

Petroglyph Energy, Inc.
Well Pad Final Reclamation Evaluation

Well Name: Anselmo 18-04

Evaluation Date: July 14, 2015

Evaluated by: Lindsey Brandt; Senior Environmental Scientist; Habitat Management, Inc.

Current Condition

Overall, the Anselmo 18-04 pad has well-established vegetation, including perennial grasses and forbs with vegetation cover typical for the region. Dominant species on the pad include western wheatgrass (*Pascopyrum smithii*), little bluestem (*Schizachyrium scoparium*), hairy golden aster (*Heterotheca villosa*), and sand dropseed (*Sporobolus cryptandrus*). A small area on the steeper slope portion of the well pad is dominated by weedy species. There are also occasional patches of common mullein (*Verbascum thapsus*) and cheatgrass (*Bromus tectorum*), as well as abundant redstem stork's bill (*Erodium cicutarium*) on the pad, but these species are not currently inhibiting vegetation establishment outside of the slope area. Small areas of exposed sandstone are not problematic. A gravel pile occurs on site and is heavily infested with cheatgrass.

Three vegetation cover transects were collected on the pad (see map below) for comparison to reference transects collected from the surrounding undisturbed area with a similar soil type. Transect data are provided in the table below. Anselmo 18-04 shows 34% cover of desirable perennial vegetation (Table 1), while the reference area shows 58%. Eighty percent of the reference cover is 47% (58×0.8 , Table 2), which represents the level of cover required for successful revegetation of this site. These data indicate that the pad is progressing towards meeting revegetation bond release standards. Photographs of current conditions and vegetation transects are provided below.

Overall the pad is in great condition. A 2011 inspection by the COGCC indicated that the well pad had passed the requirements for final reclamation.

Recommended Actions

Areas infested with cheatgrass should be treated with an appropriate herbicide to reduce the infestation. Prior to herbicide application the site should be mowed to remove the standing dead annual vegetation and allow for effective soil contact of herbicides. A pre-emergent herbicide should be applied to prevent germination of this winter annual.

Common mullein rosettes should be treated in fall and spring with spot-applications of an appropriate broadleaf selective herbicide to prevent seed development and minimize its spread on the pad. Common mullein seed heads should be harvested in the fall of 2015 and properly disposed of offsite.

Finally, the small area on the slope should be re-seeded using a no-till drill or harrow and broadcast method to facilitate desirable vegetation establishment. The approved seed mix

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should be used at the approved target rate. Seeding can occur any time from late fall to early spring, as ground conditions allow. Following seeding this area should be mulched with Woodstraw at a target rate of 70% cover.

The gravel pile should be treated for cheatgrass for 2-3 consecutive years to deplete the seed bank, and then removed from the site. Use of the gravel in its current state will spread cheatgrass to other areas. After gravel removal the disturbed area should be seeded and mulched as described above. The mulch target application rate for this area is 60% cover.

After management activities are completed the site should be checked periodically to inspect for infestation by other noxious weeds and identify other issues that may arise and potentially impact successful reclamation.

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Table 1: Anselmo 10-04 Vegetation Transect Data

