 soil profiles were analyzed for topsoil suitability parameters by Inter-Mountain Laboratories, Inc. in Sheridan, Wyoming (Addendum 2.7.3.45.A, Table 2.7.3.45.A.1). Nine additional soil profiles were described but not sampled because they duplicated soil types sampled in the previous 11 profiles. Laboratory analytical parameters and methods follow those recommended by WYDEQ/LQD Guideline 1. Profile description summary tables are shown in Addendum 2.7.3.45.B. Representative photographs of affected soil map units are provided in Addendum 2.7.3.45.C. NRCS soil series descriptions are included in Addendum 2.7.3.45.D. Field profile description forms are included in Addendum 2.7.3.45.E. Sampled profile locations are illustrated on Soil Map 2.7.3.45-1 (Addendum 2.7.3.45.F).

Profiles were described on NRCS field pedon description forms (archived at the SVC Office in Shell, Wyoming) and are available upon request. Soil horizons were identified according to criteria in *Keys to Soil Taxonomy*, 12th Edition (Soil Survey Staff, 2014) and described according to *Field Book for Describing and Sampling Soils* (Schoeneberger et al, 2012). Generally, features documented for each horizon include depth, color, texture, structure, estimated clay content, boundary type, and response to 1 Normal hydrochloric acid (HCL) solution. Descriptions of clay films, coarse fragment content, carbonate and gypsum accumulations, and root quantity were provided when appropriate. Site features documented include Universal Transverse Mercator (UTM) coordinate location using North American Datum (NAD) 83, elevation, landscape/landform description, hillslope profile position, aspect, slope percent, slope complexity, slope shape, parent material, bedrock type, surface coarse fragments and dominant vegetation.

Data from previous soil surveys associated with the adjacent Jolley Edsall Update area were also reviewed to supplement new information from this survey. Several soil series are common to both areas.

3.0 SOIL CLASSIFICATION AND DESCRIPTION

3.1 Soil Classification

Soils were classified to the series level based on profile descriptions, field observations and laboratory results. Series names were assigned by best match to soils mapped in the vicinity by the NRCS or other established series. Soil classifications (Table 2.7.3.45.1) were taken from NRCS soil series descriptions at:
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/class/?cid=nrcs142p2_053587, and when necessary, supplemented with information from *Keys to Soil Taxonomy* (USDA, 2014).

3.2 Soil Map Unit and Soil Series Descriptions; Recommended Soil Salvage Depths and Profile Descriptions

Soil map unit designations are illustrated on Soil Map 2.7.3.45-1. Map unit designations are supplemented with numbers representing recommended salvage depths (topsoil/subsoil) in inches. Depths of suitable soil within the Project area are influenced by variable in-situ chemical natures of parent material and variable depths to parent material. Recommended topsoil/subsoil salvage depths range from zero to 60 inches based on WYDEQ/LQD Guideline #1 suitability ratings (Addendum 2.7.3.45.A, Table 2.7.3.45.A1). If soils are currently supporting native vegetation, but sufficient suitable material is not available for salvage, exceptions may be noted.

Profile descriptions for the Project area are provided in Addendum 2.7.3.45.B. Acreage for each soil map unit within the Amendment boundary and estimated topsoil/subsoil salvage volumes are presented in Table 2.7.3.45.3. Descriptions and characteristics of named soil series included with Addendum 2.7.3.45.D are taken from the NRCS soils web site at http://soils.usda.gov/technical/classification/osd/index.html.

Map Unit 1; Butche; 6"/6" or lithic contact; 14.2 sampled acres/0 affected acre.
Sampled Butche profile: SL-11
Butche soils have been previously described within BPM's Permit 267C with the Jolley Edsall Update/IBR (previous sample ID #9, pages 2.7.3.45.22-7 to 9 and 27, 28; LQD approved 2011). Butche soils dominate the small upland grassland (14.2 acres) in the west-central Project area. They are also a primary component in the Butche/Spangler Complex described below. Slopes are less than ten percent and aspects are southerly. Butche soils are very shallow and well drained. They weathered from non-calcareous sandstone and have lithic contact at 12 inches or less. Recommended salvage depths for this map unit are six inches and six inches (or lithic contact), respectively for topsoil and subsoil. Other than shallow lithic contact, no chemical or physical restrictions are noted.

Map Unit 1a; Butche/Spangler Complex; <30 slopes; 6"/6" or lithic contact; 39.7 sampled acres/19 affected acres.
This mapping complex occurs in two distinct units within the southern third of the Project area. It is comprised of Butche (50 percent), Spangler and Spangler taxadjunct (40 percent) and Louviers inclusions (ten percent). Very small inclusions of wetland soils (<one percent) also occur along downstream channels receiving flows and seepage from existing stock reservoirs.

Spangler soils form in upland residuum weathered from argillaceous, non-calcareous sandstone. They are moderately deep and well drained. Spangler taxadjunct soils within this unit are shallow but still have an argillic horizon at 3-11 inches. These soils are used for rangeland and wildlife habitat. Native vegetation is ponderosa pine forest and native grasslands.

Butche soils are previously described. Within this complex, Butche soils occupy steeper, broken topographies with gradients ranging up to 30 percent. They also support ponderosa pine forest and native grasslands.

Average recommended salvage depths for this map unit are six inches and six inches (or lithic contact), respectively for topsoil and subsoil. Other than shallow lithic contact, no other chemical or physical restrictions are noted.

Map Unit 2; Grummit; 6"/12" or acid shale contact if shallower; 110.8 sampled acres/40 affected acres. Sampled Grummit profile: SL-12; Non-sampled profiles: SL-4, SL-6

Grummit soils have been previously described within BPM's Permit 267C with the 2006 Update Areas Soils Report. Grummit soils are associated with upland benches and mixed toeslope colluvium/residuum across the Project area. They occupy 80 percent of this map unit with the remaining 20 percent being primarily Querc inclusions. Slopes range from zero to 20 percent with various topographic aspects. Grummit soils consist of very shallow, well drained soils formed in clayey residuum weathered from acid fissile shale parent material. Observed depths to paralithic contact ranged from 18 to 36 inches. Weathered fragments of shale make up over 50 percent of C horizon volume in some described profiles. Laboratory analysis indicated very strong acidity at depths greater than 18 inches. Silty clay textures make this soil material marginal for suitable salvage even at the surface. However, **in areas where this soil currently supports native vegetation**, it is recommended to salvage six inches of topsoil and 12 inches of subsoil material. If possible, these soils should be stockpiled separately from other salvaged topsoil to reduce contamination. Low pH and silty clay textures are factors limiting suitability of this material for reclamation salvage.

Map Unit 2a; Steep Grummit; 6"/0"or acid shale if shallower; 88.4 sampled acres/14 affected acres.

Grummit soils within this map unit are associated with steep hill-slope topographies with gradients greater than 20% limiting access for soil salvage. Recommended salvage depths only extend to six inches for suitable topsoil and no suitable material for subsoil salvage.

Map Unit 3; Louviers; 3-6"/6" or paralithic contact if shallower; 12.7 sampled acres/0 affected acre. Sampled Louviers profiles: SL-7. Non-sampled profiles: SL-15, SL-19

Louviers soils have been previously described within BPM's Permit 267C with the Jolley Edsall Update/IBR (previous sample ID's 1, 2, 4, 6, & 8, pages 2.7.3.45.22-13-16 & 25-28; LQD approved 2011). Louviers soils are mapped within two distinct units in the northwest and southeast of the Project area. They also occur as transitional inclusions within map units 1a and OC, associated with adjacent bentonite and shale outcrops.

Louviers soils are shallow and well drained, forming in thin parent material weathered from non-calcareous shale. Slopes are less than ten percent. These soils are used principally as rangeland. Native vegetation is dominated by green needlegrass (*Nassella viridula)*, prairie junegrass (*Koeleria macrantha*), western wheatgrass (*Elymus smithii*) and Wyoming big sagebrush (*Artemisia tridentata*).

Laboratory analyses indicate these soils are usable as plant growth medium to 12 inches, although high clay content (60%) makes them marginal for salvage. No other restrictions were noted. Therefore, recommended topsoil and subsoil salvage depths are six inches and six inches, respectively.

Map Unit 5; Querc; <15% slopes with 10-20% Grummit inclusions; 168.0 sampled acres/67 affected acres. Salvage Depths, 6"/18". Sampled Querc profiles: SL-3, SL-10, SL-20. Non-sampled profiles: SL-5, SL-14, SL-16

Querc soils have been previously described within BPM's Permit 267C with the Jolley Edsall Update/IBR (previous sample ID #5, pages 2.7.3.45.22-18-19 & 25-26; LQD approved 2011). This map unit is extensive on low hills, ridge slopes and upland terraces in this Project area. Slopes are less than 15 percent. Grummit (15 percent) and Louviers/Outcrop (10 percent) inclusions also occur.

Querc soils form in residuum weathered from acid fissile shale. They are deep and well drained with depths to the base of the argillic horizon ranging from 10 to 22 inches and depths to bedded shale ranging from ten to 40 inches. They are used for rangeland and wildlife habitat. Dominate perennial grasses are green needlegrass, prairie junegrass, and Kentucky bluegrass (*Poa pratensis*). Scattered ponderosa pine and scrub oak also occur.

Laboratory analyses indicate these soils are suitable for salvage as plant growth medium to 24 inches, although high clay content can reduce suitability to a marginal status in some profiles. Acid conditions of the fissile shale parent material limit salvage below 24 inches. No other restrictions were noted. Recommended topsoil and subsoil salvage depths are 6 inches and18 inches, respectively.

Map Unit 5a; Querc; >15% slopes with 20-30% Grummit inclusions; 52.6 sampled acres/5 affected acres. Salvage Depths, 6"/18".

Querc soils within this map unit are associated with steep toe-slope topographies with gradients greater than 15 percent. Grummit inclusions range from 20-30 percent. Recommended salvage depths are the same as map unit 5.

Map Unit 6; Recluse; Salvage Depths, 6"/54"; 14 sampled acres/14 affected acres. Sampled Recluse profile: SL-13

This map unit occurs on upland benches in the central and southern portion of the Project area. Recluse soils are very deep, well trained and moderately permeable. Mollic epipedons are approximately six inches thick. Characteristically, it is 24 inches to continuous calcium carbonate accumulation and the base of the argillic horizon. Slopes are less than ten percent with variable aspects. Recluse soils are used for rangeland and wildlife habitat. Dominant perennial grasses are green needlegrass, prairie junegrass, and Kentucky bluegrass. Scattered individuals of ponderosa pine also occur. These soils have no physical or chemical restrictions in the upper 60 inches. Recommended topsoil and subsoil salvage depths are six and 54 inches, respectively.

Map Unit 7; Spangler taxadjunct; 6"/6" or lithic contact if deeper; 7.8 sampled acres/4 affected acres. Sampled Spangler taxadjunct profile: SL-9

This is a small, distinct map unit dominating an upland bench and small meadow in the southwest of the Project area. However Spangler taxadjunct soils are also co-dominant in the larger Butche/Spangler Complex (Map unit 1a) and in both Ravine Complexes (RC1 and RC2), all of which are also located in the southwest Project area. These soils are considered taxadjunct because of their shallow depth (approximately one foot) to sandstone bedrock.

Spangler soils are moderately deep and well drained. They formed in upland residuum weathered from fine grained, non-calcareous sandstone. Slopes are various, up to 20 percent. Aspects are also various. These lands are dominated by native perennial grasses with occasional ponderosa pine. They are primarily used for domestic livestock grazing and wildlife habitat. These soils have no physical or chemical restrictions above paralithic or lithic contact with sandstone. Recommended topsoil and subsoil salvage depths are six inches and six inches (or lithic/paralithic contact), respectively

Map Unit 8; Broadhurst taxadjunct; 6"/18" or paralithic contact if shallower; 8.7 sampled acres/0 affected acre. Sampled Broadhurst profile: SL-1
This map unit delineates a small colluvial fan and terrace deposition area along the east-central Project area. Broadhurst soils are very deep, well drained soils formed in clayey material derived from acid shales. They are considered taxadjunct in the Project area because they have less than 60 percent clay in the control section. These soils have very slow permeability. Slopes are less than 3 percent. The C horizon has common nests of gypsum and other salts. These soils are used primarily for rangeland and wildlife habitat. Native vegetation is prairie junegrass, green needlegrass, Kentucky bluegrass, scattered ponderosa pine and Wyoming big sagebrush. These soils are strongly acid below 24 inches. Recommended topsoil and subsoil salvage depths are six inches and 18 inches, respectively.

Map Unit 8a; Wetland Soils; 0"/0"; 4.1 sampled acres/1 affected acre. Sampled profile: SL-2
This map unit delineates inundated areas of unclassified soils associated with the drainages and impoundment area near the center of the Project area. These are wetland soils with mottling and orange staining common at two inch depth and gleying occurring at eight inches. Slopes are less than two percent. This profile has a two inch organic layer on the surface. Strong acid conditions extend to the surface and there is no suitable soil available for salvage.

Map Unit 9; Unnamed Argiustol; 6"/30"; 10. 1 sampled acres/0 affected acre. Sampled Argiustol profile: SL-18
This map unit occurs within the upland meadow occupying the southwest border of the Project area. Slopes are gentle (less than three percent) and aspects are southerly. These soils have a high clay content with a calcic layer at 12-22 inches. They formed in upland residuum from argillaceous shale parent material and are dominated by native perennial grasses and intermittent Wyoming big sagebrush. They are primarily used for domestic livestock grazing and wildlife habitat. These soils have no physical or chemical restrictions above paralithic contact with clay/shale parent material at 36 inches, although suitability becomes marginal at 12 inches due to high saturation percentages and high clay content. Recommended topsoil and subsoil salvage depths are six inches and 30 inches, respectively.

Map Unit RL; Previously Reclaimed AML Lands; Salvage Depths; 0"/0"; 6.6 sampled acres/1 affected acre.
This map unit delineates bentonite mine lands previously reclaimed by Wyoming's Abandoned Mine Land (AML) program. This area consists of recontoured and seeded

bentonite spoil but does not appear to have reapplied topsoil. It has no material suitable for soil salvage.

Map Unit RC1; Steep Ravine Complex; 40-50% slopes; Salvage Depths Variable; 37.6 sampled acres/6 affected acres.
This map unit delineates a distinct ravine area cross-cutting near the center of the Project area. It is characterized by deep, steep-sided ravines dominated by a complex of Butche (60 percent); sandstone rock outcrops (15 percent), Spangler taxadjunct (15 percent), Louviers/Outcrop (10 percent). Very small inclusions of wetland soils (less than one percent) also occur along downstream channels receiving flows and seepage from existing stock reservoirs. Salvage depths will follow those of the component soil types if affected.

Map Unit RC2; Steep Ravine Complex; 40-50% slopes; Salvage Depths Variable; 11.6 sampled acres/0 affected acre.
This map unit delineates a distinct ravine area in the southwest of the Project area. It is characterized by deep, steep-sided ravines dominated by a complex of Grummit (70 percent); Querc (20 percent); Butche, Spangler taxadjunct and sandstone rock outcrops (ten percent). Salvage depths will follow those of the component soil types if affected.

