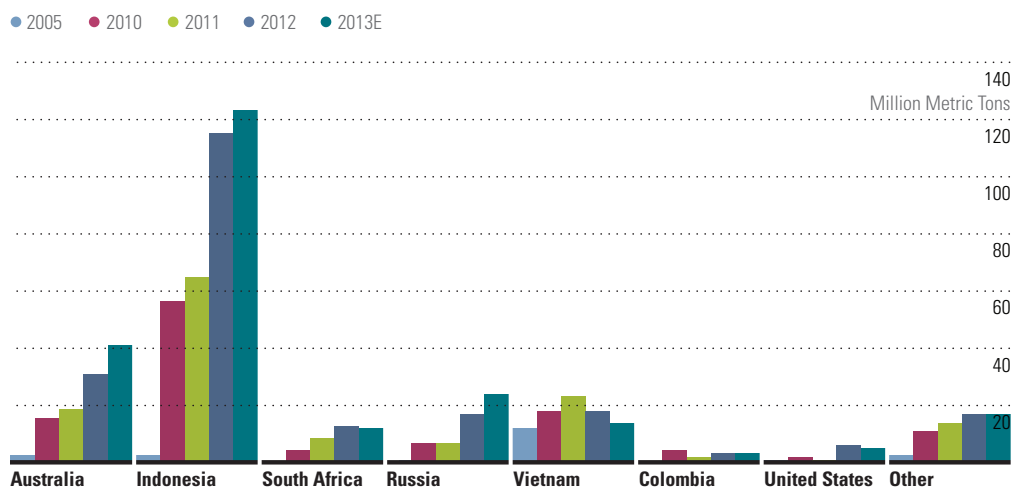


Exhibit 5 Chinese Coal Imports Surged as Dry-Bulk Shipping Rates Fell

Source: IEA, Morningstar

After Chinese imports ramped up in 2009, low-cost Indonesian miners began taking a greater share, accounting for over 50% of total Chinese imports by 2012. Australia comes in a distant second, at under 20% of the total. Australian exports were depressed in 2010-11 because of floods but rebounded in 2012. Despite weak coal prices in 2013, Australian exports continued to expand, as various mines are locked into take-or-pay contracts with railway and port owners. These contracts provide incentives for Australia to supply marginal coal at a loss, since it would cost less than reducing production. China's attractive coal market even pulled in 3 million metric tons of distant Colombian coal. Because of high transportation costs, imports from the United States have stayed low despite talk of exporting Powder River Basin coal.

Exhibit 6 Indonesia Accounted for the Majority of China's Incremental Imports
Chinese Thermal Coal Imports by Origin



Source: IEA, Morningstar

Comparably few Chinese provinces burn material quantities of imported coal. The ones that do, including Guangdong, Fujian, and Zhejiang, are on the coast, where foreign coal is the most cost competitive with domestic coal. As such, the market for imported coal is more modest than China's vast domestic coal market suggests.

China's future coal import needs will depend on whether imported coal continues to be the most cost-effective option for coastal utilities. While seaborne coal prices have declined significantly since 2011 highs, large quantities of imported coal remains cost-competitive against domestic coal being shipped down China's coast.

Chinese Imports Face Significant Headwinds

Five trends bode ill for the competitiveness of imports in southern China.

1. Improved domestic infrastructure will bolster the competitiveness of domestic coal.

High-cost Chinese producers tend to be in Inner Mongolia and transport coal expensively by truck. With the addition of the Menghua and Mengji railways by the end of 2018, Inner Mongolian miners that previously relied on expensive trucking will be able to bring an additional 300 million metric tons to the coastal market by rail, a greater quantity than all Chinese imports in 2013. The shift from trucks to rail will reduce the costs of marginal Chinese coal producers to deliver to southern China by about \$25.0-33.0 per ton (\$50.5-58.0 trucking cost per ton from Inner Mongolia minus \$25.0 per ton railway cost), potentially indicating a seismic shift in where China's supply will come from. We believe that these lower-cost domestic supplies will displace a significant portion of seaborne imports, especially from Australia.

2. New coal-fired capacity will mainly be built inland, not along the coast.

The State Council has already instructed large coastal cities such as Beijing, Shanghai, and Guangzhou to stop construction of new coal-fired power plants because of backlash over pollution. While China continues to build coal-fired power plants, they are largely far inland, where transportation costs would render imported coal uncompetitive.

3. Slower GDP growth along the coast than inland suggests lower electricity demand growth, and hence lower coal demand growth, in the regions that can use imported coal.

The inner provinces tend to have lower GDP per capita, indicating that they have more growth potential than coastal provinces.

4. There is a special push to build generation capacity in western China, where much of China's wind and hydro resources are found.

The electricity will be transmitted by ultra-high-voltage lines to demand centers across China. We estimate that this will displace 236 million metric tons of coal demand in the large population centers along the coast.

5. China's massive nuclear power program is concentrated entirely in coastal provinces.

We expect 44 new nuclear power plants to come on line by 2020, all on the coast. Assuming a 90% utilization rate, this implies 366 TWh of new nuclear power in China's coastal provinces by 2020, equivalent to 160 million metric tons of coal.

While Chinese coal consumption grew at 8.0% per year pace since 2000 to fuel China's investment-led growth boom, we believe that it will fall 0.3% per year through 2020 as the country rebalances to a more consumption-oriented economy. Simultaneously, we expect coal production to grow at a 1.8% compound annual rate from 2014-20. We expect imports to top out in 2014 and decline thereafter. By 2020, only low-cost Indonesian coal is likely to have a meaningful share of the southern China market.

China May Become a Net Exporter Again

In theory, coal that finds its way from northern China to its southern ports could easily serve Japanese and Korean customers as well. However, Chinese exports have fallen dramatically from their peak levels, more than 60 million metric tons in 2005 to under 10 metric tons in 2012. China's 10% export tax on coal probably contributes to Chinese coal not being cost-competitive against Australian and Indonesian coal in those markets.

Another limiting factor is that only four companies currently have coal export licenses: China National Coal Group, Shanxi Coal Import and Export Group, Shenhua, and China Minmetals. These restrictions on exporting coal were probably implemented to ensure that sufficient supply of coal was directed toward domestic consumption during China's electricity binge of the 2000s. While it is unlikely that the export tax will be lifted in 2014, we believe China might remove these barriers in later years if domestic production can wholly satisfy domestic consumption.

Intriguingly, the past few years of heavy coal imports by a coal-rich China may prove to be a historical anomaly. We see potential for China to revert to its status as one of the world's key coal exporters by 2017. Chinese coastal coal is already cheaper than most Australian coal based on delivered costs to southern China. Given Qinhuangdao's proximity to Japan and Korea, Chinese exports could threaten to displace higher-cost Australian exports, although Australian coal's superior quality may be its saving grace. ■■

Coal and the Environment: Clearer Skies Ahead

Daniel Rohr, CFA

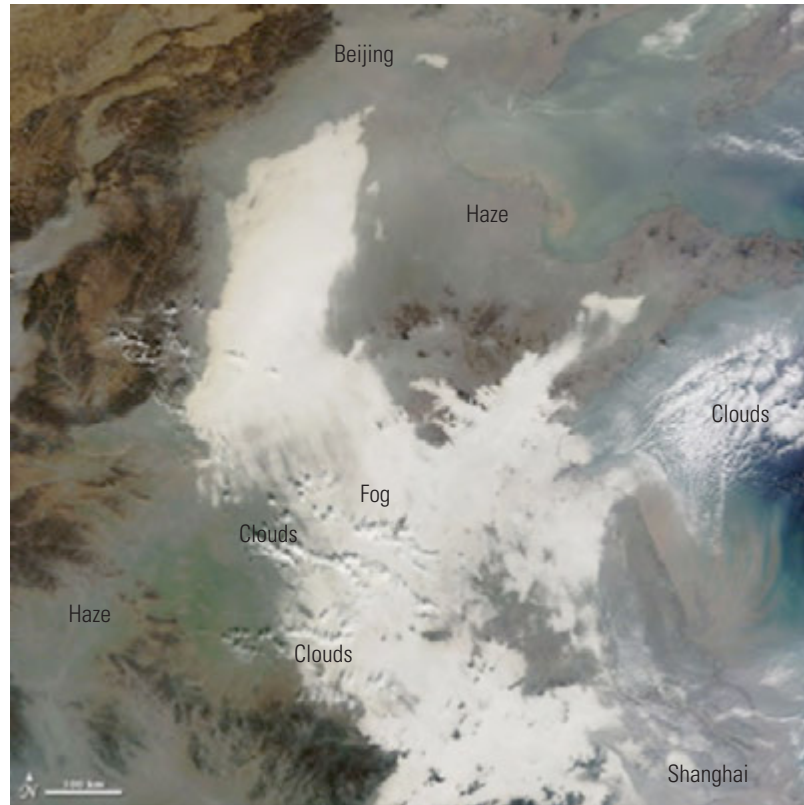
The High Price of Cheap Coal

China's reliance on cheap and plentiful coal to fuel its economic growth has had clear environmental consequences. Coal is not only China's single largest source of energy, it's also China's single largest source of air pollution.

The most prominent manifestation in daily life is the thick smog that frequently blankets China's major cities. Citizens take extraordinary measures to manage, donning surgical masks when outdoors and running a phalanx of home air purifiers when indoors. When the haze gets really bad, it disrupts daily life. Flights are grounded for lack of visibility, businesses close, and parents keep children home from school.

Pollution in Pictures

The visuals are arresting. Exhibit 1 shows a satellite image of eastern China, obscured by a brown blanket of pollution. The image was captured by NASA in December 2013 during an episode of extreme smog that, among other consequences, forced schools to close for seven days in Shanghai.¹ Exhibit 2 shows Beijing's Forbidden City in what appears to be an early morning mist fit for a movie set, but is actually a thick concentration of particulate matter.

Exhibit 1 Brown Haze Blankets Eastern China

Source: NASA

Exhibit 2 Beijing's Forbidden City Shrouded in Smog, not Mist

Source: Wikimedia commons

Pollution in Numbers

While not as visceral, statistical measures can be equally illuminating. The most commonly cited measure of air pollution in China is PM2.5, which refers to particulate matter less than 2.5 micrometers in diameter, or "fine particles." Put in perspective, that's less than one-thirtieth the width of a human hair, which is 70 micrometers across. Individual particles therefore aren't visible to the naked eye, but are readily apparent in high concentrations.

PM2.5 concentrations are expressed in micrograms per cubic meter, or $\mu\text{g}/\text{m}^3$. For example, a PM2.5 reading of 30 means a concentration of 30 micrograms of these particles in a cubic meter. PM2.5 readings can also be translated to a standardized Air Quality Index that facilitates comparison with other air pollutants.

Because these particles are small enough to be inhaled and accumulate in the respiratory system, they represent a serious health risk. According to the World Health Organization, prolonged exposure raises the risk of cardiovascular and respiratory diseases, as well as of lung cancer. A recent study published in *The Lancet*, a leading medical journal, attributes 1.2 million premature deaths annually to “ambient particulate matter pollution,” ranking behind only diet, high blood pressure, and smoking as risk factors in China. The scope and severity of the long-term health effects will become clearer with time.

Exhibit 3 shows the U.S. Environmental Protection Agency’s air quality standards for PM_{2.5} concentrations and the equivalent AQI figure. For example, the EPA classifies PM_{2.5} concentrations between 35.5 and 55.4 µg/m³ as “unhealthy for sensitive groups,” which corresponds to an AQI of 101–150. The World Health Organization, for its part, deems any PM_{2.5} reading exceeding 25 µg/m³ as unacceptable for a 24-hour period and anything above 10 micrograms per cubic meter unacceptable for a yearlong period.

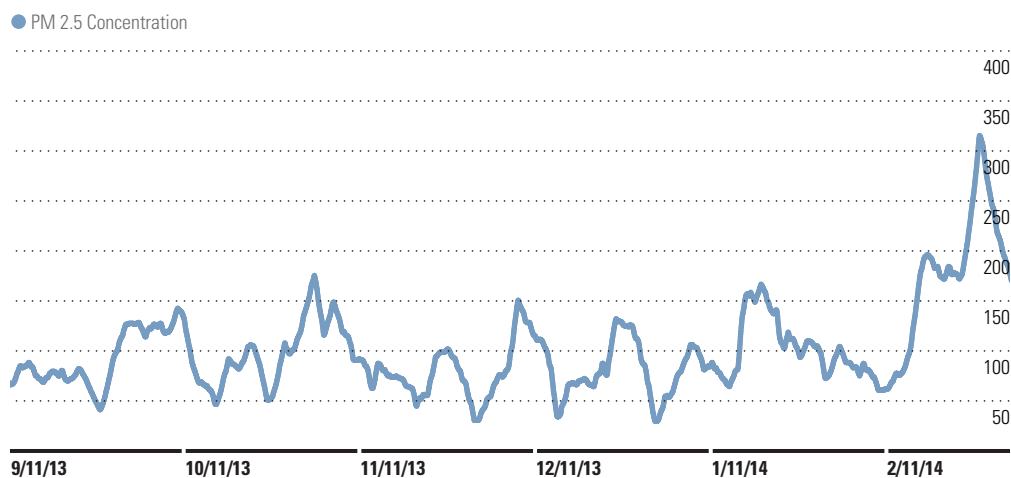
Exhibit 3 Air Quality Standards for Particle Pollution

Category	Concentration µg/m ³ (24 hr average)	Air Quality Index (AQI)	Health effects
Good	0–12	0–50	None
Moderate	12.1–35.4	51–100	Unusually sensitive people should consider reducing prolonged or heavy exertion.
Unhealthy for sensitive groups	35.5–55.4	101–150	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.
Unhealthy	55.5–150.4	151–200	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.
Very unhealthy	150.5–250.4	201–300	Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in general population.
Hazardous	250.5–500	301–500	Serious aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; serious risk of respiratory effects in general population.

Source: US Environmental Protection Agency

Major Chinese cities rate extremely poorly by EPA and WHO standards. Beijing provides the most prominent example of the particulate-laden air. We analyzed hourly data covering the 180 days to March 4 and found that Beijing residents enjoyed the equivalent of only 19 days with PM_{2.5} readings of what would be considered “good” (i.e., 12 µg/m³ or below). That compares with 108 days that would be considered “unhealthy” or worse (55.5 µg/m³ or above), including 21 days deemed “hazardous” (250.5-550 µg/m³), and roughly one day worth of readings literally off the EPA’s scale. Beijing’s average reading over this period was 114 µg/m³. Major U.S. cities like New York, Chicago, and Los Angeles each average about 10 to 12 µg/m³. The U.S. typically sees Beijing-level air quality only during forest fires.