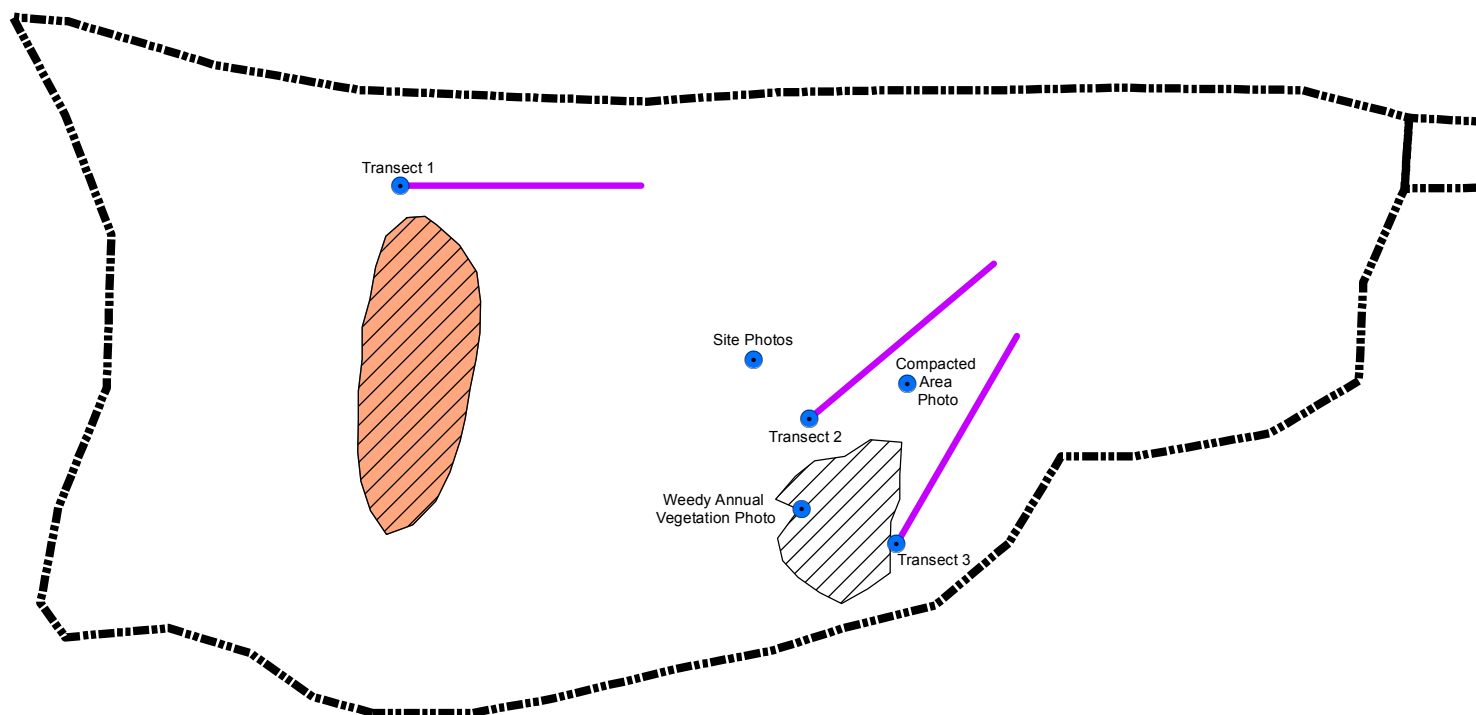
Genus	Species	Common Name	Hits				Average Absolute Cover (%)	Average Relative Cover (%)	Frequency (%)
			1	2	3	Total			
Grass & Grass-Like: Annual Undesirable									
Bromus	arvensis	field brome	p			0	0.00	0.00	33.33
Bromus	tectorum	cheatgrass	p			0	0.00	0.00	33.33
Subtotal						0	0.00	0.00	
Grass & Grass-Like: Perennial Desirable									
Achnatherum	hymenoides	Indian ricegrass	p	p	p	0	0.00	0.00	100.00
Bromus	inermis	smooth brome	p	1	p	1	0.67	1.69	100.00
Elymus	elymoides	squirreltail	p	p		0	0.00	0.00	66.67
Hespirostipa	comata	needle and thread	p			0	0.00	0.00	33.33
Pascopyrum	smithii	western wheatgrass	13	1	p	14	9.33	23.73	100.00
Schizachyrium	scoparium	little bluestem	1	7	2	10	6.67	16.95	100.00
Sporobolus	airoides	alkali sacaton	p			0	0.00	0.00	33.33
Sporobolus	cryptandrus	sand dropseed	p	3	3	6	4.00	10.17	100.00
Subtotal			14	12	5	31	20.67	52.54	
Total Graminoid Cover			14	12	5	31	20.67	52.54	100.00
Total Perennial Graminoid Cover			14	12	5	31	20.67	52.54	100.00
Forbs: Annual Desirable									
Helianthus	annuus	common sunflower	2	p	3	5	3.33	8.47	100.00
Subtotal			2		3	5	3.33	8.47	
Forbs: Annual Undesirable									
Chamaesyce	maculata	spotted sandmat			p	0	0.00	0.00	33.33
Erodium	cicutarium	redstem filaree	p	p	1	1	0.67	1.69	100.00
Melilotus	officinalis	sweetclover	p	p	p	0	0.00	0.00	100.00
Tragopogon	dubius	yellow salsify	p			0	0.00	0.00	33.33
Subtotal					1	1	0.67	1.69	
Forbs: Biennial Desirable									
Erigeron	pumilis	shaggy fleabane	p			0	0.00	0.00	33.33
Grindelia	squarrosa	curlycup gumweed	p	p		0	0.00	0.00	66.67
Subtotal						0	0.00	0.00	
Forbs: Biennial Undesirable									