Map Unit OC; Barren Clay and Bentonite Outcrops; <5% slopes; Salvage Depths 0"/0"; 0.8 sampled acres/0.7 affected acre.
This map unit was delineated in two small areas with shale and clay surface outcrops near the west-center of the Project area. It has no salvageable soil materials. This map unit also occurs in the mapping complex noted below.

Map Unit 3/OC; Louviers/Barren Clay Outcrop Complex; <10% slopes; Salvage Depths Variable (according to composition); 11.3 sampled acres/5 affected acres.
This map unit is comprised of surface outcrops of barren shale and clay with adjacent Louviers transitional areas. Aspects and slopes are variable. Soil salvage will follow those previously recommended for each component soil type.

Map Unit W; Open Water; Salvage Depths 0"/0"; 3.6 sampled acres (4 separate pond areas)/0.3 affected acre.
This map unit designates areas of open water associated with four small stock-watering reservoirs. Soil salvage would require prior draining of these reservoirs and was not assessed.

Table 2.7.3.45.1. Soil Series; Profiles Described and Sampled*; Taxonomic Classifications. *Indicates profile was sampled for laboratory analyses. [$]Indicates profile is within proposed affected area. [$$]Indicates profile is within 800 feet of proposed affected area.

Soil Series	Described/Sampled Representative Profiles	Family Classification
Butche	SL-11*[$$]	Loamy, mixed, superactive, nonacid, mesic Aridic Lithic Ustorthents
Grummit	SL-4[$$], SL-6, SL-12*[$]	Clayey, smectitic, acid, mesic, shallow Aridic Ustorthents
Louviers	SL-7*[$$]; SL-15[$$], SL-19[$]	Clayey, mixed, superactive, nonacid, mesic, shallow Ustic Torriorthents
Querc	SL-3*[$], SL-5, SL-10*[$$],SL-14[$], SL-16[$$], SL-20*[$]	Fine, smectitic, mesic Aridic Argiustolls
Reclaimed Land	SL-17[$$]	Not assessed
Recluse	SL-13*[$]	Fine-loamy, mixed, superactive, mesic Aridic Argiustolls
Spangler taxadjunct	SL-9*[$]	Fine-loamy, mixed, superactive, mesic Ustic Haplargids
Broadhurst taxadjunct	SL-1*[$$]	Very-fine, smectitic, acid, mesic Torrertic Ustorthents
wetland soils	SL-2*[$$]	not assessed, O horizon 0-2" depth
Unnamed Argiustol	SL-18*[$$]	mesic Ustic Torriorthents

Table 2.7.3.45.2. Soil Map Unit Descriptions; Recommended Salvage Depths

Map Unit	Description	Topsoil Salvage (inches)	Subsoil Salvage (inches)
1	**Butche**	6	6
1a	**Butche/Spangler Complex; <30% slopes; 10% Louviers**	6	6 or lithic contact
2	**Grummit; <20% slopes; 20% Querc inclusions**	6	12 or acid shale contact
2a	**Steep Grummit; >20% slopes; 10% RO inclusions**	6	0
3	**Louviers; <10% slopes; 10% OC inclusions**	3-6	6 or paralithic contact
5	**Querc; <15% slopes; 10-20% Grummit inclusions**	6	18
5a	**Querc; >15% slopes; 20-30% Grummit inclusions**	6	18
6	**Recluse**	6	54
7	**Spangler taxadjunct**	6	6 or lithic contact
8	**Broadhurst taxadjunct**	6	18 or paralithic contact
8a	**wetland Soils**	0	0
9	**Unnamed Argiustol**	6	30
RL	**Reclaimed Land**	0	0
RC1	**Ravine Complex 1**	variable	variable
RC2	**Ravine Complex 2**	variable	variable
OC	**Barren clay/shale Outcrops**	0	0
3/OC	**Louviers/Barren Outcrops**	variable	variable
W	**Open water**	0	0

Table 2.7.3.45.3. Soil Map Units Sampled Acreage, Projected Affected Acreage, and Proposed Salvage Volumes Within the State Lease #4 Amendment Area.

Soil Map Unit	Acres Sampled	Proposed Affected Acres	Topsoil Salvage Volume (yd^3)	Subsoil Salvage Volume (yd^3)
1, Butche	14.2	0	0	0
1a, Butche/Spangler Complex	39.7	19	15,327	15,327
2, Grummit	110.8	40	32,267	64,533
2a, Steep Grummit	88.4	14	11,293	0
3, Louviers	12.7	0	0	0
5, Querc <15% slopes	168.0	67	54,047	162,140
5a, Querc >15% slopes	52.6	5	4,033	12,100
6, Recluse	14.4	14	11,293	101,640
7, Spangler taxadjunct	4.8	4	3,227	3,227
8, Broadhurst taxadjunct	8.7	0	0	0
8a, wetland soils	4.1	1	0	0
9, Unnamed Argiustol	10.1	0	0	0
RL, Reclaimed Land	6.6	1	0	0
RC1, Ravine Complex 1	37.6	6	4,840	4,840
RC2, Ravine Complex 2	11.6	0	0	0
OC, Barren clay/shale Outcrops	0.8	0.7	0	0
3/OC, Louviers/Barren Outcrops	11.3	5	0	0
Open water	3.6	0.3	0	0
GRAND TOTALS	**600.0**	177	136,327	363,807

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Addendum 2.7.3.45.A

Laboratory Results

Table D7.A1. Topsoil Laboratory Analysis: BPM; Wyoming State Lease 42804 Amendment to Wyoming Mining Permit 267C

Sample Number/Soil Series/Map Unit	Depth Interval (inches)	pH	Sat. (%)	EC dS/m	O.M. (%)	CO3 (%)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	SAR	Sand (%)	Silt (%)	Clay (%)	Text	B ppm	Se ppm
SL1/Broadhurst/MU8	0-4	5.8	64.8	0.24	4.6	0.9	0.52	0.60	0.50	0.67	22.5	47.5	30.0	CL	0.28	<0.02
	4-8	5.5	68.2	0.14	3.0	0.8	0.35	0.34	0.40	0.68	15.0	46.3	38.8	SiCL	0.25	<0.02
	8-18	5.6	59.8	0.13	2.2	1.0	0.22	0.29	0.61	1.22	16.3	41.3	42.5	SiC	0.33	<0.02
	15-24	5.5	78.5	0.24	1.8	1.2	0.62	2.41	1.08	0.88	20.0	32.5	47.5	C	0.79	<0.02
	24-36	4.2	68.7	2.62	0.8	0.9	24.9	14.8	3.43	0.77	35.0	25.0	40.0	C	0.74	<0.02
	36-60	3.9	64.5	3.22	0.5	0.2	22.7	22.9	6.53	1.37	47.5	18.8	33.8	SCL	0.74	<0.02
SL2/Wetland Soil/MU8a	0-8	4.4	82.3	2.95	5.9	1.0	18.1	11.7	14.0	3.62	10.0	32.5	57.5	SiC	1.79	0.02
	8-18	4.5	80.9	4.38	1.1	0.9	11.5	24.0	35.8	8.49	12.5	17.5	70.0	C	2.41	<0.02
SL3/Querc/MU5	0-7	5.2	83.9	0.26	5.5	1.0	0.82	0.53	0.36	0.44	20.0	42.5	37.5	CL	0.34	<0.02
	7-14	5.5	68.3	0.13	4.1	1.3	0.55	0.34	0.22	0.33	22.5	35.0	42.5	C	0.21	<0.02
	14-24	5.7	70.2	0.10	1.7	1.0	0.36	0.25	0.26	0.47	25.0	31.3	43.8	C	0.24	<0.02
	24-40	4.6	80.1	0.19	0.7	0.9	0.70	0.44	0.46	0.61	22.5	28.8	48.8	C	0.44	<0.02
	0-3	8.2	72.5	1.03	2.5	2.3	1.31	0.85	9.55	9.20	7.5	32.5	60.0	C	0.95	<0.02
	3-12	7.8	79.9	3.56	2.0	2.2	15.6	9.09	27.3	7.77	7.5	32.5	60.0	C	0.96	0.02
SL9/Spangler taxadjunct/RC1 inclusion	0-3	5.7	46.2	0.30	4.0	0.5	0.49	0.38	1.67	2.53	60.0	25.0	15.0	SL	0.37	<0.02
	3-11	5.6	76.5	0.37	3.1	1.6	0.85	1.04	2.37	2.44	22.5	32.5	45.0	C	0.92	<0.02
SL10/Querc/MU5	0-4	6.1	75.6	0.25	7.2	2.2	0.76	0.33	0.39	0.52	25.0	31.3	43.8	C	0.43	<0.02
	4-12	6.1	91.8	0.17	3.7	2.6	0.61	0.24	0.47	0.72	25.0	27.5	47.5	C	0.58	<0.02
SL11/Butche/MU1	0-4	6.0	56.2	0.25	4.8	0.8	1.01	0.58	0.31	0.35	45.0	30.0	25.0	L	0.38	<0.02
	4-11	5.8	63.1	0.26	3.4	1.0	1.21	0.50	0.19	0.21	47.5	20.0	32.5	SCL	0.37	<0.02
SL12/Grummit/MU2a	0-4	5.9	83.4	0.20	8.2	1.8	1.10	0.58	0.13	0.14	12.5	43.8	43.8	SiC	0.36	<0.02
	4-10	5.9	75.6	0.16	4.5	1.7	0.67	0.42	0.08	0.11	7.5	40.0	52.5	SiC	0.34	<0.02
	10-18	5.7	66.4	0.14	3.0	1.7	0.42	0.34	0.19	0.31	7.5	40.0	52.5	SiC	0.32	<0.02
	18-36	4.4	78.6	0.19	1.6	0.8	0.36	0.53	0.56	0.83	15.0	28.8	56.3	SiC	0.48	<0.02

Sample Number/Soil Series/Map Unit	Depth Interval (inches)	pH	Sat. (%)	EC dS/m	O.M. (%)	CO3 (%)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	SAR	Sand (%)	Silt (%)	Clay (%)	Text	B ppm	Se ppm
SL13/Recluse/MU6	0-6	5.6	59.8	0.17	4.4	1.0	0.79	0.50	0.12	0.15	37.5	37.5	25.0	L	0.30	<0.02
	6-12	5.8	58.7	0.19	2.3	1.4	0.90	0.65	0.13	0.15	32.5	27.5	40.0	**C**	0.31	<0.02
	12-24	6.3	58.0	0.19	0.8	1.2	0.82	0.66	0.21	0.24	32.5	32.5	35.0	CL	0.36	<0.02
	24-42	8.0	53.9	0.34	0.3	9.4	1.32	1.71	0.39	0.31	32.5	37.5	30.0	CL	0.38	<0.02
	42-60	8.4	50.8	0.40	3.2	7.3	0.98	2.04	1.36	1.10	27.5	41.3	31.3	CL	0.75	<0.02
SL18/unnamed Argiustol/MU9	0-6	5.8	56.8	0.14	2.8	0.6	0.08	0.06	0.78	2.91	40.0	36.3	23.8	L	0.26	<0.02
	6-12	6.7	81.4	0.38	4.7	2.1	1.79	3.77	2.90	1.74	30.0	23.8	46.3	**C**	1.09	<0.02
	12-22	7.6	**95.0**	4.82	2.1	5.6	20.6	14.8	24.9	5.91	22.5	27.5	50.0	**C**	2.34	<0.02
	22-36	7.2	**88.2**	4.92	2.3	2.0	22.4	15.8	32.2	7.36	15.0	35.0	50.0	**C**	2.08	<0.02
SL20/Querc/MU5	0-3	6.2	54.2	0.61	3.9	0.7	0.63	0.82	2.29	2.69	35.0	43.8	21.3	L	0.67	<0.02
	3-7	6.5	49.6	0.65	1.9	1.0	0.74	1.02	3.39	3.61	42.5	33.8	23.8	L	0.76	<0.02
	7-14	7.4	70.2	5.53	1.8	1.4	17.2	45.5	30.3	5.42	20.0	16.3	63.8	**C**	4.54	<0.02
	14-34	6.5	74.6	6.73	1.0	0.8	14.0	81.1	43.2	6.27	30.0	30.0	40.0	**C**	***5.55***	<0.02

***Unsuitable parameters are listed in large, bold, italic font. Marginal parameters are listed in small bold font.**

Inter-Mountain Labs

Your Environmental Monitoring Partner

1673 Terra Avenue, Sheridan, Wyoming 82801 ph: (307) 672-8945

Soil Analysis Report
Bentonite Performance Minerals
554 U.S. HWY 212
Belle Fourche, SD 57717

Report ID: S1408494001

Project: State Lease #4 Amendment Area
Date Received: 8/27/2014

Date Reported: 10/1/2014
Work Order: S1408494

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	CO3 %	PE Calcium meq/L	PE Magnesium meq/L	PE Sodium meq/L	SAR
S1408494-001	SL 1	0-4	5.8	64.8	0.24	4.6	0.9	0.52	0.60	0.50	0.67
S1408494-002	SL 1	4-8	5.5	68.2	0.14	3.0	0.8	0.35	0.34	0.40	0.68
S1408494-003	SL 1	8-15	5.6	59.8	0.13	2.2	1.0	0.22	0.29	0.61	1.22
S1408494-004	SL 1	15-24	5.5	78.5	0.24	1.8	1.2	0.62	2.41	1.08	0.88
S1408494-005	SL 1	24-36	4.2	68.7	2.62	0.8	0.9	24.9	14.8	3.43	0.77
S1408494-006	SL 1	36-60	3.9	64.5	3.22	0.5	0.2	22.7	22.9	6.53	1.37
S1408494-007	SL 2	0-8	4.4	82.3	2.95	5.9	1.0	18.1	11.7	14.0	3.62
S1408494-008	SL 2	8-18	4.5	80.9	4.38	1.1	0.9	11.5	24.0	35.8	8.49
S1408494-009	SL 3	0-7	5.2	83.9	0.26	5.5	1.0	0.82	0.53	0.36	0.44
S1408494-010	SL 3	7-14	5.5	68.3	0.13	4.1	1.3	0.55	0.34	0.22	0.33
S1408494-011	SL 3	14-24	5.7	70.2	0.10	1.7	1.0	0.36	0.25	0.26	0.47
S1408494-012	SL 3	24-40	4.6	80.1	0.19	0.7	0.9	0.70	0.44	0.46	0.61
S1408494-013	SL 7	0-3	8.2	72.5	1.03	2.5	2.3	1.31	0.85	9.55	9.20
S1408494-014	SL 7	3-12	7.8	79.9	3.56	2.0	2.2	15.6	9.09	27.3	7.77
S1408494-015	SL 9	0-3	5.7	46.2	0.30	4.0	0.5	0.49	0.38	1.67	2.53
S1408494-016	SL 9	3-11	5.6	76.5	0.37	3.1	1.6	0.85	1.04	2.37	2.44
S1408494-017	SL 10	0-4	6.1	75.6	0.25	7.2	2.2	0.76	0.33	0.39	0.52
S1408494-018	SL 10	4-12	6.1	91.8	0.17	3.7	2.6	0.61	0.24	0.47	0.72
S1408494-019	SL 11	0-4	6.0	56.2	0.25	4.8	0.8	1.01	0.58	0.31	0.35
S1408494-020	SL 11	4-11	5.8	63.1	0.26	3.4	1.0	1.21	0.50	0.19	0.21