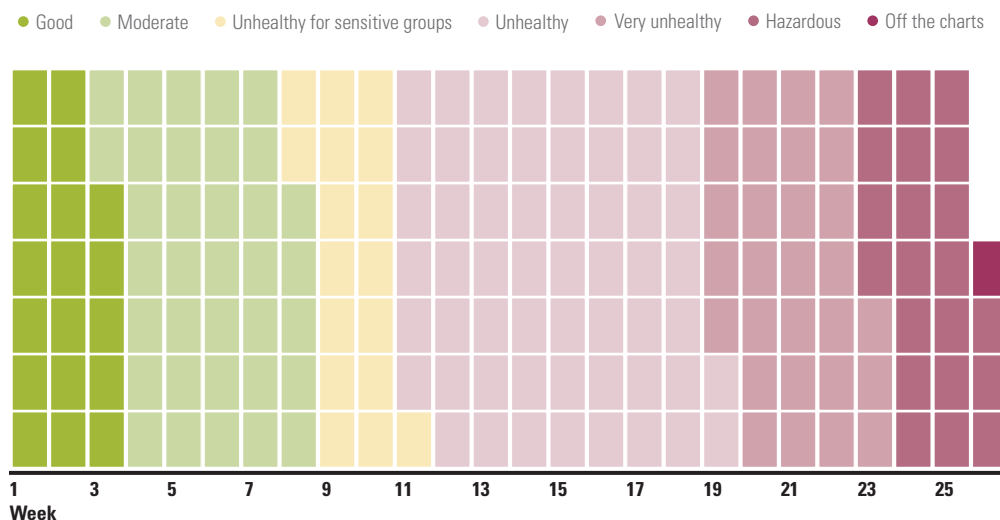
Exhibit 4 Hazardous Spikes in PM_{2.5} Concentrations Are Unfortunately Frequent
Beijing’s PM_{2.5} Readings, 1-week Moving Average



Source: U.S. Department of State, Morningstar

Exhibit 5 “Hazardous” Air Quality Days Outnumber “Good” Days in Beijing

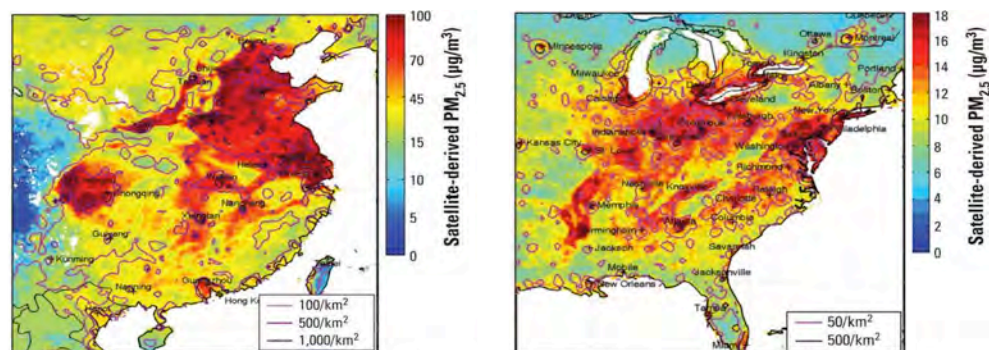
Six months of Beijing’s PM2.5 readings: Sept 4, 2013 to March 4, 2014



Source: U.S. Department of State, EPA, Morningstar

China’s air quality problem is not confined to Beijing. A January 2013 study by China’s Tsinghua University and the Asian Development Bank found fewer than five of China’s 500 largest cities meet the WHO’s standard of 25 $\mu\text{g}/\text{m}^3$ over a 24-hour period. In March 2014, Wu Shaoqing, China’s vice minister of environmental protection, said that only three of China’s 74 largest cities met national air quality standards.

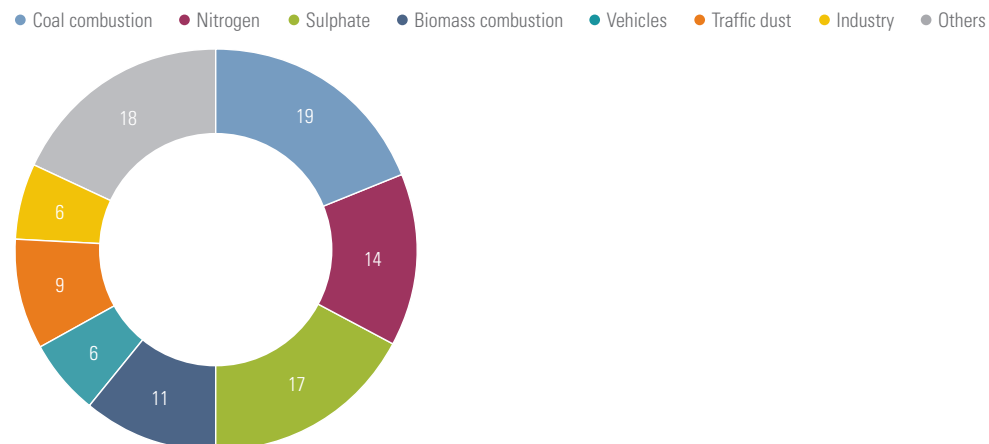
Researchers at Columbia, Dalhousie, and Yale have found that satellite data can proxy on-the-ground PM2.5 measurements, which are sparser in China than in the U.S. and Europe. Exhibit 6 compares their satellite-derived estimates of PM2.5 for China and the eastern U.S. In both cases, major population and industrial centers tend to have higher PM2.5 concentrations (orange, red, and dark red) than their rural neighbors (yellow, green, and blue). But notice the difference in scale required to draw comparisons within the two countries: A dark red reading for the U.S. (PM2.5 of 18 $\mu\text{g}/\text{m}^3$) would be equivalent to a light green reading in China. Nearly every Chinese city would be literally off the charts on the U.S. scale.

Exhibit 6 Bad Air Isn't Confined to Beijing

Source: van Donkelaar

Sources of Smog

Most studies, including a recent report by the prestigious Chinese Academy of Sciences, identify coal-fired power generation as the leading primary cause of smog and PM_{2.5} emissions in major Chinese cities. But it's not the only source. Motor vehicles (and poor-quality gasoline), coal used in household heating and cooking, as well as certain industrial activities such as cement production share the blame. Exhibit 7 breaks down the CAS report. Nitrogen and sulfur are listed as separate sources, because they are precursors to PM_{2.5}, but a portion of these are attributable to coal-fired generation as well.

Exhibit 7 Beijing PM_{2.5} by Source

Source: Chinese Academy of Sciences

Policymakers Take Aim at Coal

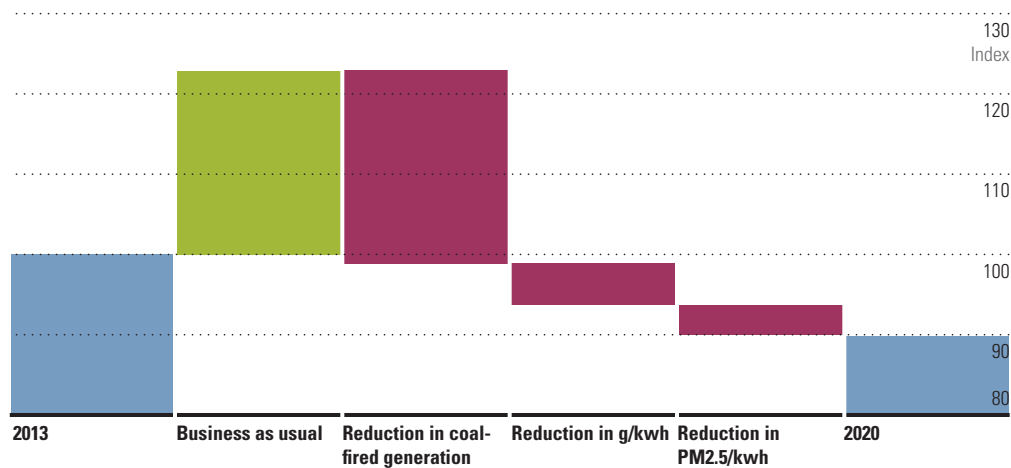
Coal's precise share of PM_{2.5} emissions remains debatable among academics. Similarly, measuring the exact long-term health risks posed by fine particles requires time. But public sentiment has already issued its verdict, and the Chinese government has begun to respond. In September 2013, the State Council, chaired by Premier Li Keqiang, released its Action Plan for Air Pollution Prevention and Control, which included a target of reducing nationwide particulate concentration by at least 10% through 2017.

For highly populated and more polluted areas, the State Council specified more aggressive targets: cuts of 25% in the vicinity of Beijing (including Hebei and Tianjin), 20% in the Yangtze River Delta (including Shanghai, Nanjing, and Hangzhou), and 15% in the Pearl River Delta (including Guangzhou and Shenzhen). To hit these targets, the State Council urged a cut in coal use and pressed for a ban on new coal-fired power plants. Beijing's municipal government responded by saying it will close all coal-fired power plants in the city by 2017.

Particulate emissions from coal-fired power generation fall 10% nationwide by 2020 in our base-case coal forecast. The decline is far greater than 10% in major cities along in coastal provinces, where we expect more significant reductions.

Two factors account for the improvement: a modest reduction in coal-fired generation and a continued trend toward larger and more efficient plants within the coal-fired fleet. Bigger and better plants improve PM_{2.5} emissions by reducing the amount of coal needed to generate a given

Exhibit 8 Falling Generation and More Efficient Plants Should Mean Slightly Cleaner Skies
PM_{2.5} emissions from coal-fired plants (2013=100)



Source: China Electricity Council, Electric Power Research Institute, Morningstar

amount of electricity (i.e., falling g/kwh) and reducing the PM2.5 emissions associated with that amount of electricity (i.e., falling PM2.5/kwh). Generally speaking, for each percentage point of efficiency gained, a plant emits a little over 2% less in particulate matter.

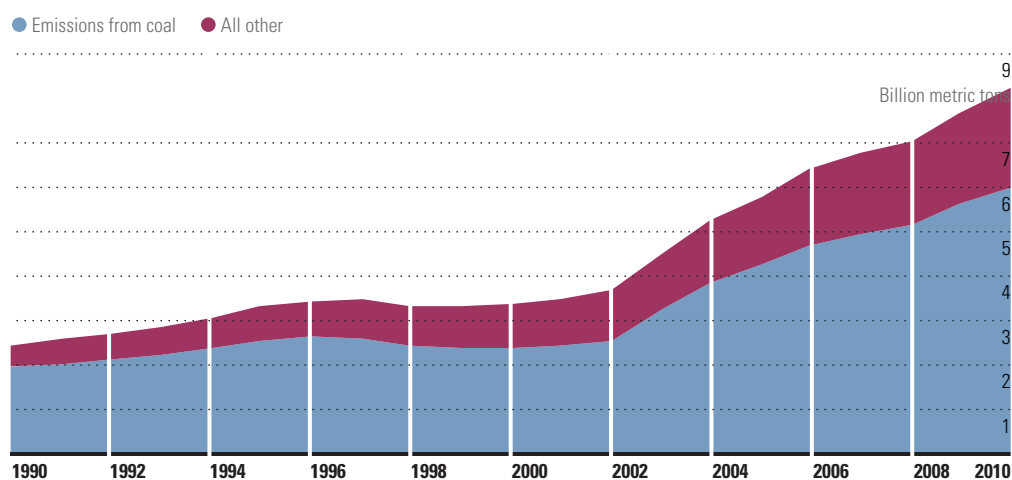
Coal Is Largely Responsible for China's Massive CO2 Emissions

While coal plays a prominent, if not dominant, role in darkening the midday skies over China's major cities, it is the majority source of carbon dioxide emissions. According to research by Oak Ridge National Laboratory, China's CO2 emissions from burning coal totaled roughly 6.0 billion metric tons in 2010. This figure, which includes coal burned for power generation as well as other uses, was equivalent to 72% of the country's 8.3 billion metric tons in total emissions. Within power generation, coal accounts for 98% of CO2 emissions.

China's CO2 emissions from coal increased 9.6% annually over the past decade, which is slower than the 12% annual growth in coal consumption and implies reduced carbon intensity of coal-fired power generation. The addition of more efficient plants to the fleet and the subtraction of less efficient plants explain the reduction.

China's total CO2 emissions increased 9.3% annually from 2000 to 2010, less than the 10.5% GDP growth rate enjoyed over the same period, implying reduced carbon intensity of the economy as a whole as well.

Exhibit 9 China's CO2 Emissions Are Mainly From Coal



Source: Oak Ridge National Laboratory

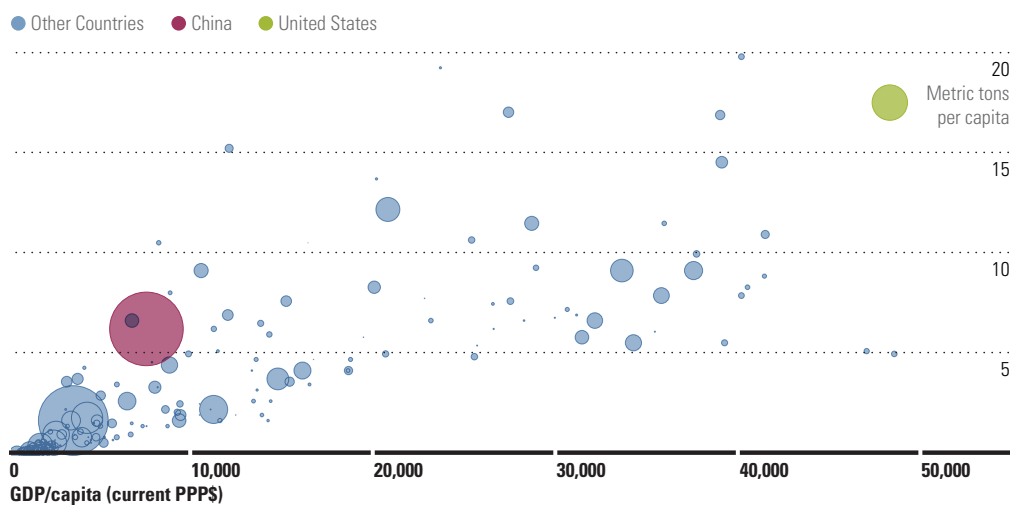
Falling carbon intensity did little to prevent China from overtaking the U.S. as the world's largest CO₂ emitter in 2006. At an estimated 8 billion metric tons of CO₂ in 2010, China is now far and away the world's largest emitter, accounting for 25% of the global total. The U.S. ranks second at a little more than 5 billion metric tons (16% of the world's emissions). In 2010, the difference between Chinese emissions and U.S. emissions was roughly equivalent to the total emissions of Japan, Germany, Korea, and the U.K. combined.

Exhibit 10 World's Top 10 CO₂ Emitters in 2010

	CO ₂ emissions (billion tons)	% world total
China	8.3	24.7
United States	5.4	16.2
India	2.0	6.0
Russian Federation	1.7	5.2
Japan	1.2	3.5
Germany	0.7	2.2
South Korea	0.6	1.7
Canada	0.5	1.5
United Kingdom	0.5	1.5
Saudi Arabia	0.5	1.4

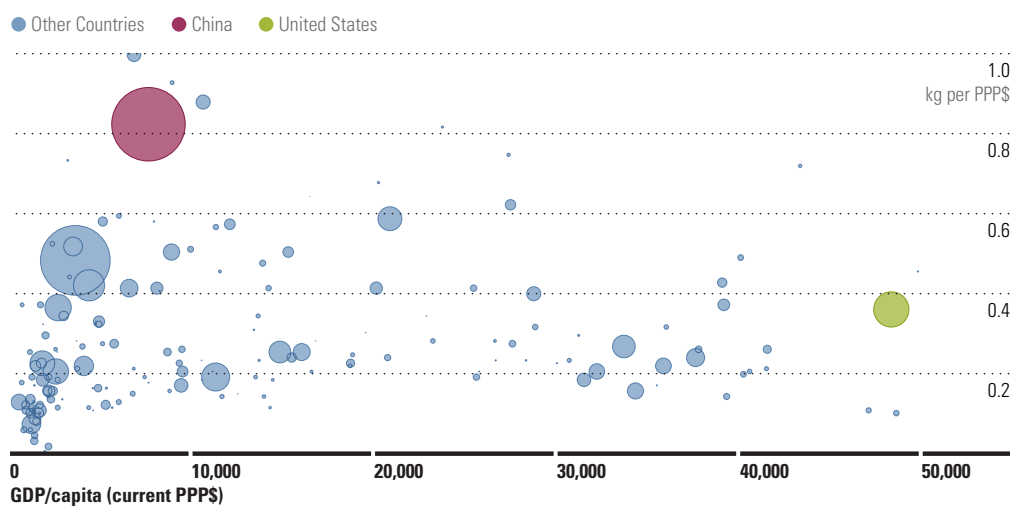
Source: Oak Ridge National Laboratory

Some of this is a function of China's enormous population, which at 1.36 billion is the world's largest. And as shown in Exhibit 11, on a per capita basis, China's emissions (6.2 kilograms) are far less than its rich world counterparts in the region (Korea at 11.5 kg, Japan at 9.2 kg), much less the U.S., which weighs in at a staggering 17.6 kg per head.