Verbascum	thapsus	common mullein	p			0	0.00	0.00	33.33
Subtotal						0	0.00	0.00	
Forbs: Perennial Desirable									
Artemisia	carruthii	Carruth's sagewort	p	1		1	0.67	1.69	66.67
Artemisia	frigida	prairie sage	p	1	p	1	0.67	1.69	100.00
Heterotheca	villosa	false hairy golden aster	7	5	2	14	9.33	23.73	100.00
Ipomopsis	laxiflora	iron ipomopsis			p	0	0.00	0.00	33.33
Linum	lewisii	blue flax	p	p	1	1	0.67	1.69	100.00
Medicago	sativa	alfalfa			p	0	0.00	0.00	33.33
Mentzelia	nuda	bractless blazingstar	p	p	p	0	0.00	0.00	100.00
Sphaeralcea	coccinea	scarlet globemallow			p	0	0.00	0.00	33.33
Thelesperma	filifolium	stiff greenthread	p	2		2	1.33	3.39	66.67
Verbena	bracteata	bigbract verbena	p	p		0	0.00	0.00	66.67
Unknown	Asteraceae		0		p	0	0.00	0.00	33.33
Subtotal			7	9	3	19	12.67	32.20	
Forbs: Perennial Undesirable									
Convolvulus	arvensis	field bindweed	p		2	2	1.33	3.39	66.67
Subtotal					2	2	1.33	3.39	
Total Forb Cover			9	9	9	27	18.00	45.76	100.00
Total Perennial Forb Cover			7	9	5	21	14.00	35.59	100.00
Woody Species: Perennial Desirable									
Gutierrezia	sarothrae	broom snakeweed	p		1	1	0.67	1.69	66.67
Opuntia	phaeacantha	tulip pricklypear			p	0	0.00	0.00	33.33
Subtotal					1	1	0.67	1.69	
Total Shrub Cover			0	0	1	1	0.67	1.69	33.33
Total Vegetation Cover			23	21	15	59	39.33	100.00	100.00
Total Perennial Vegetation Cover			21	21	11	53	35.33	89.83	100.00
Total Ground Cover			44	40	30	114	76.00		100.00
Rock			1			1	0.67		33.33
Litter			20	19	15	54	36.00		100.00
Bare Ground			6	10	20	36	24.00		100.00
Total Hits			50	50	50	150	100.00		
Total Species			26	17	20				32.00
Total Perennial Species			19	15	16				22.00