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

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Soil Analysis Report

Bentonite Performance Minerals
554 U.S. HWY 212
Belle Fourche, SD 57717

Report ID: S1408494001

Project: State Lease #4 Amendment Area
Date Received: 8/27/2014

Date Reported: 10/1/2014
Work Order: S1408494

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	CO3 %	PE Calcium meq/L	PE Magnesium meq/L	PE Sodium meq/L	SAR
S1408494-021	SL 12	0-4	5.9	83.4	0.20	8.2	1.8	1.10	0.58	0.13	0.14
S1408494-022	SL 12	4-10	5.9	75.6	0.16	4.5	1.7	0.67	0.42	0.08	0.11
S1408494-023	SL 12	10-18	5.7	66.4	0.14	3.0	1.7	0.42	0.34	0.19	0.31
S1408494-024	SL 12	18-36	4.4	78.6	0.19	1.6	0.8	0.36	0.53	0.56	0.83
S1408494-025	SL 13	0-6	5.6	59.8	0.17	4.4	1.0	0.79	0.50	0.12	0.15
S1408494-026	SL 13	6-12	5.8	58.7	0.19	2.3	1.4	0.90	0.65	0.13	0.15
S1408494-027	SL 13	12-24	6.3	58.0	0.19	0.8	1.2	0.82	0.66	0.21	0.24
S1408494-028	SL 13	24-42	8.0	53.9	0.34	0.3	9.4	1.32	1.71	0.39	0.31
S1408494-029	SL 13	42-60	8.4	50.8	0.40	3.2	7.3	0.98	2.04	1.36	1.10
S1408494-030	SL 18	0-6	5.8	56.8	0.14	2.8	0.6	0.08	0.06	0.78	2.91
S1408494-031	SL 18	6-12	6.7	81.4	0.38	4.7	2.1	1.79	3.77	2.90	1.74
S1408494-032	SL 18	12-22	7.6	95.0	4.82	2.1	5.6	20.6	14.8	24.9	5.91
S1408494-033	SL 18	22-36	7.2	88.2	4.92	2.3	2.0	22.4	15.8	32.2	7.36
S1408494-034	SL 20	0-3	6.2	54.2	0.61	3.9	0.7	0.63	0.82	2.29	2.69
S1408494-035	SL 20	3-7	6.5	49.6	0.65	1.9	1.0	0.74	1.02	3.39	3.61
S1408494-036	SL 20	7-14	7.4	70.2	5.53	1.8	1.4	17.2	45.5	30.3	5.42
S1408494-037	SL 20	14-34	6.5	74.6	6.73	1.0	0.8	14.0	81.1	43.2	6.27

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

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Soil Analysis Report

Bentonite Performance Minerals
554 U.S. HWY 212
Belle Fourche, SD 57717

Report ID: S1408494001
Date Reported: 10/1/2014
Work Order: S1408494

Project: State Lease #4 Amendment Area
Date Received: 8/27/2014

Lab ID	Sample ID	Depths Inches	Sand %	Silt %	Clay %	Texture	Boron ppm	Selenium ppm
S1408494-001	SL 1	0-4	22.5	47.5	30.0	Clay Loam	0.28	<0.02
S1408494-002	SL 1	4-8	15.0	46.3	38.8	Silty Clay Loam	0.25	<0.02
S1408494-003	SL 1	8-15	16.3	41.3	42.5	Silty Clay	0.33	<0.02
S1408494-004	SL 1	15-24	20.0	32.5	47.5	Clay	0.79	<0.02
S1408494-005	SL 1	24-36	35.0	25.0	40.0	Clay	0.74	<0.02
S1408494-006	SL 1	36-60	47.5	18.8	33.8	Sandy Clay Loam	0.74	<0.02
S1408494-007	SL 2	0-8	10.0	32.5	57.5	Silty Clay	1.79	0.02
S1408494-008	SL 2	8-18	12.5	17.5	70.0	Clay	2.41	<0.02
S1408494-009	SL 3	0-7	20.0	42.5	37.5	Clay Loam	0.34	<0.02
S1408494-010	SL 3	7-14	22.5	35.0	42.5	Clay	0.21	<0.02
S1408494-011	SL 3	14-24	25.0	31.3	43.8	Clay	0.24	<0.02
S1408494-012	SL 3	24-40	22.5	28.8	48.8	Clay	0.44	<0.02
S1408494-013	SL 7	0-3	7.5	32.5	60.0	Clay	0.95	<0.02
S1408494-014	SL 7	3-12	7.5	32.5	60.0	Clay	0.96	0.02
S1408494-015	SL 9	0-3	60.0	25.0	15.0	Sandy Loam	0.37	<0.02
S1408494-016	SL 9	3-11	22.5	32.5	45.0	Clay	0.92	<0.02
S1408494-017	SL 10	0-4	25.0	31.3	43.8	Clay	0.43	<0.02
S1408494-018	SL 10	4-12	25.0	27.5	47.5	Clay	0.58	<0.02
S1408494-019	SL 11	0-4	45.0	30.0	25.0	Loam	0.38	<0.02
S1408494-020	SL 11	4-11	47.5	20.0	32.5	Sandy Clay Loam	0.37	<0.02

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

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Soil Analysis Report

Bentonite Performance Minerals
554 U.S. HWY 212
Belle Fourche, SD 57717

Report ID: S1408494001

Project: State Lease #4 Amendment Area
Date Received: 8/27/2014

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Lab ID	Sample ID	Depths Inches	Sand %	Silt %	Clay %	Texture	Boron ppm	Selenium ppm
S1408494-021	SL 12	0-4	12.5	43.8	43.8	Silty Clay	0.36	<0.02
S1408494-022	SL 12	4-10	7.5	40.0	52.5	Silty Clay	0.34	<0.02
S1408494-023	SL 12	10-18	7.5	40.0	52.5	Silty Clay	0.32	<0.02
S1408494-024	SL 12	18-36	15.0	28.8	56.3	Silty Clay	0.48	<0.02
S1408494-025	SL 13	0-6	37.5	37.5	25.0	Loam	0.30	<0.02
S1408494-026	SL 13	6-12	32.5	27.5	40.0	Clay	0.31	<0.02
S1408494-027	SL 13	12-24	32.5	32.5	35.0	Clay Loam	0.36	<0.02
S1408494-028	SL 13	24-42	32.5	37.5	30.0	Clay Loam	0.38	<0.02
S1408494-029	SL 13	42-60	27.5	41.3	31.3	Clay Loam	0.75	<0.02
S1408494-030	SL 18	0-6	40.0	36.3	23.8	Loam	0.26	<0.02
S1408494-031	SL 18	6-12	30.0	23.8	46.3	Clay	1.09	<0.02
S1408494-032	SL 18	12-22	22.5	27.5	50.0	Clay	2.34	<0.02
S1408494-033	SL 18	22-36	15.0	35.0	50.0	Clay	2.08	<0.02
S1408494-034	SL 20	0-3	35.0	43.8	21.3	Loam	0.67	<0.02
S1408494-035	SL 20	3-7	42.5	33.8	23.8	Loam	0.76	<0.02
S1408494-036	SL 20	7-14	20.0	16.3	63.8	Clay	4.54	<0.02
S1408494-037	SL 20	14-34	30.0	30.0	40.0	Clay	5.55	<0.02

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H20Sol= water soluble,AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
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Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor

Addendum 2.7.3.45.B

Profile Descriptions

Profile BPM SL-1; Broadhurst; map unit 8; 13T 0552767E, 4970962N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-4	CL		2.5Y 4/3 3/2	gr	Fm f/m	NR
SP	Bw	4-8	SiCL		2.5Y 4/3 3/2	1, f, sbk	M f/m	NR
SP	C1	8-15	SIC		2.5Y 5/2 4/3	1, f, sbk	M f/m	NR
Auger below 30"	C2	15-36	C		--- 2.5Y 4/3	massive	Common To 28 "	NR
Auger below 30"	C3	36-60	SCL		--- 2.5Y 4/3	massive	---	NR

Profile BPM SL-2; Wetland Soils; map unit 8a; 13T 0552795E, 4970878N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	O	0-2	SiC	---	--- 10YR 3/2	fibrous	Vm f	NR
SP	A	2-8	SiC	---	--- 7.5YR 3/2	1, f, sbk	Vm f	NR
SP	C	8-18+	C	---	Gleying G2 5/5B	massive	---	NR

Profile BPM SL-3; Querc; map unit 5; 13T 0552419E, 4971091N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A1	0-2	L	---	10YR 4/4 3/2	gr	Vm f	NR
SP	A2	2-7	CL	1%	10YR 4/4 3/2	gr	Vm f	NR
SP	Bt	7-14	C	3%	10YR 4/2 2/2	2, f/m, sbk	M f/m	NR
SP	C1	14-24	C	10%	10YR 4/2 3/3	massive	C f/m	NR
Auger	C2	24-40	---	---	---	---	---	NR
Auger	Cr	40+	CLAY / SHALE			---	---	---

Profile BPM SL-4; Grummit; map unit 2; 13T 0552217E, 4971406N

Obs. Method	Horizon	Depth (in)	Text.	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
Road cut bank	A	0-5	L	5%, shale-chips	10YR 5/2 3/2	gr	Vm f	NR
Road cut bank	C1	5-10	CL	5%, shale-chips	10YR 4/2 4/2	massive	M f	NR
Road cut bank	C2	10-18	CL	10%, shale-chips	10YR 4/4 4/2	massive	F f	NR
cut bank	R	18+	Brittle Shale				---	NR

Profile BPM SL-5; Querc; map unit 5; 13T 0552782E, 4971477N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-6	L	---	10YR 4/4 3/2	gr	Vm, f	NR
SP	Bt	6-13	L	3% shale chips	10YR 4/4 3/2	2, f, sbk	M, f/m	NR
SP	C1	13-24	L	5%	10YR 4/2 2/2	massive	F, f	NR
A	C2	24-48	---	---	---	---	---	---
A	Cr	48+	Soft Clay Shale		NOT SAMPLED		---	---

Profile BPM SL-6; Grummit; map unit 2a; 13T 0552614E, 4971436N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-5	L	---	10YR 3/2 2/2	gr	M, f/m	NR
SP	C1	5-15	CL	1%	10YR 5/2 4/2	massive	M, f/m	NR
A	C2	15-36	CL	3%	10YR 4/4 4/3	massive	C, m/c	NR
A	Cr	36+	CL	---	---	platy	---	NR

Profile BPM SL-7; Louviers; map unit 3; 13T 0551547E, 4971764N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-3	C	1%	2.5Y 3/2 3/2	2, f, sbk	C, f	NR
SP	C	3-12	C	massive	2.5Y 3/2 3/2	massive	F, f	NR
SP	Cr	12-15+	Soft Clay/Shale			massive	---	NR

Profile BPM SL-8; Louviers over bentonite OC, inclusion in map unit 5; 13T 0552049E, 4971122N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-2	CLAY	5% mixed ss/sh channers	2.5Y 5/2 4/2	2, f, sbk	---	NR
SP	Cr	2-10+	CLAY	Bentonite bed			---	NR

Profile BPM SL-9; Spangler taxadjunct (shallow); map unit RC1; 13T 0551838E, 4971192N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-3	SL	1% ss channers	10YR 5/2 3/2	gr	M f	NR
SP	Bt	3-11	C	1% ss channers	10YR 3/3 2/2	3 m/c col. breaking to 2,m,sbk	C m/c	VSL
SP	R	11+	Hard Sandstone			---	---	---

Profile BPM SL-10; Querc; map unit 5; 13T 0551676E, 4971147N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-4	2	5% shale chips	10YR 2/1 2/1	gr	Vm f	NR
SP	Bt	4-12	C	50% shale chips	10YR 2/1 2/1	3, f/m, sbk	Vm f/m	NR
SP	Cr	Soft Fissile Shale 10YR 2/1					Vm f/m	NR

Profile BPM SL-11; Butche; map unit 1; 13T 0551657E, 4971039N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-4	L	1% ss channers	10YR 4/4 3/2	gr	M f	NR
SP	Bw	4-11	SCL	5% ss channers	--- 10YR 3/2	1, f, sbk	Vm f/m	NR
SP	R	11+	---	---	---	---	f	NR

Profile BPM SL-12; Grummit; map unit 2a; 13T 0552594E, 4970855N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-4	L	3%, shale channers	10YR 4/2 3/2	gr	M f	NR
SP	Bw	4-10	CL	30% shale channers	10YR 3/2 2/2	1, f, sbk	M f/m	NR
SP	C1	10-18	C	50% shale channers	10YR 4/3 3/3	massive	C m/c	NR
A	C2	18-36	--	50%, shale channers	---	massive	---	---
A	Cr	36+	Soft gray shale			---	---	---

Profile BPM SL-13; Recluse; map unit 6; 13T 0551993E, 4970872N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-6	SL	<1	10YR 4/4 3/2	gr	---	NR
SP	Bt1	6-12	CL	<1	10YR 4/3 3/4	2 f/m sbk	---	NR
SP	Bt2	12-24	CL	<1	10YR 4/3 3/4	3 m abk	---	NR
A	Bk1	24-42	CL	3	10YR 5/2 4/2	1 m sbk	---	V
A	Bk2	42-60+	CL	3	10YR 6/2 4/2	massive	---	V

Profile BPM SL-14; Querc; map unit 5; 13T 0551730E, 4970580N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
-See previous querc 0-4 A 2 f sbk + gr NR; 4-12 Bt 3 m sbk NR; 12-24 C – auger massive NR; 24+ Cr								

Profile BPM SL-15; Louviers; map unit 3/OC; 13T 0552312E, 4970599N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-2	C	3 siltstone shale	2.5Y 6/2 4/2	1 f sbk	f f	NR
SP	C	2-8	C	15% Platy shale	--- 2.5Y 3/2	massive	f f	NR
SP	Cr	8+	Soft Platy Shale		--- 2.5Y 2/1	---	---	NR

Profile BPM SL-16; Querc, map unit 5; 13T 0552183E, 4970490N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-4	See previous querc; same as SL-15					NR
SP	AB	4-7						NR
A	Bt	7-15						NR
A	C	15+						NR

Profile BPM SL-17; Reclaimed Lands, map unit RL; 13T 0551851E, 4970004N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	E	0-2	C	---	2.5Y 7/1 5/2	1 f gr	---	NR
SP	C	2+	Replaced Clay Overburden			massive Not Sampled	---	NR

Profile BPM SL-18; Unnamed Argiustol; map unit 9 13T 0551411E, 4969962N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-6	SL	<1	10YR 5/3 3/3	gr	M f	NR
SP	Bt	6-12	CL	<1	10YR 3/2 3/1	3, c, col. Breaks to 3, c, ABK Hard	F m	NR
SP	Bk	12-22	C	<1	--- 10YR 3/2	1, m, col	F m	ST with masses V
A	Cy	22-36	C	---	--- 10YR 3/2	massive	---	NR
A	Cr	36+	Soft Sandy Clay Shale			---	---	---

Profile BPM SL-19; Louviers inclusion; map unit 1a; 13T 0551769E, 4970278N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
Very shallow (2-3”) over clay Cr								

Profile BPM SL-20; Querc; map unit 5; 13T 0551631E, 4970416N

Obs. Method	Horizon	Depth (in)	Texture	Rock Fragments (%)	Color Dry- Moist	Structure	Roots	Reaction to 1 N HCl
SP	A	0-3	SCL	<1	10YR 5/3 3/3	gr	Vm f/m	NR
SP	Bt	3-7	SCL	<1	10YR ¾ 3/2	3 m abk	C m	NR
SP	Cy	7-14	Clay	3 shale chips	10YR 4/2 3/2	---	F f/m	NR
A	C	14-34+	Soft Clay Shale			---	---	NR

Addendum 2.7.3.45.C

Representative Profile and Map Unit Photographs

Figure 2.7.3.C1. Map Unit 1/Butche Series, Profile SL-11.