Exhibit 11 CO₂ per Capita, China and the Rest of the World, 2010

Source: Oak Ridge National Laboratory, World Bank, Morningstar

Still, as shown in Exhibit 12, China's economy looks very carbon-intensive when measured against its GDP, even after adjusting for income level. China emits roughly twice as much CO₂ per unit of GDP than the typical middle-income country. Emissions per unit of GDP are 127% more than the U.S.

Exhibit 12 CO₂ Intensity of GDP, China and the Rest of the World, 2010

Source: Oak Ridge National Laboratory, World Bank, Morningstar

Rebalancing the economy will reduce the carbon intensity of Chinese GDP, and emissions will be far less than most expect.

China's unusually high carbon intensity of GDP is a function of three factors:

1. High industry share of GDP

As we saw in Electricity Demand, the industrial sector accounts for an outsized share of China's economic output, with a comparably small services sector for a country of its income level. Industry is six times as electricity intensive as services in China.

2. Industrial sector geared to electricity-intensive activities

The output of China's industrial sector is heavily oriented to meeting the needs of the country's investment boom, including steel and cement, which translates to unusually high electricity intensity for the industrial sector itself.

3. High coal share of electricity generation

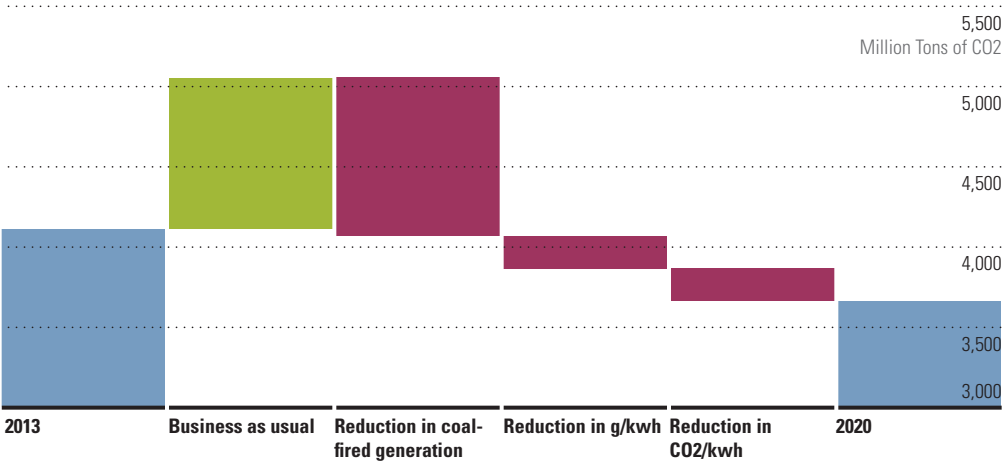
Coal is the dominant fuel source that keeps the economy moving, at a 67% share of total energy use and 74% share of total electricity generation. Coal is a highly carbon-intensive power source. Generating a kilowatt of electricity from coal produces 860 grams of CO₂, which is 35% more than oil and 115% more than natural gas. For all intents and purposes, nuclear, solar, wind, and hydro are close to carbon-free once installed.

We expect China's economic rebalancing to drive a significant drop in China's carbon intensity, and greatly diminished growth in CO₂ emissions. As discussed in "Electricity Demand," we expect the industrial sector to account for a falling share of economic output and investment a more modest share of expenditures. Both of these developments augur lower growth in electricity demand. And as discussed in Coal Demand, because of Beijing's big push into the "all of the above" strategy of nuclear, solar, wind, and hydro, coal's share of what's left will fall. Coal-fired generation declines slightly. Meanwhile, bigger and better coal plants reduce the coal needed to generate that power and cut the CO₂ emitted for each unit of power.

Putting some numbers to it, we expect CO₂ emissions from China's coal-fired power plants, which account for roughly half of the country's total emissions, to fall from about 4.1 billion metric tons to 3.7 billion metric tons by 2020. By contrast, the IEA's Current Policies and New Policies scenarios envision further emissions growth: to 5.1 billion and 4.5 billion metric tons, respectively.

Notably, we forecast that China will achieve the emission reduction contemplated in the IEA's 450 Scenario. Whereas this scenario imposes policy changes necessary to limit the increase in global temperatures to 2 degrees Celsius, our forecast achieves the outcome mainly by the falling electricity intensity that comes with a rebalancing economy.

Exhibit 13 Nonstop Ascent of Coal Plant CO2 Emissions to Reverse



Source: World Bank, IEA, Morningstar

Falling CO2 emissions from coal-fired generation drive a 9% reduction in the power sector’s overall CO2 emissions in our base-case outlook from 2013 to 2020, despite a 23% increase in China’s total electricity generation over the same interval.

Exhibit 14 Falling Coal-Fired Generation and More Efficient Plants Mean Lower CO2 Emissions

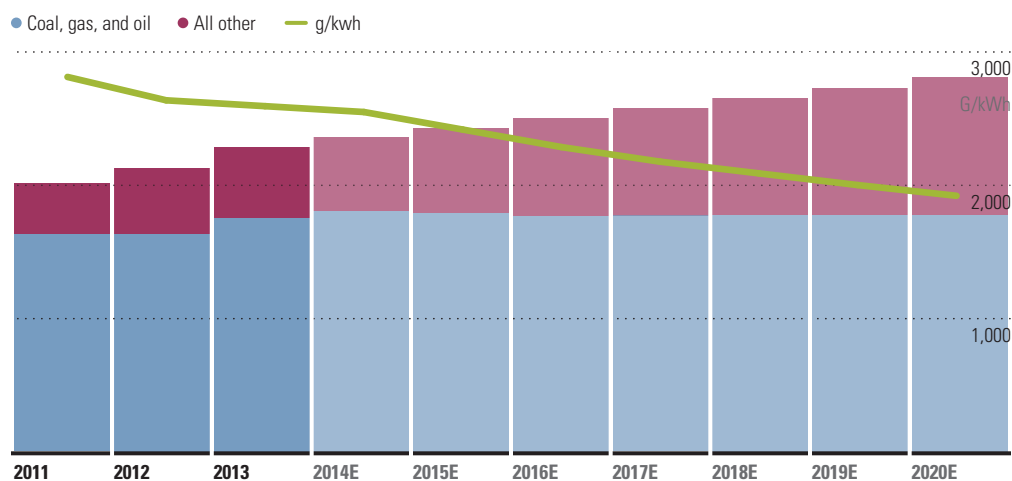
CO2 emissions from power generation, million metric tons

	2013	2020			
		Morningstar	IEA 450	IEA NP	IEA CP
Coal	4,112	3,669	3,693	4,495	5,086
Oil	18	18	17	18	19
Gas	58	111	153	139	133
Total	4,188	3,798	3,863	4,652	5,238

Source: World Bank, IEA, Morningstar

Beijing's "all-of-the-above" strategy drives the divergent trajectories of emissions and power generation. The carbon intensity of China's electricity generation drops 26% from an estimated 782 g/kwh in 2013 to 577 g/kwh in 2020. ■■

Exhibit 15 China's Carbon Intensity Falls As Its Power Generation Rises



Source: World Bank, IEA, Morningstar

1 The state-owned Global Times newspaper noted in December 2013 that this could prove beneficial to military defense: "Smog may affect people's health and daily lives... but on the battlefield, it can serve as a defensive advantage in military operations."

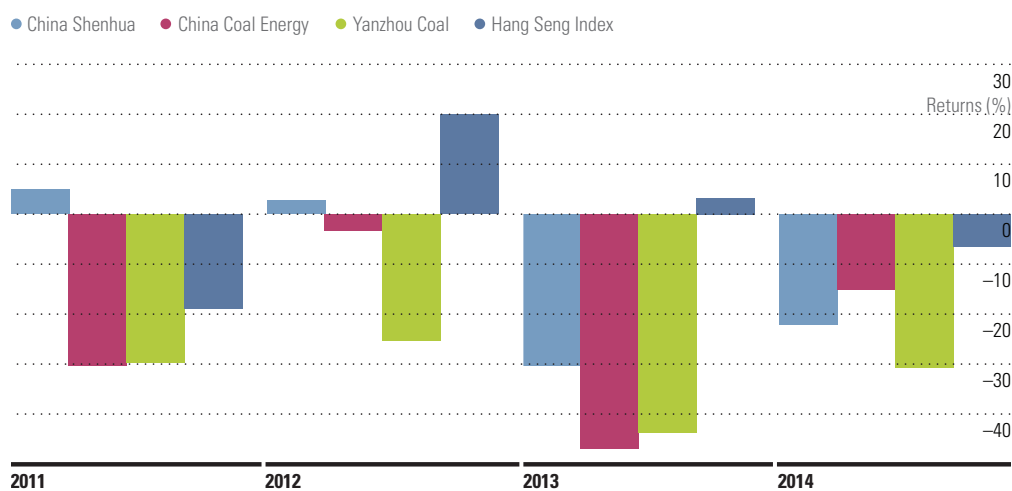
Chinese Coal Miners: No Place to Hide

Zhao Hu

Laggards With More Room to Fall

The Hong Kong-listed stocks of China Shenhua, China Coal Energy, and Yanzhou Coal have significantly underperformed the broader Hang Seng Index in each of the last four years. And with a coming downturn in coal prices testing coal miners, the situation for shareholders is unlikely to improve in the next several years.

Exhibit 1 Chinese Coal Miners Have Underperformed the Hang Seng Benchmark

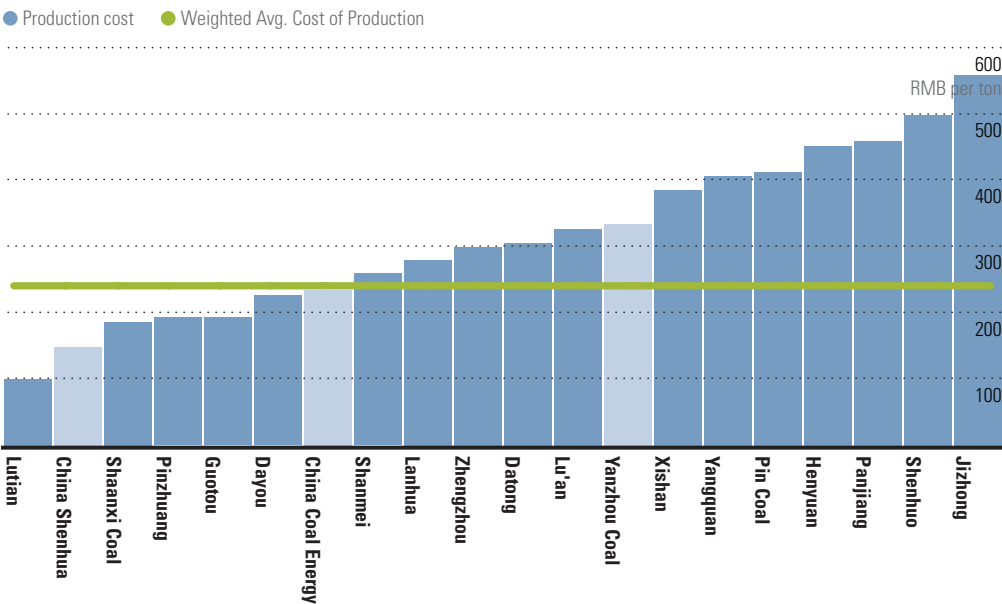


Source: Morningstar

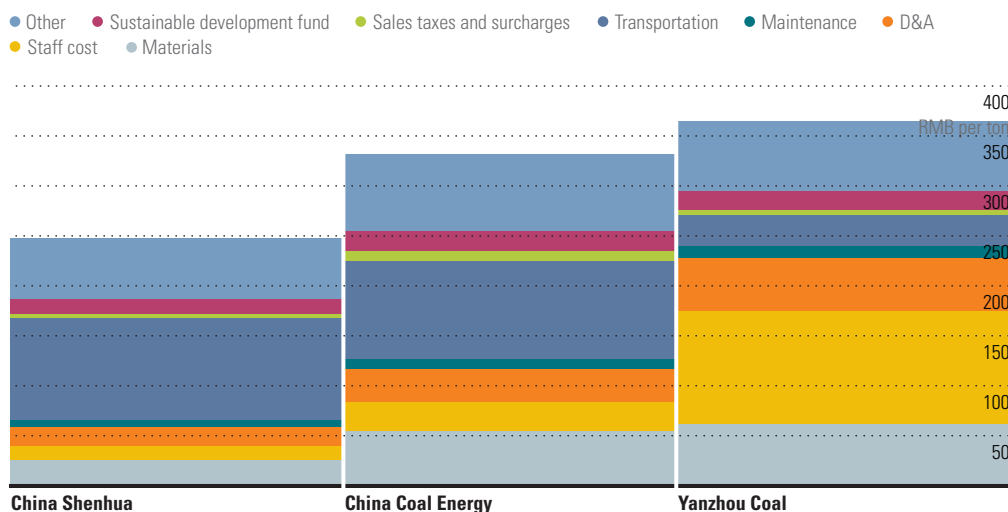
We expect significant new rail capacity to unleash latent low-cost supply from Inner Mongolia and Shaanxi on central and coastal China, flattening the cost curve and squeezing out more marginal producers. We forecast long-term prices roughly 18% below 2013's already-depressed levels and no sustained price recovery since ample spare mining and freight capacity would probably curtail any rally.

Of the Chinese coal miners we cover, we believe China Shenhua is best prepared for the difficult times ahead, thanks to low costs and vertical integration. Yanzhou is the most exposed to a persistently weak price environment.

Exhibit 2 Production Costs of the Top 20 Publicly Traded Coal Miners



Source: Company filings, Morningstar
Note: China assets only

Exhibit 3 Cost breakdown

Source: Company filings, Morningstar

China Shenhua's Moaty Business Partly Diminishes Downside Risk to Shares

Though lower coal prices will drag on all miners' earnings, China Shenhua's very low costs (the basis of our narrow economic moat rating) should dampen the bottom-line blow compared with companies such as China Coal Energy or Yanzhou Coal, which are much more sensitive to coal price swings.

China Shenhua, whose assets rank among the world's largest and most efficient and productive, operates five large-scale and highly mechanized mining areas in Inner Mongolia, Shanxi, and Shaanxi. Its large and high-quality reserve base, low mining cost, and integrated transportation network should help it deliver sustainable economic profit for the next decade.

At CNY 130 per ton of mining costs (about \$20) and CNY 250 per ton in total delivered costs to Huanghua port (about \$40 per ton) Shenhua's output sits on the lowest quartile of the Chinese cost curve, enabling it to earn economic profit under our forecast of CNY 480 per ton.

Lower Coal Prices and a Big Bet on Unproven Coal-Conversion Technology Spell Trouble for China Coal Energy

With ample profits earned from attractive mining assets grandfathered from its state-owned parent, China Coal Energy should have returned them to the shareholders. Instead, it is betting big on technologies that convert coal to chemicals and plastic.

China Coal owns and operates the Antaibao and Anjialing mines in Shanxi Province, two of China's largest coal-mining operations. With its fully mechanized mining process and outstanding recovery rate (95% versus 30% industry average), China Coal's mining costs have trended consistently at CNY 200-CNY 220 per ton (which is the middle of the cost curve) for the past four years. This compares favorably to the industry marginal cost of CNY 400-CNY 450 per ton.