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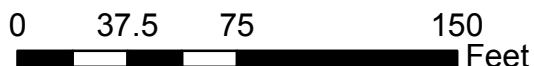
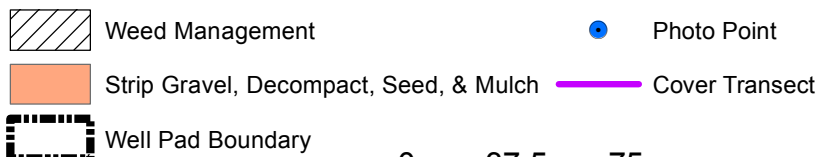
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Table 2: Reference Area C Vegetation Transect Data

GenusSpeciesCommon Name			Hits						Average Absolute Cover (%)	Average Relative Cover (%)	Frequency (%)	
			1	2	3	4	5	Total				
Grass & Grass-Like: Annual Desirable												
Vulpia	octoflora	sixweeks fescue	1	p	p	p		1	0.40	0.63	80.00	
Subtotal			1					1	0.40	0.63		
Grass & Grass-Like: Annual Undesirable												
Bromus	arvensis	field brome	5	p			1	p	6	2.40	3.75	80.00
Bromus	tectorum	cheatgrass		p					0	0.00	0.00	20.00
Subtotal			5				1		6	2.40	3.75	
Grass & Grass-Like: Perennial Desirable												
Aristida	purpurea	purple threeawn	4		5			p	9	3.60	5.63	60.00
Bouteloua	curtipendula	sideoats grama			1				1	0.40	0.63	20.00
Bouteloua	gracilis	blue grama	13	21	21	16	20	91	36.40	56.88	100.00	
Elymus	canadensis	Canada wildrye	p	p	p	1	p	1	0.40	0.63	100.00	
Elymus	elymoides	squirreltail	p	p	1	2	p	3	1.20	1.88	100.00	
Hespirostipa	comata	needle and thread			p	3	p	3	1.20	1.88	60.00	
Koeleria	macrantha	prairie junegrass			1	1		2	0.80	1.25	40.00	
Pascopyrum	smithii	western wheatgrass	4	6	p	p	1	11	4.40	6.88	100.00	
Schedonnardus	paniculatus	tumblegrass		1			1	2	0.80	1.25	40.00	
Sporobolus	cryptandrus	sand dropseed				p	1	1	0.40	0.63	40.00	
Subtotal			21	28	29	23	23	124	49.60	77.50		
Total Graminoid Cover			27	28	29	24	23	131	52.40	81.88	100.00	
Total Perennial Graminoid Cover			21	28	29	23	23	124	49.60	77.50	100.00	
Forbs: Annual Desirable												
Chenopodium	sp.	goosefoot	p					0	0.00	0.00	20.00	
Descurainia	pinnata	western tansymustard	p					0	0.00	0.00	20.00	
Helianthus	annuus	common sunflower			p			0	0.00	0.00	20.00	
Plantago	patagonica	woolly plantain	p	p	p	p	p	0	0.00	0.00	100.00	
Subtotal								0	0.00	0.00		
Forbs: Annual Undesirable												
Alyssum	desertorum	desert madwort					2	2	0.80	1.25	20.00	
Lactuca	seriola	prickly lettuce	p					0	0.00	0.00	20.00	
Melilotus	officinalis	sweetclover				1		1	0.40	0.63	20.00	
Tragopogon	dubius	yellow salsify	p					0	0.00	0.00	20.00	
Subtotal						1	2	3	1.20	1.88		
Forbs: Biennial Desirable												
Erigeron	pumilis	shaggy fleabane	p	p				0	0.00	0.00	40.00	
Grindelia	squarrosa	curlycup gumweed	p	1				1	0.40	0.63	40.00	
Subtotal				1				1	0.40	0.63		
Forbs: Perennial Desirable												
Artemisia	carruthii	Carruth's sagewort	2	p	p	3	3	8	3.20	5.00	100.00	
Artemisia	frigida	prairie sage		1	p	1		2	0.80	1.25	60.00	
Artemisia	tridentata	big sagebrush	p	p				0	0.00	0.00	40.00	
Erigeron	flagellaris	trailing fleabane		2			p	2	0.80	1.25	40.00	
Eriogonum	jamesii	James' buckwheat		1	p			1	0.40	0.63	40.00	
Heliomeris	multiflora	showy goldeneye		p	p		p	0	0.00	0.00	60.00	
Heterotheca	villosa	false hairy golden aster			p	p	p	0	0.00	0.00	60.00	
Lupinus	sp.	lupine				p		0	0.00	0.00	20.00	
Sphaeralcea	coccinea	scarlet globemallow	1	1	p			2	0.80	1.25	60.00	
Teucrium	laciniatum	lacy germander				1		1	0.40	0.63	20.00	
Thelesperma	filifolium	stiff greenthread	p		3		p	3	1.20	1.88	60.00	
Unknown	Asteraceae		0	1	1			2	0.80	1.25	40.00	
Subtotal			4	5	4	5	3	21	8.40	13.13		
Forbs: Perennial Undesirable												
Convolvulus	arvensis	field bindweed				2		2	0.80	1.25	20.00	
Subtotal						2		2	0.80	1.25		
Total Forb Cover			4	6	4	8	5	27	10.80	16.88	100.00	
Total Perennial Forb Cover			4	5	4	7	3	23	9.20	14.38	100.00	
Woody Species: Perennial Desirable												
Echinocereus	coccineus	scarlet hedgehog cactus	p	p	p			0	0.00	0.00	60.00	
Ericameria	nauseosa	rubber rabbitbrush	p					0	0.00	0.00	20.00	
Gutierrezia	sarothrae	broom snakeweed	1	p		1	p	2	0.80	1.25	80.00	
Opuntia	polyacantha	plains pricklypear	p		p		p	0	0.00	0.00	60.00	
Psoralidium	tenuiflorum	slimstem scurfpea			p			0	0.00	0.00	20.00	
Yucca	glauca	soapweed yucca			p	p		0	0.00	0.00	40.00	
Subtotal			1			1		2	0.80	1.25		
Total Shrub Cover			1	0	0	1	0	2	0.80	1.25	40.00	
Total Vegetation Cover			32	34	33	33	28	160	64.00	100.00	100.00	
Total Perennial Vegetation Cover			26	33	33	31	26	149	59.60	93.13	100.00	
Total Ground Cover			45	45	46	41	44	221	88.40		100.00	
Rock								0	0.00		0.00	
Litter			13	11	13	8	16	61	24.40		100.00	
Bare Ground			5	5	4	9	6	29	11.60		100.00	
Total Hits			50	50	50	50	50	250	100.00			
Total Species			23	20	23	19	18				42.00	
Total Perennial Species			20	18	23	16	16				29.00	