Figure 2.7.3.C2. Map Unit 1/Butche Series, Profile SL-11. General Aspect

Figure 2.7.3.C3. Map Unit 1a, Butche/Spangler Complex. General Aspect.

Figure 2.7.3.C4. Map Unit 2/Grummit Series, Profile SL-4.

Figure 2.7.3.C5. Map Unit 2/Grummit Series, Profile SL-4. General Aspect.

Figure 2.7.3.C6. Map Unit 2a/Steep Grummit Series, General Aspect.

Figure 2.7.3.C7. Map Unit 3/Louviers, Profile SL-7.

Figure 2.7.3.C8. Map Unit 3/Louviers, Profile SL-7. General Aspect

Figure 2.7.3.C9. Map Unit 5/Querc, Profile SL-3.

Figure 2.7.3.C10. Map Unit 5/Querc. Profile SL-3. General Aspect.

Figure 2.7.3.C11. Map Unit 6/Recluse, Profile SL-13.

Figure 2.7.3.C12. Map Unit 6/Recluse. Profile SL-3. General Aspect.

Figure 2.7.3.C13. Map Unit 7/Spangler taxadjunct, Profile SL-9.

Figure 2.7.3.C14. Map Unit 7/Spangler taxadjunct. Profile SL-9. General Aspect.

Figure 2.7.3.C15. Map unit 8/Broadhurst, Profile SL-1.

Figure 2.7.3.C16. Map Unit 8a/Wetland Soils, Profile SL-2.

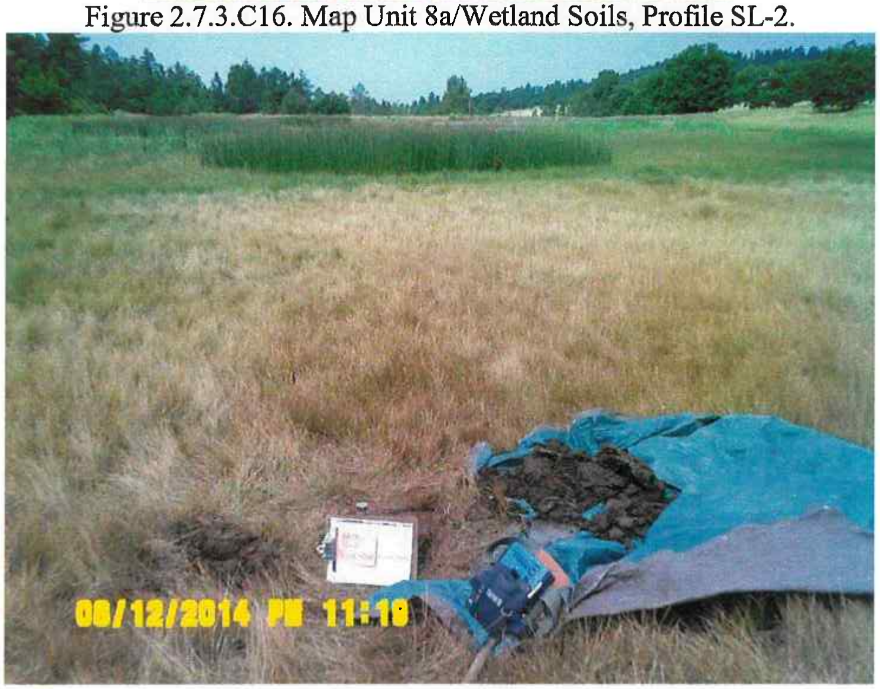

Figure 2.7.3.C17. Map unit 8a/Wetland Soils, Profile SL-2; General Aspect.

Figure 2.7.3.C18. Map Unit 9/Unnamed Argiustol, Profile SL-18.

Figure 2.7.3.C19. Map unit 9/Unnamed Argiustol, Profile SL-18. General Aspect.

Figure 2.7.3.C20. RL Map unit/Reclaimed Land, Profile SL-17.

Figure 2.7.3.C21. RL Map unit/Reclaimed Land, Profile SL-17. General Aspect.

Figure 2.7.3.C22. Map Unit RC1, Ravine Complex 1. General Aspect.

Figure 2.7.3.C23. Map Unit RC2, Ravine Complex 2. General Aspect.

Figure 2.7.3.C24. Louviers/Bare Outcrop Complex; General Aspect.

Addendum 2.7.3.45D

NRCS Soil Series Descriptions

BROADHURST SERIES

The Broadhurst series consists of very deep, well drained soils formed in clayey material derived from acid shales on colluvial fans and terraces. These soils have very slow permeability. Slopes range from 0 to 15 percent. Mean annual precipitation is about 15 inches, and mean annual air temperature is about 47 degrees F.

TAXONOMIC CLASS: Very-fine, smectitic, acid, mesic Torrertic Ustorthents

TYPICAL PEDON: Broadhurst clay - in native grass. When described the soil was dry below 20 inches. (Colors are for dry soil unless otherwise stated.)

A--0 to 3 inches; light brownish gray (10YR 6/2) clay, very dark grayish brown (10YR 3/2) moist; weak thick platy structure; very hard, very firm, sticky and plastic; few roots; moderately acid; abrupt smooth boundary. (1 to 4 inches thick)

AC--3 to 16 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse blocky and subangular blocky structure; very hard, very firm, sticky and plastic; few roots; very strongly acid; gradual smooth boundary. (8 to 15 inches thick)

C--16 to 41 inches; grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) clay; dark grayish brown (10YR 4/2) moist; massive; extremely hard, very firm, sticky and plastic; very strongly acid; clear smooth boundary.

Cz--41 to 60 inches; light brownish gray (10YR 6/2) clay, very dark grayish brown (10YR 3/2) crushing to dark grayish brown (10YR 4/2) moist; massive; hard, very firm, sticky and plastic; common fine fragments of shale; common fine nests of gypsum and other salts; very strongly acid.

TYPE LOCATION: Butte County, South Dakota; about 7 miles north and 7 miles west of Belle Fourche; 1400 feet west and 1880 feet north of the southeast corner of sec. 4, T. 9 N., R. 1 E.

RANGE IN CHARACTERISTICS: Colors throughout the soil are largely inherited from the parent rock. The control section averages between 60 and 70 percent clay. The soil has an Ustic moisture regime that borders on Aridic. Consistence is hard to extremely hard when dry and very firm when moist. When the soil is dry, cracks 1/2 to 1 inch wide and several feet long extend downward for 20 inches or more. The soil typically is very strongly acid but ranges from extremely acid to moderately acid.

A and AC horizons have hue of 10YR or 2.5Y, value of 5 or 6 and 3 or 4 moist, and chroma of 1 or 2.

The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 or 6 and 3 or 4 moist; and chroma of 1 or 2. Few or common partially weathered very fine fragments of shale are in the C horizon in most pedons. Nests of gypsum and other salts are few or common in the lower part of the C horizon.

COMPETING SERIES: There are no other series in the family.

GEOGRAPHIC SETTING: Broadhurst soils are on colluvial fans and terraces. Slope gradients range from 0 to 15 percent. These soils formed in clayey material derived from acid shales. Mean annual air temperature ranges from 43 to 48 degrees F, and mean annual precipitation ranges from 15 to 18 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Demar, Graner, and Grummit soils. Demar soils have argillic horizons and are on similar positions as the Broadhurst soils. Graner soils are friable throughout and are on adjacent undulating to rolling uplands. Grummit soils have shale within depths of 20 inches and are on steeper parts of the landscape.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is medium to very high depending on slope. Permeability is very slow except after dry periods when the initial intake in cracks is rapid.

USE AND VEGETATION: Used primarily for rangeland. Native vegetation is western wheatgrass, green needlegrass, Montana wheatgrass, forbs, and shrubs.

DISTRIBUTION AND EXTENT: Western South Dakota. The series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Butte County, South Dakota, 1970.

REMARKS: Diagnostic horizons and features recognized in this pedon: ochric epipedon - the zone from the surface of the soil to a depth of 13 inches (A and AC horizons). The soil has an Ustic moisture regime that borders on Aridic. It will be reclassified to the Torrertic subgroup when it is approved.

BUTCHE SERIES

The Butche series consists of shallow, well drained to excessively drained soils formed in loamy materials weathered from sandstone. Permeability is moderate or moderately rapid. Slopes range from 1 to 60 percent. Mean annual precipitation is about 17 inches, and mean annual temperature is about 46 degrees F.

TAXONOMIC CLASS: Loamy, mixed, superactive, nonacid, mesic Aridic Lithic Ustorthents

TYPICAL PEDON: Butche cobbly loam - on a west-facing convex slope of 25 percent under native grass. When described the soil was moist to 10 inches. (Colors are for dry soil unless otherwise stated.)

A--0 to 4 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; coarse fragments make up about 20 percent by volume; neutral; clear wavy boundary. (2 to 5 inches thick)

C--4 to 10 inches; pale brown (10YR 6/3) cobbly loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable; coarse fragments make up about 30 percent by volume; neutral; abrupt wavy boundary.

R--10 to 60 inches; very pale brown (10YR 7/4) indurated sandstone; neutral.

TYPE LOCATION: Custer County, South Dakota; about 3 miles west and 7 miles north of Buffalo Gap; 835 feet north and 1000 feet west of the southeast corner of sec. 23, T. 5 S., R. 6 E., on south side of trail.

RANGE IN CHARACTERISTICS: The soil ahs an Ustic moisture regime that borders on Aridic. Depth to sandstone ranges from 7 to 20 inches. Coarse fragments ranging in size from channery sandstone fragments up to massive slabs of sandstone about 3 feet in diameter are on the surface and mixed throughout the A and C horizons. Some pedons also have rounded cobble and stones of igneous and metamorphic rocks unrelated to the underlying sedimentary sandstone. The coarse fragments and flagstones make up 10 to 35 percent by volume of the soil mass. The control section typically is loam averaging between 15 and 25 percent clay and more than 15 percent fine sand or coarser.

The A horizon has hue of 10YR or 7.5YR, value of 4 to 6 and 2 to 4 moist, and chroma of 1.5 to 3 dry or moist. Where the color value is as dark or darker than 5.5 and 3.5 moist, the A horizon is too thin for a mollic epipedon. The A horizon is cobbly loam, cobbly fine sandy loam, stony loam, stony fine sandy loam, channery loam, loam, sandy loam, or fine sandy loam. It is slightly acid or neutral.

The C horizon typically has 10YR hue, but some pedons have hue of 7.5YR or 5YR due to variations in color of the underlying sandstone, value of 5 to 7 and 4 to 6 moist, and chroma of 2 to 6. The C horizon is cobbly loam, channery loam, stony loam, stony fine sandy loam, channery fine sandy loam, loam, sandy loam and fine sandy loam. It ranges from slightly acid to slightly alkaline. In some pedons there is an incipient cambic horizon 1 to 2 inches thick that is intermediate in color between the A and C horizon and has more pronounced structure than the C horizon. It is not continuous and is irregular in its shape and occurrence.

The R horizon is very hard sandstone and is hard and difficult to penetrate. It lacks free carbonates.

COMPETING SERIES: These are the Moret soils. Moret soils formed in a slate-like shale.

GEOGRAPHIC SETTING: Butche soils are sloping to very steep on uplands with gradients ranging from 1 to 60 percent. The Butche soils are formed in loamy materials weathered from non-calcareous sandstone. The mean annual temperature ranges from 45 to 49 degrees F, and mean annual precipitation from 13 to 18 inches. Elevations range from 3000 to 5500 feet.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Boneek, Canyon, Lakoa, Nevee and Spearfish soils. Boneek soils are on high terraces above the Butche soils and have fine argillic horizons. Canyon and Spearfish are on similar landscapes. They have carbonates and paralithic beds within depths of 20 inches. Lakoa soils are on north-facing wooded slopes and are deep soils with argillic horizons. Nevee soils are formed in deep calcareous alluvium and are on fans and terraces below the Butche soils.

DRAINAGE AND PERMEABILITY: Well drained to excessively drained. Surface runoff is low to high depending on slope. Permeability is moderate or moderately rapid.

USE AND VEGETATION: Used almost entirely for grazing. Native grasses include little bluestem, sideoats grama, western wheatgrass, needleandthread, and sedges. Short, limby ponderosa pine, growing singly or in clumps, are scattered throughout the landscape.

DISTRIBUTION AND EXTENT: Western South Dakota and eastern Wyoming in the foothills of the Black Hills. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Butte County, South Dakota, 1970.

REMARKS: Diagnostic horizons and features recognized in this pedon are: ochric epipedon - the zone from the surface of the soil to a depth of about 5 inches (A horizon). The soil has an Ustic moisture regime that borders on Aridic. It will be reclassified to the Aridic Lithic supbgroup when it is approved.

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GRUMMIT SERIES

The Grummit series consists of shallow, well drained soils formed in clayey residuum from acid shale on uplands. Permeability is moderate or moderately slow. Slopes range from 2 to 60 percent. Mean annual precipitation is about 15 inches, and mean annual temperature is about 46 degrees F.

TAXONOMIC CLASS: Clayey, smectitic, acid, mesic, shallow Aridic Ustorthents

TYPICAL PEDON: Grummit clay - on a convex slope of 5 percent in native grass. When described, the soil was moist to bedded shale. (Colors are for dry soil unless otherwise stated)

A--0 to 3 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; loose, friable; many fine roots; many very fine fragments of shale; very strongly acid; clear smooth boundary. (2 to 6 inches thick)

C1--3 to 7 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; hard, friable; many fine roots; 25 percent very fine fragments of shale; extremely acid; gradual wavy boundary.

C2--7 to 17 inches; grayish brown (10YR 5/2) and gray (2.5Y 5/1) clay, dark grayish brown (10YR 4/2) and dark gray (2.5Y 4/1) moist; common distinct mottles of yellowish brown (l0YR 5/6); weak coarse subangular blocky structure; hard, friable; partially weathered fragments of shale make up 35 percent by volume; common roots; extremely acid; clear smooth boundary.