However, China Coal's loss-making coke, coal chemicals operations, and mining and exploration rights account for more than 50% of overall assets and depress its returns on invested capital. The coke and coal chemicals businesses have very low entry barriers and margins. And because of the excess capacity in these industries, even leading urea and coke producers are hard-pressed to be profitable.

Given our outlook for lower coal prices, the poor economics of its new investments, and its leveraged balance sheet, the state-owned giant is likely to struggle.

Yanzhou Suffers From Geological Headwinds at Home, Bad Acquisitions Abroad

Blessed with a rail network and an extremely favorable location in Shandong Province, Yanzhou Coal was a cash cow during the mining boom. But with a mature production base and a deteriorating cost position at home, Yanzhou sought growth via acquisitions abroad, paying a hefty sum for Australian assets near the peak of the market. The assets are poorly positioned on the seaborne cost curve, and the acquisition materially transformed Yanzhou's cost profile for the worse. Yanzhou has the least competitive costs of the Chinese coal miners we cover.

The firm's domestic mines account for roughly 60% of its coal production, reserves, and assets, but they are showing their age. Although the company has plenty of coal—enough to last 40 years—its supply of the best-quality, easiest-to-mine coal is dwindling. Yanzhou's raw coal production in Shandong declined from 43 million tons in 2003 to 33 million in 2012, despite continuous capital investments. Costs are rising, too, as the company accesses deeper reserves and more difficult geology, complies with safety regulations, and pays more to remediate subsidence damage. In CNY terms, cash mining costs per ton nearly quintupled over the past decade. In the past five years, the rise in coal prices more than compensated for higher costs: The company posted a 14% return on invested capital as coal prices peaked in 2011, but this is hardly impressive given how high coal prices were at the time.

Yanzhou's Australian mining assets account for roughly 29% of its overall production. In 2011 and 2012, respectively, it acquired Felix and Gloucester, two large coal miners in Australia. Despite the size of these mines, the materially higher wages and transportation costs compared with Yanzhou's Chinese operations have significantly damaged the firm's overall cost position. We estimate that the marginal cost of producing at its Australian coal mines surpass CNY 450 per ton before freight. We expect these operations to struggle mightily going forward.

With peak coal prices behind us, we are increasingly worried about Yanzhou Coal's financial health. Net gearing rose to 92% in 2013's first half from 62% as of the end of 2010. EBITDA coverage over interest expense fell from 6.1 times in 2012 to an anticipated 3.3 times in 2013 as a result of a double-digit drop in coal prices. Compounding matters, amid weak pricing, the company has experienced difficulty collecting cash from its contract sales. **■**

Exhibit 4 Company Profiles

	China Shenhua	China Coal Energy	Yanzhou Coal
Ticker	1088.HK	1898.HK	1171.HK
Analyst	Hu	Hu	Hu
Morningstar ratings			
Star rating	★★★	★★	★★★
Economic moat	Narrow	None	None
Economic moat trend	Stable	Stable	Stable
Equity uncertainty	High	Very High	Very High
Equity stewardship	Exemplary	Poor	Poor
Valuation			
Morningstar fair value estimate	25.00	2.50	5.00
Share price	22.60	4.33	5.92
Price-to-Earnings	7.98	11.94	4.74
Price-to-Book	1.07	0.45	0.53
EV-to-EBITDA	4.56	8.41	13.16
Financial highlights (CNY millions, 2013)			
Revenue	283,797	82,316	56,402
EBITDA	90,303	11,287	5,147
% margin	31.82	13.71	9.13
Cash from operations	54,288	6,787.864	-2,201.058
Capital expenditures	51,148	25,375	10,221
Free cash flow	3,140	-18,587	-12,422
% margin	1.11	-22.58	-22.02
Capital structure (CNY millions, year-end 2013)			
Gross debt	90,527	69,963	55,375
Less: cash	38,332	21,021	10,923
Equals: Net debt	52,195	48,942	44,452
Plus: Market equity (April 4, 2014)	359,611	45,929	23,292
Equals: Enterprise value	411,806	94,871	67,744
Net debt-to-EV %	13	52	66
Debt-to-EBITDA	1.00	6.20	10.76
Revenue share by business line (%)			
Coal	47	86	95
Coal chemicals	2	2	2
Railway and transport	21	0	1
Power generation	26	0	0
Others	4	12	2
Resources and production (million metric tons)			
Marketable reserves	8,725	n/a	n/a
Recoverable reserves	14,838	n/a	2,902
Resources	24,971	19,460	4,597
Production (2013)	318	119	66
Marketable reserve life (years)	47	n/a	44

Source: Company filings, Morningstar

Note: All valuation measures as of April 4, 2014.

Appendix

China Power Demand Model	2011	2012	2013	2014e	2015e	2016e	2017e	2018e	2019e	2020e
Electricity demand										
GDP (PPP, bil 2005\$)	9,971	10,748	11,573	12,151	12,759	13,397	14,067	14,770	15,509	16,284
growth (%)	9.3	7.8	7.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Electricity intensity (kwh/ bil 2005\$)	0.44	0.44	0.44	0.43	0.42	0.41	0.40	0.40	0.39	0.38
growth (%)	3.0	-1.9	-0.2	-1.8	-1.8	-1.9	-1.9	-2.0	-2.0	-2.0
Electric power consumption (TWh)	4,433	4,686	5,037	5,193	5,352	5,514	5,678	5,846	6,016	6,188
growth (%)	12.6	5.7	7.5	3.1	3.1	3.0	3.0	2.9	2.9	2.9
T&D losses (TWh)	298	301	320	331	342	352	362	373	384	395
as % of production	6.3	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Electricity production (TWh)										
Coal	3,707	3,719	3,985	4,080	4,038	3,961	3,957	3,962	3,949	3,937
Hydro	668	856	888	891	907	940	990	1,041	1,091	1,142
Gas	109	109	117	133	159	178	189	201	212	224
Nuclear	87	98	112	147	242	326	362	391	436	483
Oil	6	5	6	6	6	6	6	6	6	6
Wind	74	103	144	148	201	288	338	388	438	488
Solar	1	4	14	25	42	63	89	117	147	178
Other	79	92	92	94	99	104	109	114	120	126
Total	4,731	4,987	5,357	5,524	5,693	5,866	6,041	6,219	6,400	6,583
Generation capacity (GW)										
Coal	714	759	798	832	823	807	807	808	805	803
Hydro	233	249	280	285	290	306	322	338	354	370
Gas	34	37	39	48	56	60	64	67	71	75
Nuclear	13	13	14	23	38	45	47	52	59	64
Oil	3	3	3	3	3	3	3	3	3	3
Wind	46	61	75	93	115	137	159	181	203	225
Solar	2	3	18	31	46	66	86	106	126	146
Other	17	21	35	37	39	40	42	45	47	49
Total	1,062	1,147	1,263	1,351	1,410	1,464	1,530	1,599	1,668	1,734
Generation capacity net adds (GW)										
Coal	43	45	40	33	-8	-16	-1	1	-3	-3
Hydro	20	16	31	5	5	16	16	16	16	16
Gas	15	3	2	8	8	4	4	4	4	4
Nuclear	2	0	1	9	15	7	3	5	7	5
Oil	2	0	0	0	0	0	0	0	0	0
Wind	15	15	14	18	22	22	22	22	22	22
Solar	#N/A	1	15	13	15	20	20	20	20	20
Other	#N/A	4	14	2	2	2	2	2	2	2
Total	115	84	117	88	59	54	65	69	68	66
Utilization (%)										
Coal	59	56	57	56	56	56	56	56	56	56
Hydro	33	39	36	36	36	36	36	36	36	36
Gas	36	33	34	35	35	35	35	35	35	35
Nuclear	79	89	92	90	90	90	90	90	90	90
Oil	20	20	21	21	21	21	21	21	21	21
Wind	18	19	22	20	22	26	26	26	26	26
Solar	3	12	9	12	13	13	14	14	15	15
Other	54	51	30	30	30	30	30	30	30	30
Total	51	50	48	47	46	46	45	44	44	43

Appendix (continued)

China Coal Demand Model	2011	2012	2013	2014e	2015e	2016e	2017e	2018e	2019e	2020e
Supply (Mt)										
Coal production	2,909	3,039	3,086	3,119	3,179	3,252	3,340	3,380	3,434	3,494
growth (%)	8.5	4.4	1.6	1.1	1.9	2.3	2.7	1.2	1.6	1.8
Net imports	119	209	238	258	184	80	-11	-56	-133	-233
Stock changes	-68	-161	0	0	0	0	0	0	0	0
Total coal supply	2,960	3,087	3,324	3,377	3,363	3,332	3,329	3,324	3,301	3,262
growth (%)	9.7	4.3	7.7	1.6	-0.4	-0.9	-0.1	-0.2	-0.7	-1.2
Demand (Mt)										
Electricity production from coal (TWh)	3,707	3,719	3,985	4,080	4,038	3,961	3,957	3,962	3,949	3,937
Coal plant efficiency (g/kwh)	474	468	462	459	455	452	449	446	442	439
growth (%)	-0.8	-1.2	-1.2	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7
Coal demand from power sector	1,755	1,740	1,842	1,872	1,839	1,791	1,776	1,765	1,747	1,729
growth (%)	13.6	-0.8	5.8	1.6	-1.7	-2.6	-0.8	-0.6	-1.0	-1.0
Industry	615	648	701	738	769	799	828	849	860	853
Metals (iron, steel and mining)	160	165	177	184	190	195	200	202	202	202
Chemicals & other coal conversion	76	82	89	97	104	113	122	130	133	134
Non-metallic minerals	240	253	277	288	299	308	316	319	319	303
Others industrial	140	148	158	169	176	183	190	198	205	214
Residential	86	83	79	76	73	70	67	63	60	57
Other	345	356	356	345	335	324	312	299	287	276
Coal demand from nonpower sector	1,046	1,086	1,136	1,159	1,177	1,194	1,206	1,212	1,207	1,186
growth (%)	5.3	3.8	4.6	2.0	1.6	1.5	1.0	0.5	-0.4	-1.7
Statistical adjustment	159	260	347	347	347	347	347	347	347	347
Total coal demand	2,960	3,087	3,324	3,377	3,363	3,332	3,329	3,324	3,301	3,262
growth (%)	9.7	4.3	7.7	1.6	-0.4	-0.9	-0.1	-0.2	-0.7	-1.2
Price (real CNY/ton)	814	703	582	525	510	500	493	480	480	480
Price (nominal CNY/ton)				525	523	525	531	530	543	557
Inflation (%)					2.5	2.5	2.5	2.5	2.5	2.5

Sources: SX Coal, IEA, Morningstar

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Footnote 26

Common School Trust Coal Ownership
Township 3 South, Range 45 East, Sections 26, 34 and 36
Township 4 South, Range 45 East, Sections 2, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26 and 36
9,543 acres
Powder River County
Common School Trust

Action Requested

The department requests Land Board authorization to distribute and solicit public comment on the Montana Otter Creek State Coal Valuation Report.

Brief Background

The Otter Creek tracts are the end product of the controversy over the proposed Crown Butte Mine. The Crown Butte mine was to be located near Yellowstone Park, but did not involve state trust land. Because of the controversial location, the Federal government bought out the mining rights in order to prevent the operator from obtaining a mining permit from the Montana Department of Environmental Quality. The State of Montana argued this Federal action hurt Montana through loss of jobs and taxes that would have been generated if the mine had been allowed to proceed.

The Federal government subsequently passed legislation that would convey to the State, either \$10 million in cash, the Otter Creek tracts, or other mineral rights agreed to by the State and Federal government. The State chose the Otter Creek tracts. They are located about 10 miles southeast of Ashland, Montana. Otter Creek flows northward through the Otter Creek tracts to its confluence with the Tongue River at Ashland. The Custer National Forest is adjacent to the Otter Creek tracts on both the east and west sides, with the eastern boundary of the Northern Cheyenne Reservation (Tongue River) approximately 10 miles to the west. The Otter Creek project area is currently viewed as containing up to three adjacent areas of potential reserves, which are referred to as “Otter Creek 1,2, and 3.”

The Federal conveyance to the State was approved by the State Land Board on May 20, 2002, and certified by the Governor’s Executive Order No. 12-02 on May 28, 2002. The Federal conveyance includes only mineral estate; no surface ownership was transferred. Pursuant to Article X, Section 2 of the Montana Constitution, these tracts became part of the common (i.e. public, K-12) school trust. Surface ownership is a combination of retained Federal and private ownership. The tracts conveyed to the State total 7,623 acres and are depicted on the attached map in dark blue. The State already possessed some state school trust ownership within the Otter Creek area, which are depicted in lighter blue. This brings the State’s full ownership interest to about 9,543 acres.

Prior to the Federal conveyance of the Otter Creek tracts, the Land Board entered into a February 19, 2002 Settlement Agreement with the Northern Cheyenne Tribe (NCT). The NCT had

threatened to file suit against the Federal government opposing the transfer, unless the State entered into an agreement with NCT. This agreement places certain restrictions on any coal leases that may ultimately be issued by the Land Board.

Property Information

State recoverable coal totals 616 million tons, or about one-half of the total 1.3 billion ton reserve. Of that, 572.3 million tons is unleased. Initial capital investment to develop the property is estimated at \$1.0 billion.

Anticipated coal quality in the Otter Creek area is 8,600 btu/lb, with relatively low sulfur (i.e. “compliance” coal), which is good, but with relatively high sodium content. The higher sodium content limits existing markets to those plants in the upper mid-West that possess boilers and related equipment that can handle high sodium coal. To reach these markets, the mine area would need rail access to the north (the northern portion of proposed Tongue River railroad) to connect it with existing rail-lines at Miles City, Montana. The most favorable route would require construction of approximately 90 miles of railway.

The other potential market would be construction of a coal-fired electrical generating plant (specifically designed to handle Otter Creek coal) near the Otter Creek tracts. In addition to the plant, a significant investment in power line infrastructure would be required.

The State’s ownership, though significant, comprises about one-half of the area – in a checkerboard pattern. Great Northern Properties LP (GNP) – the successor to the original railroad grant to Great Northern Railroad, owns the other half. If a mine is to be developed, it will, by necessity, include both State and GNP coal lands.

Previous State/DNRC Activities

DNRC and GNP previously entered into a Memorandum of Agreement consistent with our common goal. Both the State and GNP are interested in this area being evaluated and potentially developed for energy production, and both understand that commercial development requires the State and GNP properties to be developed together.

The 2003 Legislature passed Senate Bill 409, which identified areas of data acquisition that would be beneficial to prepare a package of tracts for possible leasing. The legislature also included \$300,000 in spending authority for the department to engage in pre-lease data acquisition and evaluation.

DNRC utilized funding authorized by Senate Bill 409 to acquire both coal resource and cultural inventory data. DNRC engaged Kennecott Energy in an exploration process to acquire additional core data and analysis. The drilling program was completed during the 2004 field season, with data delivered to DNRC in October 2004. The primary goals of the drilling and coring program were to develop additional data on sodium and trace elements, and further delineate the extent of the coal resource. Interested coal companies will utilize this data to further assess their interest in the Otter Creek tracts.

DNRC also retained GCM Services Inc., to prepare a cultural inventory of the state tracts. Field work was conducted during June 2004; the final report was received November 2, 2004. This provides DNRC and interested coal companies with initial information regarding cultural resources in the area. This also would provide additional baseline data with which to engage in the actual inventory and/or mitigation process pursuant to the Land Board's February 19, 2002 settlement agreement with the Northern Cheyenne Tribe. This process would trigger when a mine plan was actually proposed.