Management Activity	Acres
Weed Management	0.12
Strip, Rip, Seed & Mulch	0.08



Petroglyph Energy 2015

Anselmo 18-04



Evaluated: 7/14/15
Drawn: 7/31/15
Drawn By: RFB

Anselmo 18-04



Compacted area

Photo Date 7/14/2015

Lat: 37.5281104313

Long: -104.8307831352



Gravel pile on site with heavy cheatgrass

Photo Date 7/14/2015

Lat:

Long:



Looking East

Photo Date 7/14/2015

Lat: 37.5281335895

Long: -104.8309638998



Looking North

Photo Date 7/14/2015

Lat: 37.5281335895

Long: -104.8309638998



Looking South

Photo Date 7/14/2015

Lat: 37.5281335895

Long: -104.8309638998



Looking West

Photo Date 7/14/2015

Lat: 37.5281335895

Long: -104.8309638998



Transect 1

Photo Date 7/14/2015

Lat: 37.5282972189

Long: -104.8313786608



Transect 2

Photo Date 7/14/2015

Lat: 37.5280784197

Long: -104.8308985042

Anselmo 18-04



Transect 3

Photo Date 7/14/2015

Lat: 37.5279604202

Long: -104.8307961771



Weedy annual vegetation

Photo Date 7/14/2015

Lat: 37.5279932768

Long: -104.8309073445