Cr--17 to 40 inches; gray (10YR 6/1) brittle platy shale, dark gray (10YR 4/1) moist; common medium distinct stains of yellowish brown (10YR 5/8); very hard; extremely acid.

TYPE LOCATION: Butte County, South Dakota; about 4 miles west and 2 miles north of Belle Fourche; 200 feet east and 1800 feet north of the southwest corner of sec. 30, T. 9 N., R. 2 E.

RANGE IN CHARACTERISTICS: Depth to shale ranges from 10 to 20 inches. Colors throughout the soil are inherited from the shale. The horizons overlying the bedded shales typically average 50 to 65 percent clay but ranges from 35 to 65 percent clay. The low clay percentage is due to sand-size shale fragments. Consistence ranges from loose to hard when dry but is friable when moist. The soil ranges from strongly acid to extremely acid.

The A horizon has hue of 10YR or 2.5Y, value of 5 or 6 and 3 or 4 moist, and chroma of 1 or 2 dry or moist. It typically is clay but is clay loam in some pedons. It has weathered fragments of shale that make up 5 to 35 percent by volume. The A horizon contains less than 1 percent more organic matter than the C.

The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 or 6 and 3 or 4 moist; and chroma of 1 or 2. Weathered fragments of shale make up 20 to over 50 percent by volume of the C horizon.

The fissile shale is very hard and brittle and will not disperse in water or in sodium hexametaphosphate.

COMPETING SERIES: There are no other soils in the same family. Other competing soils are the Dupree, Lismas, and Samsil series. Dupree soils are more moist and have firm to extremely firm consistence. Lismas soils are more alkaline and have a firmer consistence. Samsil soils contain carbonates and are alkaline.

GEOGRAPHIC SETTING: Grummit soils are gently sloping to very steep on uplands. Slope gradients range from 2 to 60 percent. The soil formed in clayey residuum weathered from acid shales. Mean annual temperature ranges from 43 to 50 degrees F, and mean annual precipitation is about 12 to 18 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Broadhurst, Graner, and Demar soils. All of these associated soils are deeper to bedded shale. The Broadhurst and Demar soils are on adjacent, nearly level to gently sloping fans and terraces. In addition, Demar soils have argillic horizons. Graner soils are on nearby undulating to rolling uplands. Grummit soils are also associated with rock outcrop.

DRAINAGE AND PERMEABILITY: Well drained. Runoff is slow or medium. Permeability is moderate or moderately slow in the upper part and moderate in the underlying material.

USE AND VEGETATION: These soils are used primarily as native rangeland. Native vegetation typically is little bluestem, western wheatgrass, green needlegrass, blue grama, sideoats grama, and needleandthread. Short, limby, ponderosa pine is on some places.

DISTRIBUTION AND EXTENT: Western South Dakota and eastern Wyoming. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Butte County, South Dakota, 1970.

REMARKS: Diagnostic horizons and features recognized in this pedon are: ochric epipedon - the zone from the surface of the soil to a depth of 3 inches (A horizon).

National Cooperative Soil Survey
U.S.A.

LOUVIERS SERIES

The Louviers series consists of shallow, well drained soils that formed in material weathered from non-calcareous shale. Louviers soils are on hills and ridges where shale occurs close to the surface. Slopes range fromzeroto 65 percent. The mean annual precipitation is about 17 inches and the mean annual temperature is about 47 degrees F.

TAXONOMIC CLASS: Clayey, mixed, superactive, nonacid, mesic, shallow Ustic Torriorthents

TYPICAL PEDON: Louviers clay - grassland. (Colors are for dry soil unless otherwise noted.)

A--0 to 4 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong very fine granular structure; slightly hard, friable, very sticky and very plastic; neutral; clear smooth boundary. (3 to 6 inches thick)

C--4 to 14 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, very sticky and very plastic; neutral; gradual wavy boundary. (7 to 14 inches thick)

Cr--14 to 20 inches; non-calcareous clay shale.

TYPE LOCATION: Douglas County, Colorado; 400 feet west of the NE corner of the NW1/4 of Sec. 30, T. 7 S., R. 67 W.

RANGE IN CHARACTERISTICS: Base saturation ranges from 60 to 100 percent but typically is more than 90 percent. Depth to the paralithic contact ranges from 10 to 20 inches. The control section is usually heavy clay loam or clay, and averages 35 to 60 percent clay. Rock fragments range fromzeroto 35 percent by volume, but are generally less than 5 percent. They range from 1/4 to 1 inch in length.

The A horizon has hue of 5Y through 7.5YR, value of 5 through 7 dry, 3 through 6 moist, and chroma of 1 through 4. Reaction ranges from slightly acid to mildly alkaline.

The C horizon has hue of 5Y through 7.5YR. Reaction ranges from slightly acid to mildly alkaline.

COMPETING SERIES: There are no other soils in this family. The Midway and Samsil soils in the same subgroup are calcareous and have montmorillonitic mineralogy.

GEOGRAPHIC SETTING: The Louviers soils are on hills and ridges where shale bedrock occurs close to the surface. Slope gradients range fromzeroto 65 percent. The soils formed in thin parent materials weathered from non-calcareous shale. At the type location the average annual precipitation is 17 inches, with peak periods of precipitation occurring in the spring and early summer. The mean annual temperature is 46 to 48 degrees F. The frost-free season is about 125 to 140 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Bresser and Kutch soils. Bresser soils formed in material weathered from arkose, are deeper and have a medium textured subsoil. Kutch soils have a paralithic contact at a depth of 20 to 40 inches and have a mollic epipedon.

DRAINAGE AND PERMEABILITY: Well drained; rapid runoff; slow permeability.

USE AND VEGETATION: These soils are used principally as rangeland. Native vegetation is mainly blue grama, junegrass, and dryland sedge.

DISTRIBUTION AND EXTENT: Eastern and central Colorado and Wyoming. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bozeman, Montana

SERIES ESTABLISHED: El Paso County, Colorado, 1975.

QUERC SERIES

The Querc series consists of deep, well drained soils formed in residuum and slopewash derived from acid shale. Querc soils are on lower hill and ridge slopes. Slopes are 0 to 20 percent. Mean annual temperature is about 48 degrees F., and mean annual precipitation is about 14 inches.

TAXONOMIC CLASS: Fine, smectitic, mesic Aridic Argiustolls

TYPICAL PEDON: Querc silt loam-rangeland. (Colors are for dry soil unless otherwise stated.)

A1--0 to 2 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; slightly acid (pH 6.1); abrupt smooth boundary. (2 to 4 inches thick)

A2--2 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate fine granular; hard, friable, slightly sticky, slightly plastic; slightly acid (pH 6.2); clear smooth boundary. (2 to 5 inches thick)

Bt--5 to 14 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong medium and fine subangular blocky; hard, firm, sticky, plastic; continuous clay films on faces of peds; 15 percent soft shale fragments between 2 mm. and one-fourth inch in size; slightly acid (pH 6.4); clear smooth boundary. (6 to 17 inches thick)

C--14 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, firm, sticky, plastic; 30 percent soft shale fragments between 2 mm. and one-fourth inch in size; slightly acid (pH 6.1); clear wavy boundary. (10 to 25 inches thick)

Cr--35 inches; soft, weathered, acid, platy, dark gray fissile shale with sulfates between the plates.

TYPE LOCATION: Crook County, Wyoming; center of sec. 9, T. 55 N., R. 60 W.

RANGE IN CHARACTERISTICS: The mean annual soil temperature is 48 to 53 degrees F. Depth to the base of the argillic horizon is 10 to 22 inches. Depth to bedded shale is 20 to 40 inches. Shale fragments range from 15 to 35 percent and are between 2 mm. and one-fourth inch in size.

2- Querc Series

The A horizon has hue of 5Y through 10YR; chroma of 1 or 2. It is medium acid or slightly acid.
The B2t horizon has hue of 5Y through 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 1 or 2. It is typically a silty clay loam but may be clay loam or clay. Clay ranges from 35 to 60 percent and has more than 15 percent fine sand or coarser. It is medium acid or slightly acid.

The C horizon has hue of 2.5Y or 10YR. Textures are normal clay loam or silty clay loam. The shale fragments break down upon pre-treatment. It is medium acid or slightly acid.

COMPETING SERIES: These are the Ashfork, Blackpipe, Boneek, Chapin, Collbran, Emigrant, Huggins, Kube, Loma, Nunn, Rednun, Richfield, Ryus, Sofia, Savo, Thunderbird, Torreon, and Wormser series. The Ashfork, Chapin, Thunderbird, and Wormser soils have a lithic contact between 20 and 40 inches. The Ashfork, Blackpipe, Boneek, Chapin, Collbran, Emigrant, Kube, Loma, Nunn, Rednun, Richfield, Ryus, Sofia, Savo, Torreon, and Wormser have free carbonates in the series control section or above 40 inches. The Boneek, Collbran, Kube, Loma, Nunn, Rednun, Richfield, Ryus, Sofia, and Torreon soils lack a paralithic contact above 40 inches. All the competing soils have reactions more alkaline than slightly acid.

GEOGRAPHIC SETTING: Querc soils are on nearly level to moderate slopes of upland ridges and hills. Slopes are 0 to 20 percent. They form in residuum weathered from acid fissile shale. Elevation is 3,200 to 5,000 feet. The annual precipitation is 12 to 16 inches. The mean annual temperature is 46 to 51 degrees F. Frost-free season is 110 to 130 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Graner, Grummit, Tentative Louviers, and the Tentative Maggin soils. These soils lack argillic horizons.

DRAINAGE AND PERMEABILITY: Well drained; medium runoff; slow permeability.

USE AND VEGETATION: Used for rangeland and wildlife habitat. Native vegetation is blue grama, western wheatgrass, cacti, buffalo grass, some scattered ponderosa pine, and scrub oak.

DISTRIBUTION AND EXTENT: Northeastern Wyoming. Series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Crook County, Wyoming, 1978.

National Cooperative Soil Survey
U.S.A.

SPANGLER SERIES

The Spangler series consists of moderately deep, well drained soils that formed in residuum weathered from fine grained sandstone. Slopes are 2 to 20 percent. The mean annual precipitation is about 16 inches, and the mean annual temperature is 47 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, mesic Ustic Haplargids

TYPICAL PEDON: Spangler loam-rangeland. (Colors are for dry soil unless otherwise stated.)

A--0 to 6 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral (pH 6.6); clear smooth boundary. (3 to 7 inches thick)

BA--6 to 12 inches; brown (10YR 5/3) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and fine angular blocky structure; hard, firm, sticky and plastic; neutral (pH 6.6); clear smooth boundary. (2 to 6 inches thick)

Bt--12 to 24 inches; brown (10YR 5/3) clay loam, dark yellowish brown 10YR 4/4) moist; moderate medium and fine angular blocky structure; hard, firm, sticky and plastic; thin continuous clay films on all faces of peds; neutral (pH 6.6); clear smooth boundary. (9 to 15 inches thick)

BC--24 to 30 inches; pale brown (10YR 6/3) clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; neutral (pH 6.7); clear smooth boundary. (3 to 6 inches thick)

C--30 to 36 inches; pale brown (10YR 6/3) clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; neutral (pH 6.7); abrupt wavy boundary. (3 to 8 inches thick)

Cr--36 inches; yellowish brown, slightly hard, fine grained, non-calcareous, argillaceous sandstone.

TYPE LOCATION: Crook County, Wyoming; 100 yards northeast of the southwest corner of sec. 31, T. 54 N., R. 66 W.

RANGE IN CHARACTERISTICS: The mean annual soil temperature is 47 to 52 degrees F. Depth to bedded sandstone is 20 to 40 inches. Depth to the base of the B2t horizon is 14 to 26 inches.

2- Spangler Series

The A horizon has hue of 2.5Y or 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 2 or 3 dry and moist. It is loam or sandy loam.

The Bt horizon has hue of 2.5Y through 7.5YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 3 through 5 dry and moist. It is clay loam or sandy clay loam and averages 27 to 35 percent clay and less than 35 percent fine sand or coarser.

The C horizon has hue of 2.5Y or 10YR. Coarse sandstone fragments less than 3 inches in diameter range from 0 to 15 percent.

COMPETING SERIES: These are the balon, Buckle, Cambria, Cerrillos, Clovis, Cushman, Decolney, Fattig, Fernando, Fort Collins, Forkwood, Gaddes, Hagerman, Harbord, Hiland, Los Alamos, Maysdorf, Millett, Olney, Penistaja, Pokeman, Potts, Progresso, Pugsley, Rauzi, Scholle, Spenlo, Stoneham, Sundance, Tapia and Toluca series. The balon, Buckle, Cambria, Cerillos, Clovis, Decolney, Fernando, Fort Collins, Forkwood, Harbord, Hiland, Los Alamos, Maysdorf, Millett, Olney, Penistaja, Potts, Rauzi, Scholle, Spenlo, Stoneham, Sundance, Tapia, and Toluca soils are deep. Bowbac, Cushman, and Pokeman soils are calcareous or have Bk horizons. The Fattig, Gaddes, Hagerman, and Progresso soils have a lithic contact at 20 to 40 inches. Pugsley soils have more than 35 percent fine or coarser sand in the Bt horizon.

GEOGRAPHIC SETTING: Spangler soils are on uplands. They formed in residuum weathered from argillaceous, non-calcareous sandstone. Slopes range from 2 to 20 percent. Elevation is 3,200 to 5,000 feet. The mean annual precipitation is 14 to 18 inches, most of which falls in the spring or early summer. The mean annual temperature is 45 to 50 degrees F. The frost-free season is 110 to 130 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Hargreave, Butche, and Norka soils. Hargreave soils have a mollic epipedon. Butche soils have a lithic contact at a depth of 10 to 20 inches. Norka soils have a ca horizon.

DRAINAGE AND PERMEABILITY: Well drained; moderate runoff; moderate permeability.

USE AND VEGETATION: Used for rangeland. Native vegetation is needleandthread grass, western wheatgrass, blue grama, and Sandberg bluegrass.

DISTRIBUTION AND EXTENT: Northeastern Wyoming within or adjacent to the Black Hills. The series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Denver, Colorado

SERIES ESTABLISHED: Crook County, Wyoming; 1978.

Addendum 2.7.3.45E

Field Profile Description Forms

USDA-NRCS PEDON DESCRIPTION

PEDON ID #: BPM SL-1 — DRAFT 3/200

Series or Component Name: Broadhurst | Map Unit Symbol: | Photo #: | Classification: | Soil Moist. Regime (Tax.):

Describer(s): King | Date: 8-13-2014 | Weather: | Temp.: Air: Soil: Depth: | Latitude: ° ' " N | Longitude: ° ' " W | Datum: | Location: Sec. T. R.