DNRC obtained all technical data available from the Bureau of Land Management (BLM) on the acquired tracts. This data, along with the newly acquired technical and cultural data has been converted to electronic format. DNRC is able to provide all existing data, reports, documents, etc. to coal companies and interested parties on a CD or via website.

In 2006, DNRC and GNP completed a joint property resource study. This study utilized previously available data, GNP proprietary data, and the new datasets acquired by DNRC in 2004. The result was the most comprehensive analysis yet of the Otter Creek coal reserve.

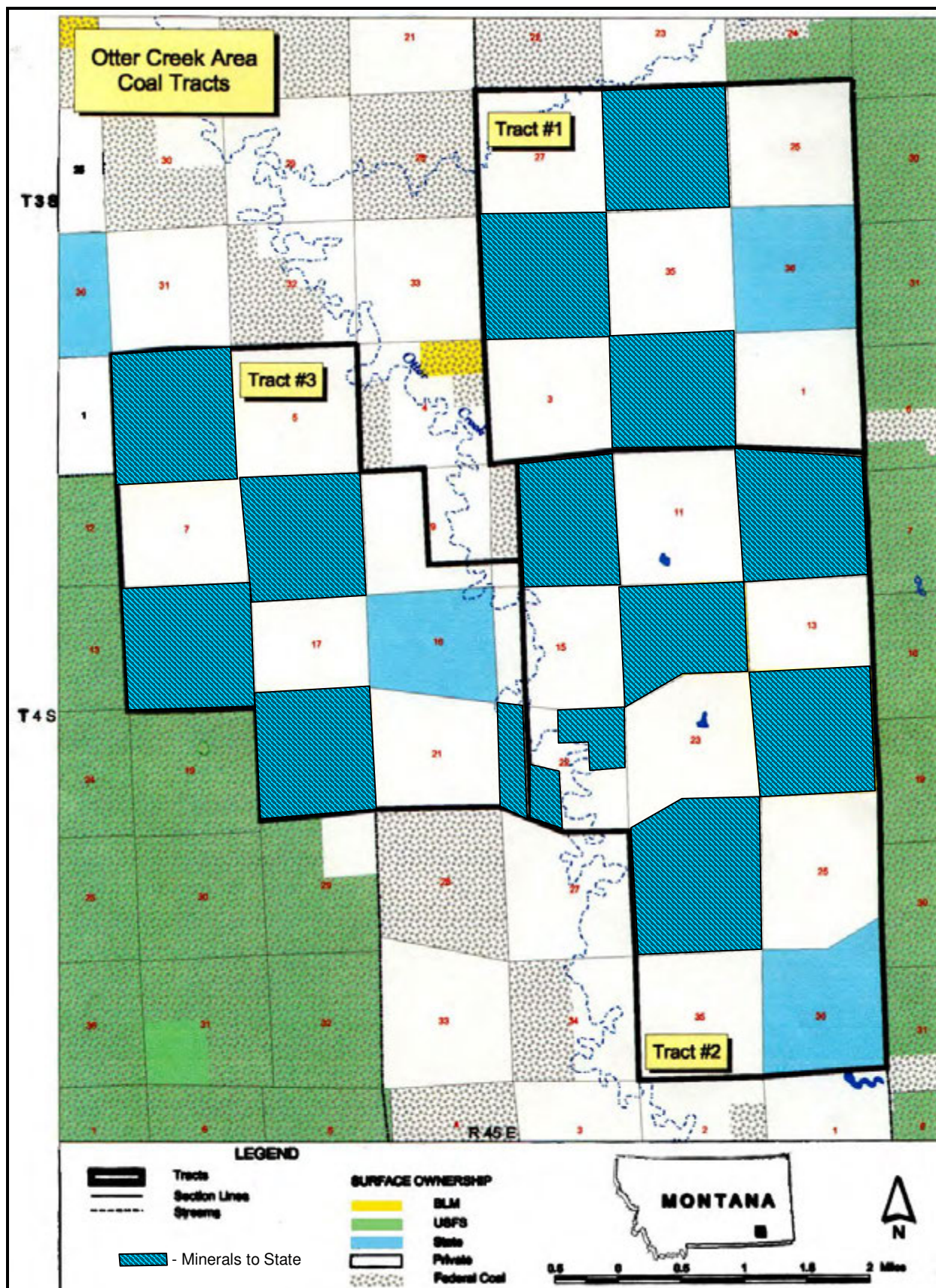
Coal Leasing Appraisal

The recently completed coal leasing appraisal is ready for distribution and solicitation of public comment as required pursuant to 77-3-312, MCA. The appraisal was prepared to determine the fair market value of the state school trust's Otter Creek coal ownership. This appraisal process is required in order to place the coal tracts up for competitive lease bid.

The appraisal was prepared pursuant to Federal Bureau of Land Management Handbook H-3070-1, Economic Evaluation of Coal Properties. The Handbook prescribes the standards and methodologies to be utilized for examination of coal properties for competitive leasing. Two major approaches are available, and both were utilized in the subject appraisal; one, consideration and analysis of comparable sales information, and two, calculation using a net present value analysis model.

The appraisal estimates the school trust could receive as much as \$1.4 billion in royalty payments over a 40 year period, and concludes a minimum up-front bonus bid of between \$0.05 and \$0.07 per recoverable ton represents fair market value. The minimum bid increases to \$0.10 per recoverable ton if independent financing is assumed for construction of the Tongue River Railroad. The total minimum up-front bonus bid would be \$37.3 million at \$0.07 per ton, and \$57.2 million at \$0.10 per ton of recoverable coal.

If the Land Board approves, the department would distribute the appraisal and solicit public comments for review. The department would anticipate returning to the Land Board in June 2009 to review comments received. The issue before the Board at that time would be whether and upon what minimum terms to offer the state's unleased coal property out for bid.



DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

Trust Land Management Division



BRIAN SCHWEITZER, GOVERNOR

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HELENA, MONTANA 59620-1601

OTTER CREEK COAL PROPERTY APPRAISAL REQUEST FOR COMMENTS

April 21, 2009

Dear Reader:

The Montana Department of Natural Resources and Conservation appreciates your interest in the development and management of the Otter Creek school trust coal property. The attached appraisal document represents the culmination of a multi-year effort to gather and provide both technical resource and project financial information to the Land Board, interested companies and the public.

Located southeast of the town of Ashland in western Powder River County, the Otter Creek coal property contains over 1.2 billion tons recoverable coal reserves. One half of the reserve is located on what is now Montana school trust land. The other half of the coal reserve is privately owned, with the vast majority held by Great Northern Properties LP. (GNP) The ownership pattern resembles a checkerboard, with GNP and the State owning alternating sections. Both parties must participate for coal to be developed.

The state school trust originally held three sections within the Otter Creek property. However in 2002, a settlement involving the Federal government, the Northern Cheyenne Tribe and the State Land Board completed the transfer of an additional 12½ sections of federally owned coal and mineral rights to Montana's public (i.e. K-12) school educational trust. Revenues generated from management of the public school trust help fund Montana schools statewide.

The department utilized funding from the 2003 Legislature to obtain additional drill and core hole data on the state's Otter Creek ownership. This data was combined with federal and GNP data to produce the 2006 Otter Creek Property Summary Report, the most detailed analysis to date of the total coal resource. The attached appraisal document utilizes technical data from the 2006 property report and develops an estimate of fair market value of the state's ownership. State statute requires the preparation and public review of an appraisal for the Land Board's consideration prior to offering school trust coal properties out for competitive leasing. A coal appraisal serves a specific purpose – it provides the financial terms (bonus bid, rental and royalties) which together represent the full, fair market value of the property that may be offered for lease. An appraisal is not an environmental analysis. If the property were leased by the Land Board, and if the lessee submits a proposed plan for development, a detailed MT-DEQ mine permit review prepared pursuant to MEPA would be required.

This appraisal was completed according to the methods specified in the Bureau of Land Management (BLM) Handbook H-3070-1, *Economic Evaluation of Coal Properties*. The handbook provides two separate methods for determining a coal property's value, and both were utilized in this appraisal.

Appraisal standards require consideration of the costs involved in delivering coal to market. The base appraisal therefore includes the financing cost for a rail line between Otter Creek and Miles City. This produces a minimum bonus bid of \$0.065 per ton. At the department's request, the appraiser also calculated the minimum bonus bid assuming the rail line was separately financed. This increased the minimum bonus bid to \$0.10 per ton. The appraisal yields the following estimated value for the state property that may be considered for lease and development.

Minimum Bonus Payment: \$37.3 million (\$57.2 million if rail line is separately financed)
Annual Rentals (\$3/acre): \$1.0 million (over 40 years)
Royalty Payments (12.5%): \$1.4 billion (over 40 years)

Additional information is available on our website at: http://dnrc.mt.gov/trust/MMB/otter_creek

Please submit comments to me in writing by May 22, 2009:

Monte Mason, Minerals Management Bureau Chief

By mail: Dept of Natural Resources and Conservation
PO Box 201601
Helena, MT 59620-1601

By fax: 406-444-2684

By email: mmason@mt.gov

It is anticipated the lease appraisal and comments will be considered by the Land Board at their regularly scheduled June 15, 2009 meeting.

**MONTANA OTTER
CREEK STATE COAL
VALUATION**

ENERGY, MINING, AND ENVIRONMENTAL CONSULTANTS

NORWEST
CORPORATION

**MONTANA OTTER
CREEK STATE COAL
VALUATION**

Submitted to:

**MONTANA DEPARTMENT OF
NATURAL RESOURCES &
CONSERVATION**

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TABLE OF CONTENTS

	EXECUTIVE SUMMARY	E-1
	Comparable Sales.....	E-1
	Income Approach.....	E-1
	FINDINGS	E-2
SECTION 1	INTRODUCTION.....	1-1
	PROPERTY TO BE APPRAISED.....	1-1
	PURPOSE OF APPRAISAL	1-1
	PREMISE OF VALUE	1-2
	EFFECTIVE DATE.....	1-2
	SIGNIFICANT PROFESSIONAL ASSISTANCE PROVIDED BY OTHERS	1-2
	LIMITING CONDITIONS	1-2
	CERTIFICATION	1-3
SECTION 2	COMPARABLE LEASE SALES APPROACH	2-1
	INTRODUCTION	2-1
	SELECTED COMPARABLE LEASES	2-1
	MAJOR INFLUENCE FACTORS.....	2-4
	Geology	2-4
	Coal Quality	2-4
	Market Prices	2-7
	Strip Ratio	2-8
	COMPARABLE SALES VALUATION	2-8
	Sodium Adjustment	2-8
	Btu Adjustment	2-8
	Summary of Adjustments	2-9
SECTION 3	INCOME APPROACH	3-1
	GENERAL	3-1
	GEOLOGIC MODEL.....	3-1
	LOGICAL MINING UNITS (LMUS).....	3-1
	ECONOMIC MODELS.....	3-2
	PRODUCTION SCHEDULE.....	3-2
	CAPITAL COSTS	3-2
	Equipment	3-2
	Equipment Replacement	3-4
	Facilities.....	3-4
	Coal Processing Plant	3-4
	Rail Line to Miles City, MT	3-6
	Working Capital.....	3-6
	Permitting and Exploration Drilling	3-6
	Total Capital.....	3-7

EQUIPMENT OPERATING COSTS	3-7
OTHER CONTROLLABLE UNIT COSTS	3-8
Labor	3-8
Explosives	3-8
Other Supplies and Services	3-9
NON-CONTROLLABLE COSTS	3-9
Taxes, Fees, and Royalties.....	3-9
Other Non-Controllable Costs	3-9
COAL PRICE	3-10
DISCOUNTED CASH FLOW ANALYSIS AND NPV.....	3-11
VALUATION.....	3-11

SECTION 4	REFERENCES.....	4-1
------------------	------------------------	------------

APPENDIX A	DETAILED FPC CALCULATIONS AND HAUL ROUTES
APPENDIX B	DETAILED PRICE CALCULATIONS
APPENDIX C	ANNUAL CASH FLOWS BY YEAR

List of Figures

E.1 Otter Creek Location Map.....	E-4
E.2 Montana DNRC Otter Creek Lease Tracts.....	E-5

List of Tables

E.1 Fair Market Value of Montana Unleased Coal.....	E-2
2.1 All BLM Lease Sales	2-2
2.2 Selected LBA Sales.....	2-3
2.3 Market Prices (\$/Ton) vs Bonus Bid	2-7
2.4 Coal Quality Comparisons (As Received Basis)	2-8
2.5 Bonus Bid Adjustments	2-9
3.1 LMU5 Equipment Capital Summary	3-4
3.2 LMU6 Equipment Capital Summary	3-4
3.3 Total Capital (Mine, Facilities, Plant, Railroad & Working Capital.....	3-6
3.4 Equipment Unit Cost Summary	3-8
3.5 Average Coal Price for Each Model	3-11
3.6 NPV Summary (10% Discount Rate)	3-11

List of Charts

2.1 Bonus Bid vs Heat Content.....	2-5
2.2 Bonus Bid vs Sulfur Content	2-6
2.3 Bonus Bid vs Sodium Content.....	2-6
2.4 Bonus Bid vs Strip Ratio	2-7

EXECUTIVE SUMMARY

Norwest Corporation (Norwest) completed a valuation of the Otter Creek Coal Tracts 1 through 3 located in the State of Montana. The purpose is to determine the fair market value that Montana should accept from a qualified bidder. This valuation was completed according to the methods specified in the Bureau of Land Management (BLM) Handbook H-3070-1, *Economic Evaluation of Coal Properties*. The handbook provides two separate methods for determining a coal property's value. These methods are the Comparable Lease Sales Approach and the Income Approach. Research for this valuation was completed in October, 2008 and all revenue and costs reflect economic conditions at that time. The actual valuation process went through multiple reviews by Norwest and by the State of Montana prior to completion and preparation of this report on January 30, 2009.

Comparable Lease Sales Approach

The Comparable Lease Sales Approach uses similar past lease sales to determine the bonus price per ton of the coal. It is generally assumed that this approach provides the best indication of value when reliable sales data are available. The Comparable Lease Sales Approach takes past lease sale transactions and compares them to the new coal property to determine its value. Adjustments to the reference properties are made to develop a more accurate estimate of the new property. Typically these adjustments include key economic parameters such as coal quality, stripping ratio, and transportation options among others. The final per ton value is calculated by taking an average of the similar lease sales or one that is the closest in coal quality and stripping ratio to the new property and applying any adjustments for differences in these parameters.

Income Approach

Using the Income Approach, an economic model of the coal property is created. This model should emulate the most economic mine plan for the coal property which creates the highest net present value (NPV). Under the Income Approach, a mine plan based on current and projected coal markets is created. Cost and revenue streams are estimated and combined to produce a cash flow over the projected mine life. The cash flow is then discounted to present day values using a discount rate of 10%. This rate is

justified on the basis that it is representative of the alternative cost of capital and has been successfully used for a number of years in coal land valuations. The calculated NPV is then divided by the number of recoverable tons for the lease to determine the bonus price per ton.

FINDINGS

The results of the two valuation methods are discussed in detail in the body of this report and are summarized in Table E.1 below.