UTM: Zone: mE: mN: 13T 0552767 4970962 | Topo Quad: | Site ID: | Yr: | State: | County: | Pedon #: | Soil Survey Area: | MLRA / LRU: | Transect: ID: Stop #: Interval:

Landscape: Rolling Hills | Landform: Valley Floor | Microfeature: | Anthro: | Elevation: 3637 | Aspect: South | Slope (%): 3 | Slope Complexity: 5 | Slope Shape: (Up & Dn / Across) LL/LL

Hillslope Profile Position: Toe | Geom. Component: | Microrelief: | Physio. Division: | Physio. Province: | Physio. Section: | State Physio. Area: | Local Physio. Area:

Drainage: | Flooding: | Ponding: | Soil Moisture Status: | Permeability: K_{sat}: | Land Cover / Use:

Parent Material: Residuum | Bedrock: Kind: Fract.: Hard.: Depth: Shale | Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree: | Runoff: | Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: <1% | Diagnostic Horz. / Prop.: Kind: Depth:

P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:

VEGETATION:

SYMBOL	COMMON NAME	% QD COVER
STVI		
KIMA		
POPR		
PIPO		
ARTR		
ARFR		

MISCELLANEOUS FIELD NOTES / SKETCH:

Sample 1
0-4 A1
4-8 A2
8-15 B
15-24 -
24-36 -
36-60 -C2

Component Name: | Map Unit Symbol: BPM SL-1 | Date: 8-13-2014

Obsrv. Method	Depth (in) (cm)	Horizon	Bnd.	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
SP													
"	0 – 4	A_1	g, w	2.5Y 4/3	2.5Y 3/2	CL	"	gr	1	NS		NP	
"	4 – 8	Bw	s, w	4/3	3/2	SiCL	"	1, f, sbk		SS		NP	..
"	8 – 15	C_1	c, w	2.5Y 5/2	4/3	SiC	"	1, f, sbk	–				
Auger below 30"	15 - 36	C_2	NA	—	4/3	C	1% selfite shale ch	massive					NOTE – CLAY SKINS on Ped faces to 24"
	36 - 60	C_3	—		4/3	SCL	3-5% sh chips	massive					

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bo Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Co	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth) Effer (agent) Clay % CCE	Notes
1							
2				Fm f/m		NR	
3				m f/m		NR	
4				m f/m		NR	
5		Common soft gyp masses		Common TO 28"		NR	few orange mottles sulfates?
6		many threads + soft crystals $CaSO_4$ Gyp				NR	"
7							
8							
9							
0							

USDA-NRCS 2-76 September 2002

USDA-NRCS PEDON DESCRIPTION

PEDON ID #: SL #2 DRAFT 3/2002

Series or Component Name:	Map Unit Symbol:	Photo #:	Classification: wetland Soil	Soil Moist. Regime (Tax.):
Describer(s): KING	Date: 8-13-14	Weather: Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:	Location: Sec. T. R.
UTM: Zone: mE: mN: 13T 0552795 4970878	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area: MLRA / LRU:	Transect: ID: Stop #: Interval:
Landscape: Rolling Hills	Landform: Wet Meadow	Microfeature:	Anthro:	Elevation: 3618
Aspect: W	Slope (%): <1	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) LL/LL	
Hillslope Profile Position: NA	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:
Physio. Section:	State Physio. Area:	Local Physio. Area:		
Drainage:	Flooding:	Ponding:	Soil Moisture Status:	Permeability: K_{sat}:
Land Cover / Use:				
Parent Material: Alluvium	Bedrock: Shale Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:		
Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: 0	Diagnostic Horz. / Prop.: Kind: Depth:	
P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:				

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
Sedges		
Rushes		
HJU		

MISCELLANEOUS FIELD NOTES / SKETCH:

SAMPLE
0-8" H2S odor
8-18" below ~15"

Component Name: | **Map Unit Symbol:** SL #2 | **Date:** 8-13-14

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry Mst Stk Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SP	0-2	O	C,S	—	10YR 3/2	SiC	—	loose		
2		2-8	A	C,W	—	7.5YR 3/2	SiC	—	1 f sbk		
3		8-18+	C		gleying G2 5/5B		C 40+	—	massive		
4											
5											
6											
7											
8											
9											
10											

	Redoximorphic Features % Sz Cn Frd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Cp	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth) Effer (agent) Clay % CCE	Notes
1				vm f		NE	
2	many mottles orange staining	orange staining oxidized roots		Vm f		NE	roots oxidized
3		MANY gyp crystals + masses				NE	stopped @ 18" very muddy
4							
5							
6							
7							
8							
9							
10							

USDA-NRCS 2-76 September 2002

USDA-NRCS — **PEDON DESCRIPTION** — **PEDON ID #:** SL #3 — **DRAFT 3/200**

Series or Component Name: Gurrc | Map Unit Symbol: | Photo #: | Classification: BPW | Soil Moist. Regime (Tax.):

Describer(s): King | Date: 8-13-14 | Weather: | Temp.: Air: Soil: Depth: | Latitude: ° ' " N | Longitude: ° ' " W | Datum: | Location: Sec. T. R.

UTM: Zone: 13T mE: 552419 mN: 4971091 | Topo Quad: | Site ID: Yr. State: County: Pedon #: | Soil Survey Area: | MLRA / LRU: | Transect: ID: Stop #: Interval:

Landscape: Rolling Hills | Landform: Toeslope Valley Floor | Microfeature | Anthro: | Elevation: 3634 | Aspect: South | Slope (%): 6 | Slope Complexity: Simple | Slope Shape: (Up & Dn / Across) LL/LL

Hillslope Profile Position: Toeslope | Geom. Component: | Microrelief: | Physio. Division: | Physio. Province: | Physio. Section: | State Physio. Area: | Local Physio. Area:

Drainage: | Flooding: | Ponding: | Soil Moisture Status: | Permeability: K_{sat}: | Land Cover / Use:

Parent Material: Residuum | Bedrock: Kind: Frac.: Hard.: Depth: Clay shale | Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree: | Runoff: | Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: <1% | Diagnostic Horz. / Prop.: Kind: Depth:

P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
KOMA		
POPR		
STVI		
Lupine		

MISCELLANEOUS FIELD NOTES / SKETCH:

0-7"
7-14
14-24
24-40"
4

Map Unit Symbol: SL #3 Date: 8-13-14

Observ Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Mst	Stk	Pls	Mottles % Sz Cn Col Mst Sp Loc
SP	0 – 2	A1	CS	10YR 4/4	10YR 3/2	L 14	—	gr					
"	2 – 7	A2	g,w	10YR 4/4	10YR 7/2	CL	1%	gr					
"	7 – 14	Bt	c,w	10YR 4/2	10Y 2/2	C	3% shale chips	2 f/m sbk					
"	14 – 24	C1	--	4/2	3/3	C	10% "	massive					
Augr	24 – 40	C2											
	40+	Cr		CLAY/Shale									

Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
			vm f			NR			
			vm f			NR			
		moderately clay skins common on ped faces	m f/m			NR			
	gyp masses + sgt crystals common		C f/m			NR			
	Common orange mottling, + gyp crystals		–	–		NR			

USDA-NRCS 2-76 September 2002

USDA-NRCS PEDON DESCRIPTION

PEDON ID #: SL #4 — DRAFT 3/200

- **Series or Component Name:** Grummit
- **Map Unit Symbol:**
- **Photo #:**
- **Classification:** BPW
- **Soil Moist. Regime (Tax.):**
- **Describer(s):** King
- **Date:** 8-13-2014
- **Weather:**
- **Temp.:** Air: Soil: Depth:
- **Latitude:** ° ' " N
- **Longitude:** ° ' " W
- **Datum:**
- **Location:** Sec. T. R.
- **UTM:** Zone: 13T mE: 552217 mN: 4971406
- **Topo Quad:**
- **Site ID:** Yr: State: County: Pedon #:
- **Soil Survey Area:**
- **MLRA / LRU:**
- **Transect:** ID: Stop #: Interval:
- **Landscape:** Rolling Hills
- **Landform:** Ridge backslope
- **Microfeature:**
- **Anthro:**
- **Elevation:** 3795
- **Aspect:** South
- **Slope (%):** 15%
- **Slope Complexity:** complex
- **Slope Shape:** (Up & Dn / Across) CC/CV
- **Hillslope Profile Position:** midslope
- **Geom. Component:**
- **Microrelief:**
- **Physio. Division:**
- **Physio. Province:**
- **Physio. Section:**
- **State Physio. Area:**
- **Local Physio. Area:**
- **Drainage:**
- **Flooding:**
- **Ponding:**
- **Soil Moisture Status:**
- **Permeability:** K_{sat}:
- **Land Cover / Use:**
- **Parent Material:** Residuum
- **Bedrock:** Kind: Brittle Shale Fract.: Hard.: Depth:
- **Lithostrat. Units:** Group: Formation: Member:
- **Erosion:** Kind: Degree:
- **Runoff:**
- **Surface Frag %:** GR: CB: ST: BD: CN: FL: Kind: > 70% Shale
- **Diagnostic Horz. / Prop.:** Kind: Depth:
- **P. S. Control Section:** Depth Range: Ave. Clay %: Ave. Rock Frag %:

VEGETATION :

SYMBOL	COMMON NAME	% CD COVER
PIPU		
OAK		
RAR		
ELTR		
ELSM		
STVI		

MISCELLANEOUS FIELD NOTES / SKETCH :

0-5"
5-10
10-18
3

Component Name:

Map Unit Symbol: SL4

Date: 8-13-14

Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Kind %	Rock Frags Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
ROAD cutbank	0-5	A	CS	10YR5/2	3/2	L 28	5	shale chips	gr					
	5-10	C1	CS	4/2	4/2	CL 36	5	" "	massive					
	10-18	C2	CS	4/4	"	CL 38	10	" "	massive					
	18+	R		Brittle Shale			--							

Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped/V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth) Effer (agent) Clay % CCE	Notes
	—		vm f		NR	
	—		m f		NR	
	common gyp crystals + yellow staining		c f		NR	
					NR	

USDA-NRCS 2-76 September 2002

USDA-NRCS **PEDON DESCRIPTION** PEDON ID #: SL #5 DRAFT 3/200

Series or Component Name:	Quere-like
Map Unit Symbol:	
Photo #:	
Classification:	
Soil Moist. Regime (Tax.):	
Describer(s):	KING
Date:	8-13-14
Weather:	
Temp.: Air: Soil: Depth:	
Latitude: ° ' " N	
Longitude: ° ' " W	
Datum:	
Location: Sec. T. R.	
UTM: Zone: mE: mN:	13T 552782 4971477
Topo Quad:	
Site ID: Yr: State: County: Pedon #:	
Soil Survey Area:	
MLRA / LRU:	
Transect: ID: Stop #: Interval:	
Landscape:	Rolling Hills
Landform:	Upland meadow
Microfeature:	
Anthro:	
Elevation:	3634
Aspect:	North
Slope (%):	1-2
Slope Complexity:	Simple
Slope Shape: (Up & Dn / Across)	LL/LL
Hillslope Profile Position:	NA Meadow Flow
Geom. Component:	
Microrelief:	
Physio. Division:	
Physio. Province:	
Physio. Section:	
State Physio. Area:	
Local Physio. Area:	
Drainage:	
Flooding:	
Ponding:	
Soil Moisture Status:	
Permeability: K_{sat}:	
Land Cover / Use	
Parent Material:	Residuum
Bedrock: Kind: Fract.: Hard.: Depth:	Clay Shale
Lithostrat. Units: Group: Formation: Member:	
Erosion: Kind: Degree:	
Runoff:	
Surface Frag %: GR: CB: ST: BD: CN: FL: Kind:	0 —
Diagnostic Horz. / Prop.: Kind: Depth:	
P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:	

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
grassland		
POPR		
STVI		
KoMA		
ELSm		
Lupin		
ACMI		

MISCELLANEOUS FIELD NOTES / SKETCH:

SAMPLES
0-6
6-13
13-24
24-

Map Unit Symbol: SL #5 Date: 8-13-14

Observ Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd %	Rock Frags Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
SP	0-6	A	c,s	N/A 4/4	3/2	L	—		gr					
SP	6-13	Bt	g,w	4/4	3/2	L	3	Shale Chips	2,f,sbk					
SP	13-24	C1		4/2	2/2	L	5		massive					
A	24-48	C2	—	—	—	—	—		Auger					
	48+	Cr	Soft	clay		Shale			NOT SAMPLED					

Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped/V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
			vmf			NR			
		mod clay skins	m f/m			NR			
	gyp masses + soft crystals		f, f			NR			
	orange staining common								

USDA-NRCS — **PEDON DESCRIPTION** — **PEDON ID #:** BPM-SL6 — **DRAFT 3/200**

Series or Component Name:	Grummit lik6 - not sure
Map Unit Symbol:	
Photo #:	
Classification:	
Soil Moist. Regime (Tax.):	
Describer(s):	King
Date:	8-13-14
Weather:	
Temp.: Air: / Soil: / Depth:	
Latitude: ° ' " N	
Longitude: ° ' " W	
Datum:	
Location: Sec. T. R.	
UTM: Zone: / mE: / mN:	13T 552614 4971436
Topo Quad:	
Site ID: Yr: State: County: Pedon #:	
Soil Survey Area:	
MLRA / LRU:	
Transect: ID: / Stop #: / Interval:	
Landscape:	Rolling Hills
Landform:	Ridge Backslope
Microfeature:	
Anthro:	
Elevation:	3725
Aspect:	North
Slope (%):	8
Slope Complexity:	Simple
Slope Shape: (Up & Dn / Across)	LL/LL
Hillslope Profile Position:	mid
Geom. Component:	
Microrelief:	
Physio. Division:	
Physio. Province:	
Physio. Section:	
State Physio. Area:	
Local Physio. Area:	
Drainage:	
Flooding:	
Ponding:	
Soil Moisture Status:	
Permeability: / K_{sat}:	
Land Cover / Use:	
Parent Material:	Residuum
Bedrock: Kind: Fract.: Hard.: Depth:	Soft Platy Shale
Lithostrat. Units: Group: Formation: Member:	
Erosion: Kind: Degree:	
Runoff:	
Surface Frag %:	0
GR: CB: ST: BD: CN: FL:	
Kind:	—
Diagnostic Horz. / Prop.: Kind: Depth:	
P. S. Control Section: Ave. Clay %: Ave. Rock Frag %:	
Depth Range:	

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
PIPO	Forest	
Juniper		
Sedge		

MISCELLANEOUS FIELD NOTES / SKETCH:

[illegible]

0-5 (3) MAY BO 0-5 A

5-15 5-8 B

15-36 [illegible]

Component Name: | Map Unit Symbol: SL #6 | Date: 8-13-14

Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd %	Structure Grade Sz Type	Consistence Dry Mst Stk Pls	Mottles % Sz Cn Col Mst Sp Loc
SP	0-5	A	CS	10YR 3/2	2/2	LOAM 20	–	gr /	weak pbk – fi	
SP	5-15	C1	WS	5/2	4/2	CL 38	1%	massive	?	8-15 C -40+
A	15-36	C2	?	4/4	4/3	↓	3%	massive		5-8 CL -36
	36+	Cr						Platy		

Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
			m f/m			NR			
			m f/m			NR			
			c -m/c			NR			
						NR			

USDA-NRCS 2-76 September 2002

USDA-NRCS PEDON DESCRIPTION

PEDON ID #: UIM SL #7 — DRAFT 3/200

Series or Component Name: Louviers	Map Unit Symbol:	Photo #:	Classification:	Soil Moist. Regime (Tax.):

Describer(s): King	Date: 8-13-14	Weather:	Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W	Datum:	Location: Sec. T. R.