Table E.1 Fair Market Value of Montana Unleased Coal

Method	Bonus (\$/ton)	Recoverable Tons (1,000,000s)	Total Bonus (\$1,000,000s)
Comparable Lease Sales Approach	\$0.0539	572.3	\$30.8
Income Approach	\$0.0652	572.3	\$37.3

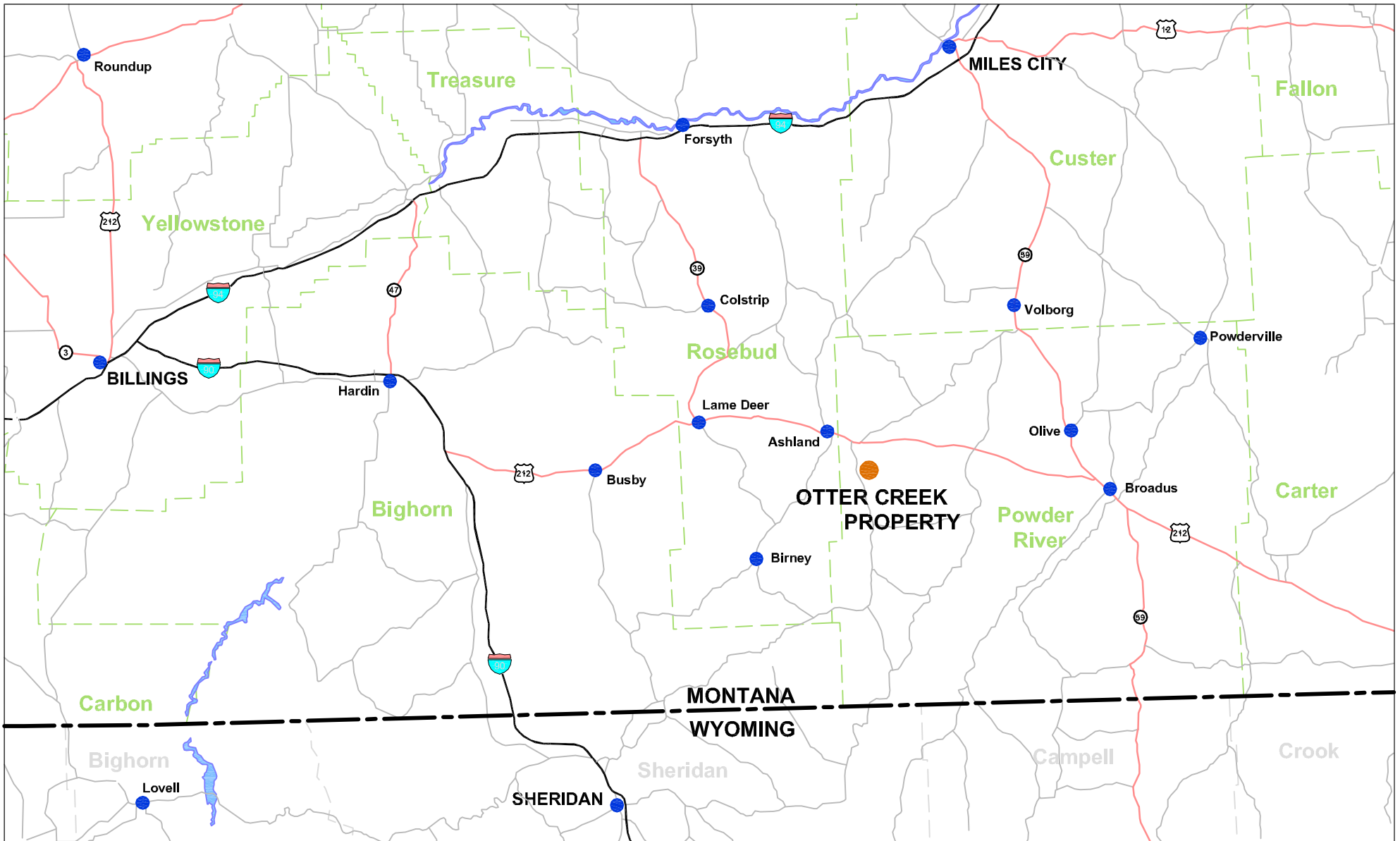
The Comparable Lease Sales Approach produced a value of \$30.8 million (M) or approximately \$0.05/ton for Montana's 572M recoverable tons of coal. This value is lower than similar federal lease sales of high sodium coal in Montana, reflecting the lack of existing rail service at Otter Creek.

The Income Approach produced a value of \$37.3M, or \$0.07/ton for 572M tons of coal. The economic model includes \$187M for an 85 mile rail line addition. There is an approved rail line proposed along this same route, owned by the Tongue River Railroad Company (TRRC), but construction has not begun, nor is Norwest aware of a set schedule for construction. Norwest has assumed that the developer of Otter Creek would pay for this railroad in the two years ahead of production and be reimbursed by TRRC over 15 years from the start of production. Because the developer would not own the railroad, the cost is not included as a capital expenditure, but rather is shown in the cash flow calculation along with recapture payments from TRRC at 4% interest. Had the railroad been in place at the time of this report, the resulting NPV would have been \$124.8M, or approximately \$0.10/ton.

In addition to the bonus bid, Montana will receive production royalties for coal mined on these leases as well as an annual fee of \$3 per acre. The typical royalty is 12.5% of the gross sales value. On a theoretical market price of \$20/ton FOB mine, the royalty would be \$2.50/ton.

In summary, Norwest concludes that a bonus bid between \$0.05 and \$0.07/ton of recoverable coal, as determined through the Comparable Lease Sales and Income approaches, represents the fair market value range for the Otter Creek Tracts 1 through 3.

Figure E.1 shows the general location of the Otter Creek Coal Tracts. Figure E.2 illustrates the remaining lease areas.



LEGEND

- Interstate
- Principal Highway
- Other Roads
- - - State Line
- - - County Line

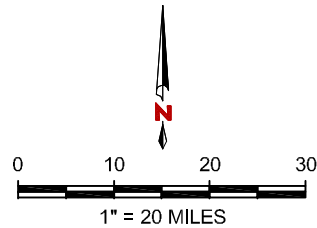
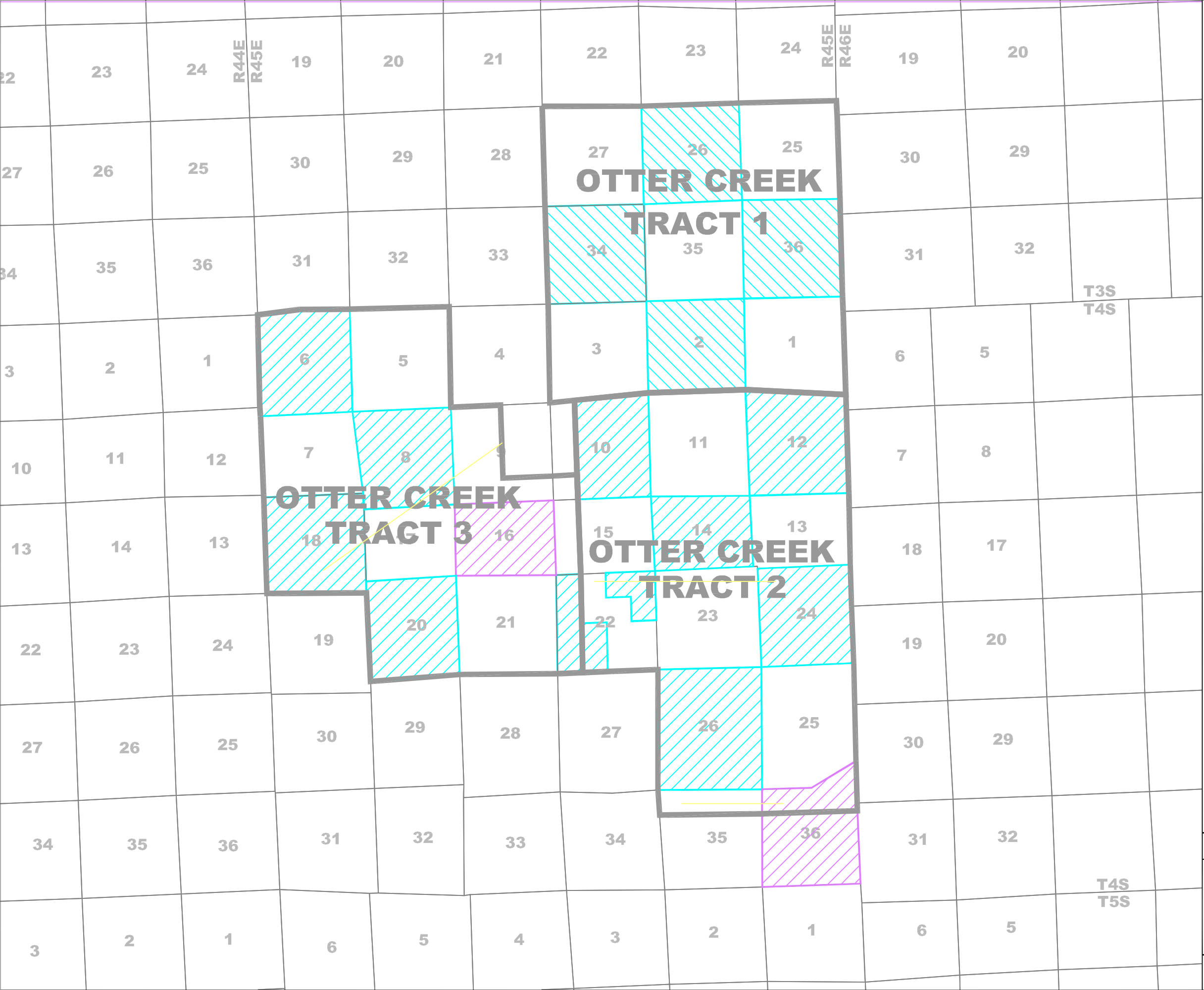


Figure E.1
Otter Creek
Location Map

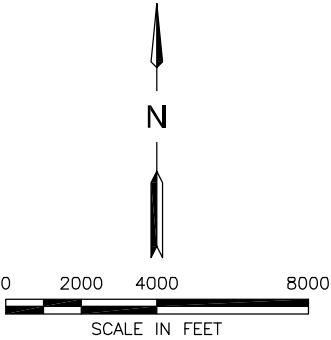
DATE: 10/31/2008
FILE: E.1Location

PROJECT:
3823 **NORWEST**
CORPORATION



LEGEND:

- MT UNLEASED COAL
- MT ALREADY LEASED COAL
- OTHER



INTRODUCTION

PROPERTY TO BE APPRAISED

The mineral property being appraised is the Otter Creek Coal Tracts 1 through 3 located in Powder River County, Montana approximately 10 miles southeast of Ashland, Montana near US Route 212. The coal tracts are bounded on three sides by the Custer National Forest. A portion of the coal property is owned by the State of Montana and is administered by the Trust Land Management Division of the Montana Department of Natural Resources & Conservation. The remainder of the coal property is owned by private parties of which Great Northern Properties Limited Partnership (GNP-LP) is the majority owner.

The tracts are located in the following townships of Powder River County:

Township 4 South, Range 45 East:

All of Section 2

All of Section 6

All of Section 8

E1/2W1/2 and the E1/2 of Section 10

All of Section 12

All of Section 14

All of Section 18

All of Section 20

W1/2W1/2; E1/2SW1/4; NW1/4NE1/4; E1/2NE1/4 of Section 22

All of Section 24

All of Section 26

Township 3 South, Range 45 East:

All of Section 26

All of Section 34

All of Section 36

PURPOSE OF APPRAISAL

The results of this appraisal will be used by the state of Montana to set a minimum bid price for Otter Creek Coal Lease Tracts 1, 2 and 3. This bid price is typically expressed in dollars per ton of recoverable coal contained in the lease area.

PREMISE OF VALUE

The premise of the valuation used by Norwest is that these coal lands will be acquired through a competitive lease sale and developed into an operating mine. This appraisal does not consider re-sale of the undeveloped leases which could result in a significantly lower value.

EFFECTIVE DATE

The effective date of this valuation is October 2008, as that is when the research was completed. Coal pricing as well as equipment prices, fuel, electricity and wages are based on information and quotations obtained at that time. This report was issued January 30, 2009 after considerable review and discussion within Norwest and between Norwest and the state of Montana.

**SIGNIFICANT
PROFESSIONAL
ASSISTANCE PROVIDED
BY OTHERS**

In the course of completing this appraisal assignment, significant professional assistance was provided by Mr. Kevin Gunesch, a Norwest associate, and Mr. Gary Stubblefield of Norwest Corporation. Mr. Gunesch, a Mining Engineer, developed the financial models used in the Income Approach. Gunesch also assisted in the reporting of the Comparable Lease Sales analyses.

LIMITING CONDITIONS

Norwest has made no attempt to determine current legal ownership of the coal lands that are set forth herein, nor have we investigated as to the existence of any liens or encumbrances on these lands.

All related facts, comments and data set forth herein have been obtained from sources believed to be knowledgeable, reliable and accurate. For purposes of this report those sources include a 2005 study by Norwest on Otter Creek; 2007 Mine & Mill Equipment Costs An Estimators Guide and the 2008 Mining Cost Service.

Coal tonnage and qualities within Tracts 1 through 3 used in this appraisal were determined through the use of a geologic model of the deposit compiled using public information combined with proprietary information from GNP-LP. The 3D model was compiled using geological modeling software¹ by Carlson Software, Inc. The site of Otter Creek Coal Tracts 1 through 3 were not physically visited or inspected during the preparation of this report. These coal lands are undeveloped and thus would reveal very little information in a site visit beyond the general topography and flora and fauna.

¹ "Carlson Mining 2008", by Carlson Software, Inc.

CERTIFICATION

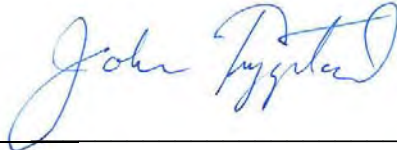
This report was prepared by Norwest Corporation for the Montana Department of Natural Resources & Conservation, Trust Land Management Division located at 1625 11th Avenue, Helena, MT 59620-1601. The material herein reflects our best judgment in light of the information available to us at the time of preparation. Accordingly, Norwest accepts no responsibility for decisions made or actions taken based on this report.

We HEREBY CERTIFY to the best of our knowledge and belief the following are true and accurate:

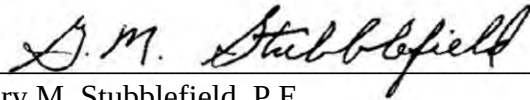
- The facts and data reported by the appraiser and used in the appraisal process are true and correct.
- The analyses, opinions, and conclusions in this appraisal report are limited only by the assumptions and limiting conditions stated in this appraisal report and our personal, impartial, and unbiased professional analyses, opinions, and conclusions.
- That no deeper coal seams would be adversely affected by the mine plan used in this study. This is in conformance with Montana Statute 77-3-305, Sub. 2.
- That we have no present or prospective interest in the property that is the subject of this appraisal report and no personal interest with respect to the parties involved.
- That we have no bias with respect to the property that is the subject of this appraisal report or to the parties involved in this assignment.
- That our engagement in this assignment was not contingent upon developing or reporting predetermined results.
- That our compensation is not contingent on any action or event resulting from the analyses, opinions, or conclusions in this report or from its use.
- That the reported analyses, opinions, and conclusions were developed and this appraisal report was prepared, in conformity with the requirements of the Code of Professional Ethics & Standards of Professional Appraisal Practice of the Appraisal Institute, which include the Uniform Standards of Professional Appraisal Practice.
- That no one other than the undersigned prepared the analyses, conclusions and opinions concerning the coal lands that are set forth in this appraisal report.

- That significant professional assistance in estimating the minimum bonus price was provided by Mr. Kevin Gunesch, Norwest Associate Mining Engineer and Gary Stubblefield, Vice President Norwest.

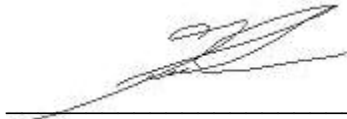
Signed



John E. Trygstad
Candidate Member, American Society of Appraisers



Gary M. Stubblefield, P.E.
Vice President, Norwest Corporation



Kevin Gunesch, P.E.
Associate Mining Engineer, Norwest Corporation

COMPARABLE LEASE SALES APPROACH

INTRODUCTION

The Comparable Lease Sales Approach examines the prices paid for similar coal properties in the area to determine the fair market value (FMV) of the new lease. It is generally assumed that the Comparable Lease Sales Approach provides the best indication of value when reliable sales data are available. The basis for this estimation is the value the competitive market would determine for a property given that:

- Prices are determined in a competitive market.
- Prices result from the negotiation between a knowledgeable buyer and seller.
- Neither the buyer nor seller is under any undue pressure to complete the transaction.
- Variations in the appraisal property and the comparable properties can be accounted for by a technically based monetary adjustment.

The following sections give an overview of Comparable Lease Sales within the last 10 years. These lease sales are discussed in terms of the bonus paid, bonus per ton of recoverable coal, coal quality, strip ratio, proximity to transportation, and geologic and mine method comparability to the appraisal property. A bonus bid price per recoverable ton amount for the entire Otter Creek property is determined based on these comparisons. This unit value is then multiplied by the recoverable tonnage of Montana state coal within Otter Creek Tracts 1 through 3 to determine the dollar value.

SELECTED COMPARABLE LEASES

A database consisting of 31 federal lease sales was compiled by Norwest for the Powder River Basin (PRB) area (see Table 2.1). These sales included 12 lease modifications (MOD) and 19 lease by application (LBA) sales. The MOD sales are modifications of current leases that add a small incremental tonnage to an existing lease. These small sales are not considered as competitive sales since they are inherently attached to a current lease and mining operation and not an openly competitive sale. A quick review of the MOD sales indicates that bonus bids on these leases were typically in the range of \$0.04/ton to \$0.05/ton, while bonus bids on LBAs ranged from \$0.11/ton up to \$0.97/ton.

TABLE 2.1 FEDERAL COAL LEASE SALES- POWDER RIVER BASIN, MONTANA AND WYOMING (from 1991) 10/30/08													
TRACT	APPLICANT	HIGH BIDDER	BLM SERIAL NO.	CASE TYPE	SALE DATE	TOTAL BONUS	TRACT ACRES	BONUS (\$/ACRE)	TONS RECOV. (MMT)	BONUS (\$/TON)	MINING RATIO (BCY:TON)	HEAT VALUE (BTU/LB)	Na as % Ash
Spring Creek	Spring Creek Coal	Spring Creek Coal	MTM 94378	LBA	4/17/2007	\$19,902,200	1,117.7	\$17,806.39	108.60	\$0.1833	2.89	9,331	8.38
Decker Modifications	Decker Coal Co.	Decker Coal Co.	MTM037604/ MTM057934	MOD	4/18/2006	\$456,320	100.4	\$4,545.02	4.960	\$0.0920	2.76	9,546	1.27
West Roundup	Triton Coal	Peabody Energy	WYW151134	LBA	2/16/2005	\$317,697,610	2,812.51	\$112,958.75	327,186 *	\$0.9710	4.30	8,790	1.60
West Antelope	Antelope Coal	Antelope Coal	WYW151643	LBA	12/15/2004	\$146,311,000	2,809.13	\$52,084.10	194,961 *	\$0.7505	3.00	8,858	1.86
West Hay Creek	Triton Coal	Kiewit Mining Group	WYW151634	LBA	11/17/2004	\$42,809,400	921.16	\$46,473.49	142,698 *	\$0.3000	2.00	8,346	1.75
Little Thunder	Ark Land Co.	Ark Land Co.	WYW150318	LBA	9/22/2004	\$610,999,950	5,083.50	\$120,192.77	718,719 *	\$0.8501	3.40	8,884	1.20
NARO South	Powder River Coal	Powder River Coal	WYW154001	LBA	6/29/2004	\$274,000,000	2956.725	\$92,670.10	297,469 *	\$0.9211	2.80	8,929	2.00
Rosebud	Western Energy	Western Energy	MTM80697	Mod	2/17/2004	\$11,250	30.0	\$375.00	0.250	\$0.0450	4.63	8,382	0.5
N. Jacob's Ranch	Jacob's Ranch Coal	Jacob's Ranch Coal	WYW146744	LBA	1/16/2002	\$379,504,652	4,982.2	\$76,171.49	537,542 *	\$0.7060	3.51	8,792	1.29
Spring Creek	Kennecott	Kennecott	MTM88405	LBA	11/27/2000	\$1,740,200	150.0	\$11,601.33	15.860	\$0.1097	2.08	9,370	8.63
Horse Creek	Antelope Coal	Antelope Coal	WYW141435	LBA	9/7/2000	\$91,220,121	2,818.7	\$32,362.54	275,577 *	\$0.3310	2.60	8,890	1.49
Spring Creek	Kennecott	Kennecott	MTM69782	MOD	10/1/1999	\$13,860	10.0	\$1,386.00	0.330	\$0.0420	1.92	9,361	9.56
Rosebud	Western Energy	Western Energy	MTM80697	LBA	6/16/1999	\$4,416,000	1,401.0	\$3,152.03	27,600	\$0.1600	3.51	8,382	10.3
Thundercloud	Kerr-McGee	Ark Land Co.	WYW136458	LBA	10/1/1998	\$158,000,009	3,545.5	\$44,563.50	412,000 *	\$0.3835	2.57	8,810	1.45
Powder River	Peabody	Peabody	WYW136142	LBA	6/30/1998	\$109,596,500	4,224.2	\$25,944.91	532,024 *	\$0.2060	3.00	8,742	1.84
Decker	Kennecott	Kennecott	MTM57934-A/ MTM61685	MOD	6/10/1998	\$478,400	320.0	\$1,495.00	7,360	\$0.0650	2.35	9,512	1.27
Spring Creek	Kennecott	Kennecott	MTM69782	MOD	4/10/1998	\$163,170	25.0	\$6,526.80	3,366	\$0.0485	1.48	9,350	8.72
N. Rochelle	Bluegrass Coal	Bluegrass Coal	WYW127221	LBA	9/25/1997	\$30,576,340	1,481.9	\$20,632.78	157,610 *	\$0.1940	2.91	8,680	na
Antelope	Kennecott	Kennecott	WYW128322	LBA	12/4/1996	\$9,054,600	617.2	\$14,670.45	60,364	\$0.1500	1.70	8,776	1.21
Spring Creek	Kennecott	Kennecott	MTM69782	MOD	6/16/1995	\$166,000	60.0	\$2,766.67	4,380	\$0.0379	1.88	9,357	na
Eagle Butte	Cyprus-Anax	Cyprus-Anax	WYW124783	LBA	4/5/1995	\$18,470,400	1,059.2	\$17,438.40	163,300	\$0.1131	1.99	8,376	8.72
Spring Creek	Kennecott	Kennecott	MTM69782	MOD	11/23/1994	\$19,509	15.0	\$1,300.60	0.465	\$0.0420	1.67	9,237	na
Caballo	Exxon	Exxon	WYW125698	MOD	2/2/1994	\$25,217	20.2	\$1,246.82	0.917	\$0.0275	1.76	8,500	na
Spring Creek	NERCO	NERCO	MTM69782	MOD	9/1/1993	\$1,000	10.0	\$100.00	0.020	\$0.0500	2.10	8,183	na
Scotia Bay	Thunder Basin	Thunder Basin	WYW2313	MOD	5/30/1993	\$64,000	10.2	\$6,268.36	1,030	\$0.0621	1.43	8,752	na
West Rocky Butte	Peabody	Peabody	WYW122586	LBA	1/7/1993	16,500,000	463.2	\$35,621.76	56,700	\$0.2910	3.75	8,354	na
N. Antelope	Peabody	Peabody	WYW119554	LBA	9/28/1992	\$86,987,765	3,064.0	\$28,389.89	403,500	\$0.2156	2.23	8,752	na
W. Black Thunder	Thunder Basin	Thunder Basin	WYW118907	LBA	8/12/1992	\$71,909,282	3,492.5	\$20,589.69	429,000	\$0.1676	2.72	8,839	na
Jacobs Ranch	Kerr-McGee	Kerr-McGee	WYW117924	LBA	9/26/1991	\$20,114,930	1,708.6	\$11,772.62	147,424	\$0.1364	2.46	8,540	na
E.Black Thunder	Thunder Basin	Thunder Basin	WYW2313	MOD	4/29/1991	\$300,155	102.8	\$2,920.93	5,000	\$0.0600	0.70	8,508	na
West Decker	Kiewit	Kiewit	MTM37604	MOD	1/1/1991	\$494,650	160.0	\$3,091.56	7,610	\$0.0650	4.20	9,610	na

* Reserves expressed as TONS MINABLE
MOD- Lease Modification
LBA- Lease By Application

The significantly higher bonus bids for LBA sales reflect higher interest and importance placed on these typically larger tracts. The highest bids occurred more recently on coal lease sales in the lower PRB (Wyoming) where two or more companies with neighboring mines competed for large tonnage lease tracts. Because of the obvious difference between bid amounts on LBA sales compared to MOD sales and the fact that Otter Creek is not adjacent to existing mines, Norwest did not consider MOD sales further in this analysis.

Of the remaining 19 LBA sales a total of three leases were selected for further analysis. These sales represent all Montana LBA sales completed in the area since 1999. Table 2.2, below, illustrates the selected LBA sales with their respective parameters of coal quality and strip ratios which are key contributors in determining mining cost and marketability of the coal from a particular property.

Table 2.2 Selected LBA Sales

Tract	Sale Date	Number of bidders	BLM Serial No.	Case Type	Total Bonus	Tract Acres	Bonus (\$/Acre)	Recoverable Tons (million)
Spring Creek 1	4/17/2007	1	MTM 94378	LBA	\$19,902,200	1,117.7	\$17,806.39	108.60
Spring Creek 2	11/27/2000	1	MTM 88405	LBA	\$1,740,200	921.2	\$46,473.49	142.698
Rosebud	6/16/1999	1	MTM 80697	LBA	\$4,416,000	1,401.0	\$3,152.03	27.600

Tract	Sale Date	Bonus (\$/ton)	Strip Ratio (BCY/ton)	Heating Value (Btu/lb)	% Sulfur	% Ash	% Moisture	Na as % Ash
Spring Creek 1	4/17/2007	\$0.1833	2.89	9,331	0.35	3.80	25.71	8.38
Spring Creek 2	11/27/2000	\$0.1097	2.08	9,370	0.34	3.65	25.53	8.63
Rosebud	6/16/1999	\$0.1600	3.51	8,382	0.81	10.3	25.41	10.3

The common thread among these three leases is the high sodium content when compared to other LBAs included in Table 2.1. These other LBAs reach a maximum sodium content of 2%. High sodium coals face a limited market because of the slagging problems they cause in most electric generating plant boilers.

Heat content, expressed as Btu/lb of coal, does not show a strong correlation to the LBA bid price, but is important in selling coal because most electric utilities buy Btus rather than tons.

Ash and sulfur are higher in the Rosebud lease than in either of the Spring Creek leases, but as will be established later in this report, these attributes do not impact the bid price significantly.

**MAJOR INFLUENCE
FACTORS**

Geology

Each tract contained in Table 2.1 is within the PRB which extends from northern Wyoming into Montana. The coal deposits within the PRB exhibit similar geologic conditions with a low number of thick coal seams covered by a minimal amount of overburden resulting in low overburden volume to coal tons, referred to as strip ratio. Coal mines in the PRB employ a strip mining method, usually with a combination of draglines and truck shovel fleets for overburden and coal removal.

Coal Quality

All coal within the region is classified as sub-bituminous with heating values between 8,300 Btu and 9,500 Btu/lb, as-received. Coal quality differs somewhat between the southern PRB (Wyoming) and the northern PRB (Montana). Heating values in the Northern PRB are typically above 9,300 Btu/lb, while the lower PRB coals fall below 8,800 Btu/lb. An exception is the Rosebud Mine in Montana with a heating value of about 8,400 Btu/lb. Coal sales contracts typically purchase Btus rather than tons so heat content must be considered in determining bid values. This can be done by comparing Otter Creek heat content to that of the selected comparison mines and adjusting for the difference.

Nearly all mines in the PRB have low (under 0.5%) sulfur content and are considered Compliance Coal (they produce less than 1.2 lbs of sulfur dioxide (SO₂) per million Btu when burned in a utility boiler). Here again, Rosebud is an exception at 0.8% sulfur or 1.93 lbs SO₂ per million Btu. Otter Creek sulfur content at 0.28% is in the same range as Spring Creek and thus will not significantly influence this valuation.

An important difference in coal quality among PRB coals is the weight percent of sodium contained in the ash. Coals with high sodium content share a limited market due to slagging problems they cause in certain types of power plant boilers. This limits the market for high sodium coals to a small number of mid-western electric generating plants and some industrial plants. LBA tracts in Table 2.1 with high sodium content include Spring Creek at 8 to 9%, Eagle Butte at 8.72% and Rosebud at 10.3%. These tracts

received lower unit bonus bids than most of the other LBA tracts. Charts 2.1 through 2.3 are scatter plots comparing bid price to quality parameters, including heat content, sulfur and sodium in ash. There is no clear pattern in Charts 2.1 and 2.2, indicating that bid price is not tied strongly to heat content or sulfur percent. There is however, a relationship of bid price to sodium in ash. It is clear from Chart 2.3 that the high sodium LBAs are grouped in the lower price range (\$0.11 - \$0.19); whereas the other lease sales with low sodium levels had bid prices in a wide range, i.e. from \$0.15/ton up to \$0.97/ton. This reflects the limited market for high sodium coal.