UTM: Zone: 13T mE: 551547 mN: 4971764	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:

Landscape: Rolling Hills	Landform: Ridge Top	Microfeature:	Anthro:	Elevation: 3807	Aspect: North	Slope (%): 8%	Slope Complexity: Complex	Slope Shape: (Up & Dn / Across) CC/CC

Hillslope Profile Position: Crest	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage:	Flooding:	Ponding:	Soil Moisture Status:	Permeability: K_{sat}:	Land Cover / Use:

Parent Material: Residuum	Bedrock: Kind: Clay Shale Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: 70% Siltstone / Claystone	Diagnostic Horz. / Prop.: Kind: Depth:

P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:	

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
ELSM		
Koma		
STVI		
ARTR		

MISCELLANEOUS FIELD NOTES / SKETCH:

0-3 2 Samples
3-12

Component Name:

Map Unit Symbol: SL #7 - Date: 8-13-14

Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Kind % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Ms Sp Loc
SP	0-3	A	C,W	2.5Y 3/2	2.5Y 3/2	CLAY	1%	2 f sbk					
	3-12	C	G,W	2.5Y 3/2	2.5Y 3/2	CLAY	10% shale siltstone channers	massive					
	12-15+	Cr		Soft	clay/shale		—	massive					

Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH Effer Clay CCE (meth) (agent) %	Notes
		—	c f		NR	2" surface cracks
	few soft Cr clay masses	—	f f		NR matrix - Cr clay-SL	
					NR	

USDA-NRCS 2-76 September 2002

USDA-NRCS **PEDON DESCRIPTION** PEDON ID #: SL #8 DRAFT 3/200

Series or Component Name: Bentonite O.C + Lowlers	Map Unit Symbol:	Photo #:	Classification:			Soil Moist. Regime (Tax.):
Describer(s): King	Date: 8-14-14	Weather:	Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W	Datum:	Location: Sec. T. R.
UTM: Zone: mE: mN: 13T 552049 4971122	Topo Quad:	Site ID: Yr: State:	County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:
Landscape: Rolling Hills	Landform: eroded outcrop	Microfeature:	Anthro:	Elevation: 3617	Aspect: South	Slope (%): 6
Slope Complexity: Complex	Slope Shape: (Up & Dn / Across) CC/LL					
Hillslope Profile Position: —	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:
Local Physio. Area:						
Drainage:	Flooding:	Ponding:	Soil Moisture Status:	Permeability: K_{sat}:	Land Cover / Use:	
Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth: Bentonite Clay	Lithostrat. Units:	Group:	Formation:	Member:	
Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: Variable 0-70% shale siltstone	Diagnostic Horz. / Prop.:	Kind:	Depth:	
P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:						

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
ELSM		
KOMA		
CALO		
POAR		
PSSP		

MISCELLANEOUS FIELD NOTES / SKETCH:

This location characterized by eroded areas with Bent. O.C. [Vshallow soils, not barren] with fingers of Quirk on upland Ridges Knolls

— Bent OC — 504 12 19 552049 4971122

— 8A edge of Quirk SW 12 22 552091 4971126

— 8B finger of Quirk SW 12 33 551999 4971130

TS in OC can vary up to 6" in depth in drainage deposition areas

0-2 % Slopes

Component Name: Map Unit Symbol: SL#0 - Date: 8-14-14

Obsd. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Kcd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
SP	0-2	A	CS	2.5Y 5/2	2.5Y 4/2	CLAY	5% mixed CH	2 f sbk					
	2-10+	Cr				CLAY	Bentonite Bed						

Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
						NR			
						NR			

USDA-NRCS 2-76 September 2002

USDA-NRCS PEDON DESCRIPTION

PEDON ID #: SL#9

DRAFT 3/200

- Series or Component Name: Sparkler forced? + 55 ROC
- Map Unit Symbol: 5/B
- Photo #:
- Classification:
- Soil Moist. Regime (Tax.):
- Describer(s): KING
- Date: 8-14-14
- Weather:
- Temp.: Air: Soil: Depth:
- Latitude: ° ' " N
- Longitude: ° ' " W
- Datum:
- Location: Sec. T. R.
- UTM: Zone: 13 mE: 0551838 mN: 4971192
- Topo Quad:
- Site ID: Yr: State: County: Pedon #:
- Soil Survey Area:
- MLRA / LRU:
- Transect: ID: Stop #: Interval:
- Landscape: Rolling Hills + Ravines
- Landform: Upland Bench
- Microfeature:
- Anthro:
- Elevation: 3625
- Aspect: South
- Slope (%): 0-6
- Slope Complexity: Complex
- Slope Shape: (Up & Dn / Across) LL/LL
- Hillslope Profile Position: Crest
- Geom. Component:
- Microrelief:
- Physio. Division:
- Physio. Province:
- Physio. Section:
- State Physio. Area:
- Local Physio. Area:
- Drainage:
- Flooding:
- Ponding:
- Soil Moisture Status:
- Permeability: K_{sat}:
- Land Cover / Use:
- Parent Material: Residuum
- Bedrock: Kind: Sandstone Fract.: Hard: Depth:
- Lithostrat. Units: Group: Formation: Member:
- Erosion: Kind: Degree:
- Runoff:
- Surface Frag %: 15 GR: CB: ST: BD: CN: FL: Kind: Sandstone
- Diagnostic Horz. / Prop.: Kind: Depth:
- P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
PIPO		

MISCELLANEOUS FIELD NOTES / SKETCH:

2

0-3"

3-11"

Map Unit Symbol: SL#4 Date: 8-14-14

Obsv. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry Mst Stk Pls	Mottles % Sz Cn Col Mst Sp Loc
SP	0 – 3	A	C,S	10YR 5/2	10YR 3/2	SL 10	1% ~~SS~~ SS CH	gr		
	3 – 11"	Bt	W,S	10YR 3/3	10YR 3/2	CL 36	1% SS CH	3 m/c PY	brk K, to 2-m-SbK	
	11" +	R	—	Hard Sandstone				—		

Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hc Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
			m F			NR			
		Thick clay Skins common on Ped faces	c m/c			VSL			

USDA-NRCS 2-76 September 2002

USDA-NRCS | **PEDON DESCRIPTION** | **PEDON ID #:** SL #10 | **DRAFT 3/2002**

Series or Component Name: Querc
Map Unit Symbol:
Photo #:
Classification:
Soil Moist. Regime (Tax.):

Describer(s): KING
Date: 8-14-14
Weather:
Temp.: Air: Soil: Depth:
Latitude: ° ' " N
Longitude: ° ' " W
Datum:
Location: Sec. T. R.

UTM: Zone: 13T mE: 551676 mN: 4971147
Topo Quad:
Site ID: Yr: State: County: Pedon #:
Soil Survey Area:
MLRA / LRU:
Transect: ID: Stop #: Interval:

Landscape: Rolling Hills
Landform: upland meadow
Microfeature:
Anthro:
Elevation: 3627
Aspect: South
Slope (%): 1%
Slope Complexity: Simple
Slope Shape: (Up & Dn / Across) LL/LL

Hillslope Profile Position: —
Geom. Component:
Microrelief:
Physio. Division:
Physio. Province:
Physio. Section:
State Physio. Area:
Local Physio. Area:

Drainage:
Flooding:
Ponding:
Soil Moisture Status:
Permeability: K_{sat}:
Land Cover / Use:

Parent Material: Residuum
Bedrock: Kind: Dark Fissile Flattening shale Fract.: Hard.: Soft Depth: 12"
Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree:
Runoff:
Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: <1%
Diagnostic Horz. / Prop.: Kind: Depth:

P. S. Control Section: Ave. Clay %: Ave. Rock Frag %:
Depth Range:

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
STVI		
KuMA		
ELSm		
ELTR	thickspike	
Solidago		
Lauseunt		
CAld		
BOGR		

MISCELLANEOUS FIELD NOTES / SKETCH:

2 SAMPLES
0-4
4-12

K gray?

Component Name: Map Unit Symbol: SL #10 Date: 8-14-14

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SP	0-4	A	cs	10YR 2/1	10YR 2/1	L 28	5% shale chips	gr-3					
2		4-12'	Bt	g,s	"	"	C 40'	50% shale chips	3, f/m sbk					
3			Cr		Soft	Fissile	shale		10YR 2/1 platy					
4														
5														
6														
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth) Effer (agent) Clay % CCE	Notes
1				Vm f		NR	
2			clay films on Ped faces	Vm f/m		NR	
3				Vm f/m in cracks		NR	
4							
5							
6							
7							
8							
9							
10							

USDA-NRCS 2-76 September 2002

USDA-NRCS PEDON DESCRIPTION

PEDON ID #: SL #11 — DRAFT 3/2002

Series or Component Name: Butche —
Map Unit Symbol:
Photo #:
Classification:
Soil Moist. Regime (Tax.):

Describer(s): King
Date: 8-14-14
Weather:
Temp.: Air: Soil: Depth:
Latitude: ° ' " N
Longitude: ° ' " W
Datum:
Location: Sec. T. R.

UTM: Zone: mE: mN: 13T 0551657 4971039
Topo Quad:
Site ID: Yr: State: County: Pedon #:
Soil Survey Area:
MLRA / LRU:
Transect: ID: Stop #: Interval:

Landscape: Rolling Hills
Landform: upland meadow
Microfeature:
Anthro:
Elevation: 3634
Aspect: South
Slope (%): 1%
Slope Complexity: Simple
Slope Shape: (Up & Dn / Across) LL/LL

Hillslope Profile Position: —
Geom. Component:
Microrelief:
Physio. Division:
Physio. Province:
Physio. Section:
State Physio. Area:
Local Physio. Area:

Drainage:
Flooding:
Ponding:
Soil Moisture Status:
Permeability: K_{sat}:
Land Cover / Use:

Parent Material: Residuum
Bedrock: Kind: Sandstone Fract.: ~~Hard~~: Soft Depth:
Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree:
Runoff:
Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: <1%
Diagnostic Horz. / Prop.: Kind: Depth:

P. S. Control Section: Ave. Clay %: Ave. Rock Frag %:
Depth Range:

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
STVI		
Indian Grass & warm season		
BOGR		
KOMA		
large leaf sage		
ELSM		
ELTR		
CALO		
ARLU		

MISCELLANEOUS FIELD NOTES / SKETCH:

0-4"
4-11"

2.7.3.45-74

Component Name: | Map Unit Symbol: SL #11 | Date: 8-14-14

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SP	0-4	A	CS	10YR 4/4	10YR 3/6	SL 24	1% ss CH	gr					
2		4-11	Bw	CS	—	10YR 3/2	L 26	5% ss CH shale chips	1, f, sbk					
3		11+	R	—				—	—					
4														
5														
6														
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1				m f			NR			
2			weak clay films on ped faces	vn f/m			NR			
3				f			NR			
4										
5										
6										
7										
8										
9										
10										

USDA-NRCS 2-76 September 2002

USDA-NRCS — **PEDON DESCRIPTION** — **PEDON ID #:** SI #12 — **DRAFT 3/2002**

Series or Component Name: Grummit 15-20% Slop	Map Unit Symbol:	Photo #:	Classification:	Soil Moist. Regime (Tax.):
Describer(s): King	Date: 8-14-14	Weather: Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:	Location: Sec. T. R.
UTM: Zone: 13 mE: 0552594 mN: 4970855	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area: MLRA / LRU:	Transect: ID: Stop #: Interval:
Landscape: Rolling Hills	Landform: Ridge Slope	Microfeature:	Anthro:	Elevation: 3637 Aspect: North Slope (%): 15
Slope Complexity: Complex	Slope Shape: (Up & Dn / Across) CC/CC			
Hillslope Profile Position: Mid	Geom. Component:	Microrelief:	Physio. Division: Physio. Province:	Physio. Section: State Physio. Area: Local Physio. Area:
Drainage:	Flooding: Ponding:	Soil Moisture Status:	Permeability: K_{sat}:	Land Cover / Use:
Parent Material: Residuum	Bedrock: Shale Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:		
Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: <1%	Diagnostic Horz. / Prop.: Kind: Depth:	
P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:				

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
APO		
Juniper		
Quga		
STVI		

MISCELLANEOUS FIELD NOTES / SKETCH :

0-4
4-10 4
10-18
18-36

2.7.3.45-76

Component Name: Grummit **Map Unit Symbol:** SL #12 **Date:** 8-14-14

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cr Col Mst Sp Loc
1	SP	0-4	A	C,W	10YR 4/2	3/2	L 18	3 sh, ch	Gr					
2		4-10	Bw	g,W	3/2	2/2	CL 28	30% sh, CH	1, f, sbk					
3		10-18	C1	--	4/3	3/3	C 40	50% "	massive					
4	A	18-36	C2	--	—	—	~	50% "	massive					
5		36+	Cr	Soft	grey shale									
6														
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH Effer Clay CCE (meth)(agent) %	Notes
1				M f		NR	
2			clay skins on ped faces	M f/m		VR	
3				C m/c		NR	
4				—			
5							
6							
7							
8							
9							
10							

USDA-NRCS 2-76 September 2002

USDA-NRCS — **PEDON DESCRIPTION** — **PEDON ID #:** SL #13 — **DRAFT 3/2002**

Series/or Component Name: Recluse	Map Unit Symbol:	Photo #:	Classification:
Soil Moist. Regime (Tax.):			
Describer(s): King	Date: 8-14-14	Weather:	Temp.: Air: Soil: Depth:
Latitude: ° ' " N	Longitude: ° ' " W	Datum:	Location: Sec. T. R.
UTM: Zone mE: mN: 13T 551993 4970872	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:
MLRA / LRU:	Transect: ID: Stop #: Interval:		
Landscape: Rolling Hills	Landform: Upland meadow	Microfeature:	Anthro:
Elevation: 3651	Aspect: SW	Slope (%): 2%	Slope Complexity: Simple
Slope Shape: (Up & Dn / Across) LL/LL	Hillslope Profile Position: crest	Geom. Component:	Microrelief:
Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:
Local Physio. Area:	Drainage:	Flooding:	Ponding:
Soil Moisture Status:	Permeability: K_{sat}:	Land Cover / Use:	
Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth: SS ?	Lithostrat. Units: Group: Formation: Member:	
Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: <1	Diagnostic Horz. / Prop.: Kind: Depth:
P. S. Control Section: Depth Range:	Ave. Clay %:	Ave. Rock Frag %:	

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
Grassland	see previous	

MISCELLANEOUS FIELD NOTES / SKETCH :

Mapping Notes → 13 551950 4970692
13 551967 4970816

0-6
6-12
12-24
24-42
42-60

5

Recluse

Recess shale chalk
Approx boundary
Soil 13 ? Recluse

Component Name: **Map Unit Symbol:** SL #13 **Date:** 8-14-14

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry Msl Stk Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SP	0 – 6	A	CS	10YR 4/4	3/2	SL 18	<1	gr		
2		6 – 12	Bt1	CS	4/3	3/4	CL 36	<1	2 f/m sbk		
3		12 – 24	Bt2	g,w	4/3	3/4	CL 36	<1	3 m abk		
4	A	24 – 42	Bk1	--	5/2	4/2	CL 30	3	1 m sbk		
5	A	42 – 60+	Bk2	--	6/2	4/2	CL 36	3	massive		
6											
7											
8											
9											
10											

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1							NR			
2			thin clay skins				NR			
3			thick clay skins				NR			
4		VM soft lime masses	Thin clay skins + sand bridging				V disseminated + masses			
5							V disseminated			
6										
7										
8										
9										
10										

USDA-NRCS 2-76 September 2002

USDA-NRCS | # PEDON DESCRIPTION | **PEDON ID #:** SL #14 | **DRAFT 3/2002**

Series or Component Name:	Map Unit Symbol:	Photo #:	Classification:	Soil Moist. Regime (Tax.):
Querc				

Describer(s):	Date:	Weather:	Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W	Datum:	Location: Sec. T. R.
King	8-14-14					

UTM: Zone:	mE:	mN:	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:
13	551730	4970580					

Landscape:	Landform:	Microfeature:	Anthro:	Elevation:	Aspect:	Slope (%):	Slope Complexity:	Slope Shape: (Up & Dn / Across)
Rolling Hills	Hill top			3627	South	0-8	Simple	LL/LL

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:
Crest					–		

Drainage:	Flooding:	Ponding:	Soil Moisture Status:	Permeability: K_{sat}:	Land Cover / Use:

Parent Material:	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:
Residuum	shale	

Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind:	Diagnostic Horz. / Prop.: Kind: Depth:
		<1%	

P. S. Control Section : Ave. Clay %: Ave. Rock Frag %:
Depth Range:

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	common grassland	

MISCELLANEOUS FIELD NOTES / SKETCH :

This is a Querc check pit with samples ∴ See previous querc for complete descriptions

0-4	A	2 f sbk + gr	NR
4-12	Bt	3 m sbk	NR
12-24	C – auger	massive	NR
24+	Cr		

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: SL15

DRAFT 3/2002

Series or Component Name: Louviers
Map Unit Symbol:
Photo #:
Classification:
Soil Moist. Regime (Tax.):

Describer(s): Kins
Date: 8-15-11
Weather:
Temp.: Air: Soil: Depth:
Latitude: ° ' "N
Longitude: ° ' "W
Datum:
Location: Sec. T. R.

UTM: Zone: mE: mN: 13T 552312 4970599
Topo Quad:
Site ID: Yr: State: County: Pedon #:
Soil Survey Area:
MLRA / LRU:
Transect: ID: Stop #: Interval:

Landscape: Rolling Hills
Landform: UNAUD Hill top
Microfeature:
Anthro:
Elevation: 3726
Aspect: West
Slope (%): 2
Slope Complexity: Complex
Slope Shape: (Up & Dn / Across) CV/CC

Hillslope Profile Position: CREST
Geom. Component:
Microrelief:
Physio. Division:
Physio. Province:
Physio. Section:
State Physio. Area:
Local Physio. Area:

Drainage:
Flooding:
Ponding:
Soil Moisture Status:
Permeability: K_{sat}:
Land Cover / Use:

Parent Material: Residuum
Bedrock: Shale Kind: Fract.: Hard.: Depth:
Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree:
Runoff:
Surface Frag %: Varied GR: CB: ST: BD: CN: FL: Kind: 10 - 80% Siltstone/Shale
Diagnostic Horz. / Prop.: Kind: Depth:

P. S. Control Section: Ave. Clay %: Ave. Rock Frag %:
Depth Range:

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
STVI		
POMA		
BOGR		
PIPO		
ARTR		
Ant SPP		

MISCELLANEOUS FIELD NOTES / SKETCH :

0 - 8" SAMPLE

Component Name: Lowviers **Map Unit Symbol:** SL #15 **Date:** 8-15-14

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd %	Rock Frags Rnd	Rock Frags Sz	Structure Grade	Structure Sz.	Structure Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SP	0-7	A	C,S	2.5Y 6/2	2.5Y 4/2	C 40+	3	[illegible] Shale		1	f	sbk					
2		2-8	C	C,S	—	2.5Y 3/2	C 60+	15%	Platy Shale		massive							
3		8+	Cr		—	2.5Y 2/1	Platy Soft Shale											
4																		
5																		
6																		
7																		
8																		
9																		
0																		

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1				F f			NR			
2				f f			NR			
3							VE			
4										
5										
6										
7										
8										
9										
10										

USDA-NRCS — PEDON DESCRIPTION — PEDON ID #: SL #6 — DRAFT 3/2002

Series or Component Name: Quers
Map Unit Symbol:
Photo #:
Classification:
Soil Moist. Regime (Tax.):

Describer(s): King
Date: 8-15-14
Weather:
Temp.: *Air:* *Soil:* *Depth:*
Latitude: ° ' " N
Longitude: ° ' " W
Datum:
Location: Sec. T. R.

UTM: *Zone* 13 *mE:* 552183 *mN:* 4970490
Topo Quad:
Site ID: *Yr:* *State:* *County:* *Pedon #:*
Soil Survey Area:
MLRA / LRU:
Transect: *ID:* *Stop #:* *Interval:*

Landscape: rolling
Landform: upland meadow
Microfeature:
Anthro:
Elevation: 3731
Aspect: South East
Slope (%): 2
Slope Complexity: Simple
Slope Shape: *(Up & Dn / Across)* L/L

Hillslope Profile Position: crest
Geom. Component:
Microrelief:
Physio. Division:
Physio. Province:
Physio. Section:
State Physio. Area:
Local Physio. Area:

Drainage:
Flooding:
Ponding:
Soil Moisture Status:
Permeability: K_{sat}:
Land Cover / Use:

Parent Material: Residuum
Bedrock: Shale *Kind:* *Fract.:* *Hard.:* *Depth:*
Lithostrat. Units: *Group:* *Formation:* *Member:*

Erosion: *Kind:* *Degree:*
Runoff:
Surface Frag %: *GR:* *CB:* *ST:* *BD:* *CN:* *FL:* *Kind:* <1%
Diagnostic Horz. / Prop.: *Kind:* *Depth:*

P. S. Control Section : *Ave. Clay %:* *Ave. Rock Frag %:* *Depth Range:*

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	GRASSLAND	
	AS Before	

MISCELLANEOUS FIELD NOTES / SKETCH :

SAME AS Previous Quers

Not Sampled

Component Name: | Map Unit Symbol: SL 1B | Date: 8-15-14

	Obser. Method	Depth (in)	Depth (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd %	Rock Frags Rnd	Rock Frags Sz	Structure Grade	Structure Sz	Structure Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles %	Mottles Sz	Mottles Cn	Mottles Col	Mottles Mst	Mottles Sp	Mottles Loc
1	SP	0-4		A																					
2	SP	4-7		AB			See	Previous	Quarc																
3	A	7-15		Bt						Same As															
4		15+		C																					
5																									
6																									
7																									
8																									
9																									
10																									

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1							NR			
2							NR			
3							NR			
4							NR			
5										
6										
7										
8										
9										
10										

USDA-NRCS 2-76 September 2002

USDA-NRCS PEDON DESCRIPTION

PEDON ID #: SL 17 — DRAFT 3/2002

Series or Component Name: AML Recl.	Map Unit Symbol:	Photo #:	Classification: BPM	Soil Moist. Regime (Tax.):
Describer(s): King	Date: 8-15-14	Weather: Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:	Location: Sec. T. R.
UTM: Zone: mE: mN: 13T 0551851 4970004	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area: MLRA / LRU:	Transect: ID: Stop #: Interval:
Landscape: Rolling Hills	Landform: reclaimed LAND - AML	Microfeature:	Anthro:	Elevation: 3579
Aspect: NE	Slope (%): 10%	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) LL/LL	
Hillslope Profile Position: mid	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:
Physio. Section:	State Physio. Area:	Local Physio. Area:		
Drainage:	Flooding:	Ponding:	Soil Moisture Status:	Permeability: K_{sat}:
Land Cover / Use:				
Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth: CLAY SHALES	Lithostrat. Units: Group: Formation: Member:		
Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: 20% SANDSTONE	Diagnostic Horz. / Prop.: Kind: Depth:	
P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:				

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
ELSM		
RPR		

MISCELLANEOUS FIELD NOTES / SKETCH :

Very thin layer replaced soil or soil substitute or Treated OB

0 – 2" E + A Variable across Reclaimed Area *
2 + Replaced clay overburden or Insitu clay from old highwall reduction

* Varies up to 4"
Sample 0 – 4

Component Name: **Map Unit Symbol:** SL 17 **Date:** 8-15-14

	Obser. Method	Depth (in)	Depth (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd %	Rock Frags Rnd	Rock Frags Sz	Structure Grade	Structure Sz	Structure Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SP	0-2		E	GS	2.5Y 7/1	5/2	C				1	f	gr	loose				
2		2+		C	Replaced	clAY		overburden				[illegible] NOT sampled							
3							4/2												
4																			
5																			
6																			
7																			
8																			
9																			
10																			

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1							NR			
2							NR			
3										
4										
5										
6										
7										
8										
9										
10										

USDA-NRCS 2-76 September 2002

PEDON DESCRIPTION

PEDON ID #: SL 18 — DRAFT 3/2002

Name: Unnamed Ag. cold	Map Unit Symbol:	Photo #:	Classification:		Soil Moist. Regime (Tax.):
Describer(s): KING	Date: 8-15-14	Weather:	Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum:	Location: Sec. T. R.
UTM: Zone: 13T mE: 0551411 mN: 4969962	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:
Landscape: Rolling Hills	Landform: upland meadow	Microfeature:	Anthro:	Elevation: 3618	Aspect: E
Slope (%): 3	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) LL/LL			
Hillslope Profile Position: Crest	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:
State Physio. Area:	Local Physio. Area:				
Drainage:	Flooding:	Ponding:	Soil Moisture Status:	Permeability: K_{sat}:	Land Cover / Use:
Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth: CLAY/shale	Lithostrat. Units:	Group:	Formation:	Member:
Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: <1%	Diagnostic Horz. / Prop.:	Kind:	Depth:
P. S. Control Section: Depth Range:	Ave. Clay %:	Ave. Rock Frag %:			

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	GRASSLAND as before	
	multiple species	
	very few scattered sage	

MISCELLANEOUS FIELD NOTES / SKETCH :

0-6 See 13?
6-12
12-22
22-

Component Name: 8-15-14 **Map Unit Symbol:** SL 18

#	Obsrv Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mo % Sz
1	SP	0 - 6	A	CS	10YR 5/3	3/3	SL 22	<1	gr		loose			
2	SP	6 - 12	Bt	CS	10YR 3/2	10YR 3/1	CL 38	<1	3, c, col. breaks to 3c, abk	HARD				
3	SP	12-22	Bk	gs	—	10YR 3/2	C 40+	<1	1, m, col		very hard			
4	A	22 - 36	Cy	--		10YR 3/2	C 40+	—	massive		very hard			
5	A	36+	Cr	Soft sandy CLAY SHALE										
6														
7														
8														
9														
10														

#	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1				m f			NR			
2			Thick clay films on ped faces	f m			NR			
3		V many lime masses	Common clay films	f m			ST with masses V			
4		V many gyp threads + masses					NR			
5										
6										
7										
8										
9										
10										

USDA-NRCS 2-76 September 2002

USDA-NRCS PEDON DESCRIPTION

PEDON ID #: SL#19 — DRAFT 3/2002

Series or Component Name:	Map Unit Symbol:	Photo #:	Classification:	Soil Moist. Regime (Tax.):

Describer(s): King	Date: 8-15-11	Weather:	Temp.: Air: Soil: Depth:	Latitude: ° ' " N / Longitude: ° ' " W	Datum:	Location: Sec. T. R.

UTM: Zone: 13 mE: 551769 mN: 4970278	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:	MLRA / LRU:	Transect: ID: Stop #: Interval:	

Landscape: Rolling Hills	Landform: upland meadow	Microfeature:	Anthro:	Elevation: 3600	Aspect: S	Slope (%): 1	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) LL/LL

Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:

Drainage:	Flooding:	Ponding:	Soil Moisture Status:	Permeability: K_{sat}:	Land Cover / Use:

Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:

Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: 15% SS	Diagnostic Horz. / Prop.: Kind: Depth:

P. S. Control Section: Depth Range:	Ave. Clay %:	Ave. Rock Frag %:	

VEGETATION :

SYMBOL	COMMON NAME	% GD COVER
	GRLAND + PIPO	

MISCELLANEOUS FIELD NOTES / SKETCH :

S04° 12 441

Shovel check Only

Very shallow over clay CR
See #8 (?) × Hot Spot
2-3" over clay — Photo + Z of wetland + 1
East of Gulch more Across wet toward
like Louviers!

USDA-NRCS | **PEDON DESCRIPTION** | **PEDON ID #:** SL #20 | **DRAFT 3/2002**

Series or Component Name: Querc	Map Unit Symbol:	Photo #:	Classification:
Soil Moist. Regime (Tax.):			
Describer(s): King	Date: 8-15-14	Weather: Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W
Datum:	Location: Sec. T. R.		
UTM: Zone: 13T mE: 551631 mN: 4970416	Topo Quad:	Site ID: Yr: State: County: Pedon #:	Soil Survey Area:
MLRA / LRU:	Transect: ID: Stop #: Interval:		
Landscape: rolling Hills	Landform: meadow	Microfeature:	Anthro:
Elevation: 3610	Aspect: East	Slope (%): 1	Slope Complexity: Simple
Slope Shape: (Up & Dn / Across) LL/LL			
Hillslope Profile Position:	Geom. Component:	Microrelief:	Physio. Division:
Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area:
Drainage:	Flooding:	Ponding:	Soil Moisture Status:
Permeability: K_{sat}:	Land Cover / Use:		
Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth:	Lithostrat. Units: Group: Formation: Member:	
Erosion: Kind: Degree:	Runoff:	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: <1%	Diagnostic Horz. / Prop.: Kind: Depth:
P. S. Control Section: Ave. Clay %: Ave. Rock Frag %: Depth Range:			

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
ELSm	Grassland	

MISCELLANEOUS FIELD NOTES / SKETCH:

0-3
3-7
7-14
14-34

Component Name: [illegible] **Map Unit Symbol:** SL #20 **Date:** 8-15-14

	Obser. Method	Depth (in) (cm)	Horizon	Bnd.	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SP	0-3	A	CS	10YR 5/3	3/3	SCL 30	<1	gr					
2		3-7	Bt	gw	3/4	3/2	SCL 32	<1	3 m abk					
3		7-14	Cy		4/2	3/2	CLAY 40	3 shale chips						
4	A	14-34+	C		soft		clay	shale						
5														
6														
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth) Effer (agent) Clay % CCE	Notes
1				vn f/m		NR	
2			Thick clay films on ped faces	c m		NR	
3		Common soft gyp masses & threads	—	f f/m		NR	
4		" " "				NR	SL4 13 54
5							
6							
7							
8							
9							
10							

Addendum 2.7.3.45F

Soil Map 2.7.3.45-1