Chart 2.1 Bonus Bid vs. Heat Content

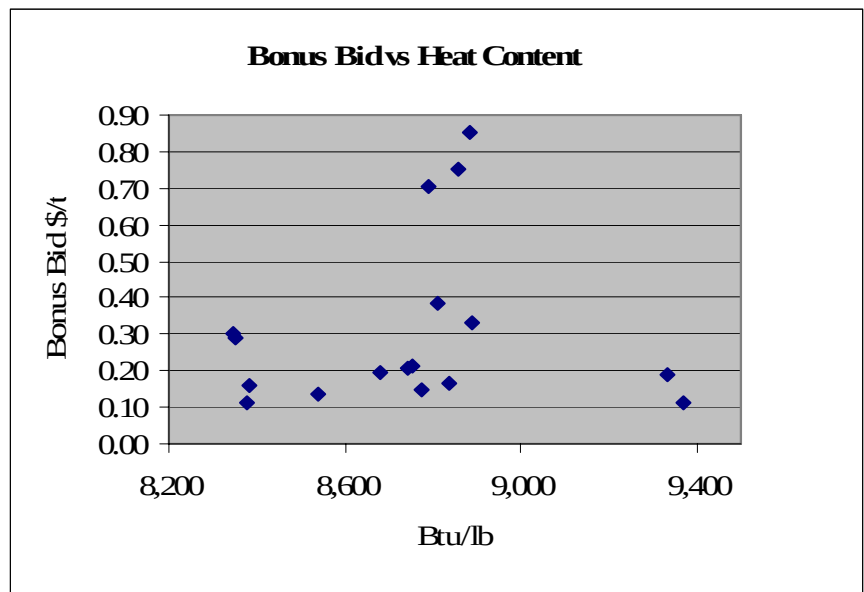


Chart 2.2 Bonus Bid vs. Sulfur Content

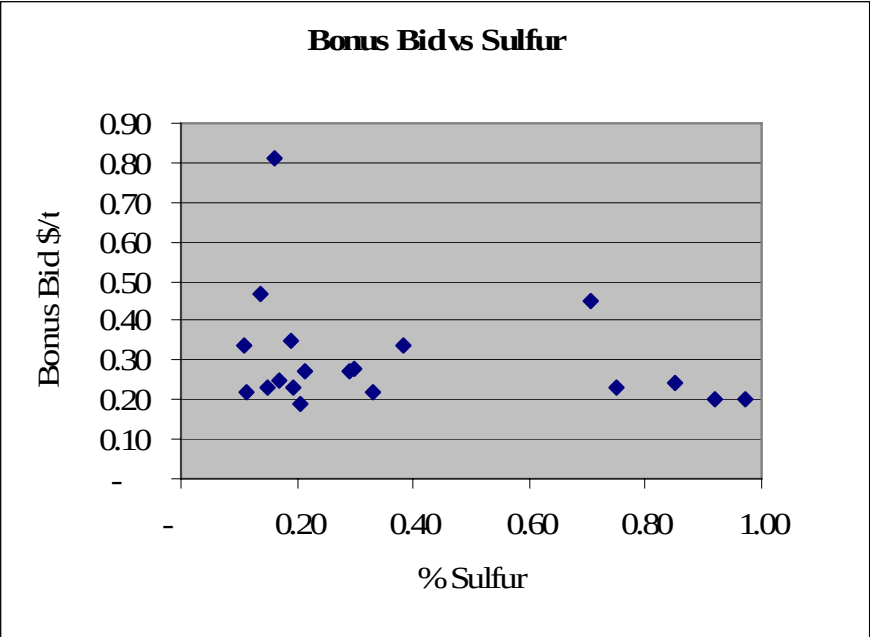


Chart 2.3 Bonus Bid vs. Sodium Content

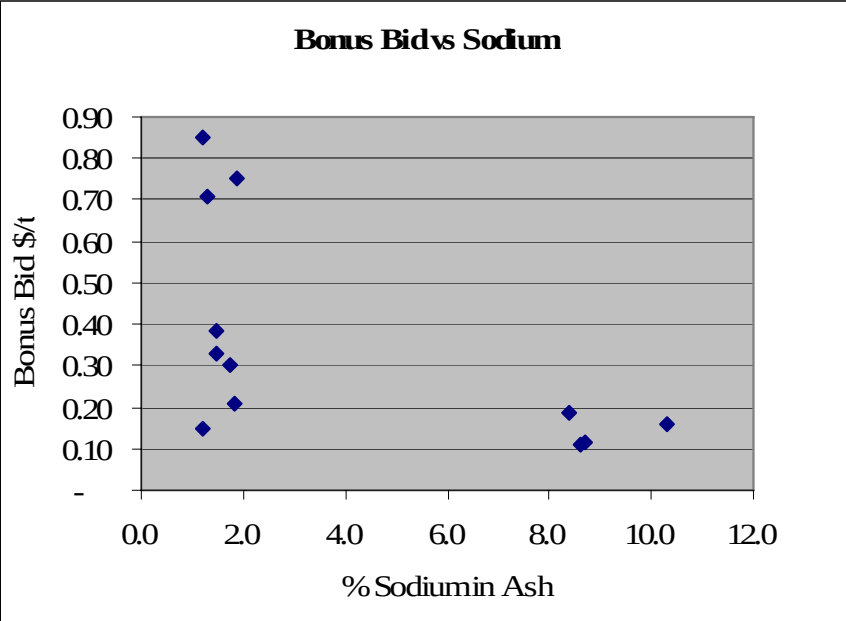
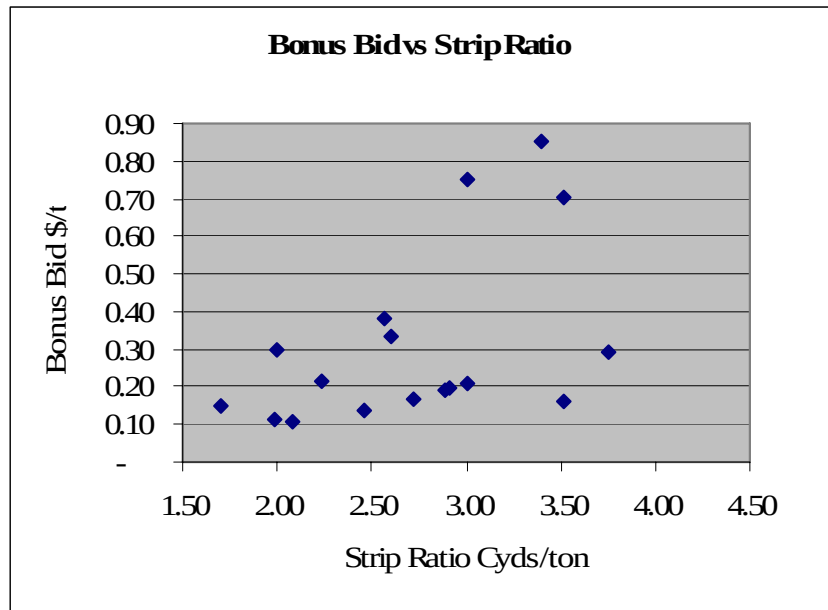


Chart 2.4 Bonus Bid vs. Strip Ratio



Market Prices

It seems reasonable that market prices would influence the LBA bid price. The three Montana coal tracts listed in Table 2.2 sold in 1999, 2000 and 2007 respectively. The average coal prices for PRB coals during those specific years are shown in Table 2.3 below.

Table 2.3 Market Prices (\$/Ton)² vs Bonus Bid

	1999	2000	2007
Average Montana Coal Prices*	\$8.82	\$8.87	\$11.79
%Change		0.6	32.9
LBA Bid Amounts \$/ton	\$0.1883	\$0.1097	\$0.1600
%Change		-41.7	45.9

* These are nominal dollars, i.e. actual \$ paid in the given year

There does not appear to be a connection between the LBA bid amount and the average coal price in Montana during the specific years. In the period 1999 to 2000 average coal prices in Montana climbed less than 1%, yet bid prices dropped nearly 42%. Between years 2000 and 2007, average Montana coal price increased 33%; however the LBA bid price jumped almost 46%.

² Energy Information Administration/Coal Industry Annual 2000 and 2007.

Strip Ratio

Strip ratio, sometimes referred to as mining ratio, is a measure of the volume (cubic yards) of waste rock moved in order to recover one ton of coal. Typically, the higher the strip ratio, the greater the mining cost. Strip ratios for the selected sales vary from 2.0 bank cubic yards (BCY)/ton to 4.3 BCY/ton. One would expect that the unit bonus bid would vary inversely in proportion to strip ratio; however, this was not the case. In fact, the highest strip ratio tract, West Roundup, received the highest unit bonus bid at \$0.9710/ton. This contradiction may be explained by the fact that there were two bidders competing for that tract which created a highly competitive bidding process between the two parties (Arch Coal Company and Peabody Energy). In this particular case, the initial bid by Arch Coal Company was rejected, and then followed by re-offer bids from both parties (Bureau of Land Management, 2008). Chart 2.4 shows no distinctive trend with regard to strip ratio affecting LBA bid price.

Proximity to Transportation

Both Spring Creek and Rosebud mines have had rail service from their startup, whereas Otter Creek will have to fund construction of approximately 85 miles of main line to Miles City, MT. This is a significant cost (estimated at roughly \$187M) and even though Norwest assumes the cost will be recovered over time, this negatively impacts the value of Otter Creek coal.

COMPARABLE SALES VALUATION

Sodium Adjustment

Sodium content appears to be a primary factor influencing LBA bid prices in the Northern PRB. In recognition of this, Norwest has adjusted the actual bids on the Spring Creek and Rosebud leases to reflect the sodium content in Otter Creek coals. The Otter Creek tracts are characterized by sodium in ash content of 7.51%, which is only slightly lower than Spring Creek tracts at 8.38% and 8.63% respectively and well below the Rosebud tract (10.3% Na). This high sodium content will limit the market for Otter Creek coal as it does for coals produced at Spring Creek and Rosebud mines.

Table 2.4 Coal Quality Comparisons (As Received Basis)

Tract	Heating Value (Btu/lb)	% Sulfur	% Ash	% Moisture	Na as % Ash
Otter Creek	8,609	0.28	5.50	27.89	7.51
Spring Creek 1	9,331	0.35	3.80	25.71	8.38
Spring Creek 2	9,370	0.34	3.65	25.53	8.63
Rosebud	8,382	0.81	10.3	25.41	10.3

Spring Creek 1 (Tract MTM 94378) is the most recent sale (2007) and contains similar coal qualities as Otter Creek coal with regards to sulfur, ash, moisture, and most notably sodium. The bid price for this tract was \$0.1883/ton. If we adjust this bid amount on a straight line basis to reflect a sodium content of 7.51%, as in Otter Creek coal, we get a bid price of \$0.2045/ton ($8.38 / 7.51 \times \0.1883). In a similar manner, the bid price adjustment based on Spring Creek 2 (Tract MTM 88405, 2000) produces a theoretical bid price of \$0.1261/ton. Finally, adjusting the bid price of the Rosebud tract to match the sodium level at Otter Creek produces a theoretical bid of \$0.2194. The average of these three theoretical bid amounts is \$0.1833/ton which is coincidentally the same as the actual bid on the 2007 Spring Creek 1 LBA.

Btu Adjustment

The \$0.1833/ton value must further be adjusted for Btu content since most sales contracts call for a quantity of Btu rather than tons. Applying a Btu adjustment to the three comparison LBAs reduces the Otter Creek bid amount to \$0.1766/ton (see Table 2.5).

Transportation Adjustment

An adjustment to recognize that these three lease sales were associated with properties that already had access to rail transportation is necessary. Since the length of rail line required at these mines is unknown, the cost estimate for the rail line needed at Otter Creek was used to adjust the three lease sales. This was accomplished by dividing that cost by the total tons of recoverable coal at Otter Creek. This calculates to \$0.1429/ton (\$187M/1,308.6Mtons). This transportation adjustment was further reduced separately for each lease by discounting at a 2.5 percent *annual* rate over the time difference in months between the three lease sales and October, 2008. The resulting adjustments, shown in Table 2.5, average \$0.1227/ton and the final adjusted values averages **\$0.0539** per ton.

Table 2.5 Bonus Bid Adjustments

Lease	Lease Sale Date	Bid Price	Na as % Ash	Adjust Bid to 7.51 % Na	Heat Content Btu/lb	Addtn'l Adjust. for Btu	Adjust for No Railroad	Final Adjusted Value
Spring Creek 1	4/17/2007	\$0.1833	8.38	\$0.2045	9,331	\$0.1887	-\$0.1376	\$0.0511
Spring Creek 2	11/27/2000	\$0.1097	8.63	\$0.1261	9,370	\$0.1158	-\$0.1173	-\$0.0015
Rosebud	6/16/1999	\$0.1600	10.3	\$0.2194	8,382	\$0.2254	-\$0.1132	\$0.1122
Otter Creek			7.51	\$0.1833	8,609	\$0.1766	-\$0.1227	\$0.0539

Notes: Otter Creek adjustments are arithmetic averages of the three federal sales.

Summary of Adjustments

Bonus bids on three federal coal lease sales in Montana were adjusted to match Otter Creek coal Btu and Sodium qualities and for rail service as follows:

- First, the adjustment for sodium at Spring Creek 1 is calculated by dividing its sodium value (8.38) by the sodium value at Otter Creek 1 (7.51), then multiplying the result by \$0.1833/ton which yields an adjusted value of \$0.2045/ton. The same calculation applies to Spring Creek 2 and Rosebud sales. The average of these three bids, adjusted for sodium is \$0.1883/ton.
- Next, the adjustment for heat content (Btu/lb) is applied in a similar fashion, but now to the sodium adjusted values and this yields an average bid price for Otter Creek coal of \$0.1766/ton.
- Finally, the three comparable lease bids were adjusted downward to recognize that they had rail service at the time of the bid while Otter Creek does not. This was accomplished by discounting (\$0.1429/ton) downward to account for time differences between the lease dates of the comparable leases and October, 2008; then deducting these results from the adjusted Btu value on each lease. This gives a final average bid price of \$0.0539/ton.
- Multiplying this unit bonus bid amount by the recoverable unleased Montana State coal contained within the three Otter Creek Tracts (572.3Mtons) yields a total value under the Comparable Sales approach of \$30.8M.

INCOME APPROACH

GENERAL

The value of the remaining Montana state coal leases within the Otter Creek Tracts 1 through 3 was also determined through the Income Approach. This approach involves preparing a discounted cash flow analysis by estimating the annual costs and revenues associated with the development of the coal leases under realistic conditions. The cash flow is discounted to the net present value (NPV) by applying a reasonable discount rate. The discount rate chosen for this analysis is 10% which matches the rate currently used by the U.S. Department of Interior's Bureau of Land Management (BLM)³. The following sections describe the assumptions and methodologies used to calculate the NPV for the remaining coal leases with the Otter Creek Tracts.

GEOLOGIC MODEL

The coal tonnage and qualities within the Otter Creek Tracts 1 through 3 were determined through the use of a geologic model of the deposit compiled using public information and proprietary information provided by GNP-LP. The combination of the geologic data from both sources has produced the most definitive model of the Otter Creek deposit to date. This 3D computer model, prepared using Carlson Mining software, was used to determine the in-place coal tonnages and qualities used in the analyses.

LOGICAL MINING UNITS (LMUS)

Four logical mining units (LMUs) were identified in the 2005 Norwest study, which included Montana coal plus federal and private coal parcels. To simplify the valuation process, the two LMUs located on each side of Otter Creek were combined to form logical mining units, LMU 5 on the east side and LMU 6 on the west side. Economic models were created for each of these new LMUs assuming a greenfield surface mining development scenario for each. As discussed further in the text, the predicted coal market will absorb simultaneous coal production from both LMUs. Therefore, the NPVs from each model are combined to produce a single value for the entire coal property.

³ "H-3070-1 – Economic Evaluation of Coal Properties", U.S. Department of the Interior, BLM. Retrieved October 27, 2008 from <http://www.eia.doe.gov/cneaf/coal/page/coalnews/coalmar.html>.

ECONOMIC MODELS

The economic models for both LMUs (located in Appendix C) are identical in structure, i.e. calculating revenue and cost cash flows in the same manner. The only differences between the models are:

- Mining Rate (LMU5 = 21.2Mtpa, LMU6 = 12Mtpa)
- Capital Equipment Assumptions (which vary based on the mining and stripping requirements).

All other cost assumptions and methodologies in determining costs are the same throughout each model.

PRODUCTION SCHEDULE

The production schedule was adjusted to reflect a total of 5,500 net operating hours per year for major mobile equipment excluding the draglines which operate 6,000 hours per year. These annual operating hours are based on the following assumptions:

- 12 hour shifts
- 2 shift per day
- 7 days per week
- 50 weeks per year (allows for annual outage of 2 weeks)
- 80% availability
- 92% shift efficiency (15 min start up and shut down, 30 min lunch, effective work 11 of 12 hours per shift)
- 12% operating delays.

CAPITAL COSTS

Since the results of each separate model are combined into a single value, the capital for infrastructure as well as working capital, permitting, and exploration drilling is split equally between the separate models.

Equipment

The capital assumptions for each LMU were verified for major mobile equipment from the 2005 study. Capital equipment numbers and sizes for draglines, overburden shovels, and ancillary/support equipment were kept the same. Changes were made to the number of overburden trucks and to the coal loading/hauling fleets. The list below summarizes the assumptions used to verify the capital equipment numbers.

- Draglines were sized based on the annual stripping requirement and a productivity of 275,000 BCY/year/CY of bucket capacity.
- Overburden and coal trucks were sized based on truck match with the loading equipment.

- Overburden shovels were sized based on stripping volumes.
- Coal shovels were replaced with large wheel loaders which provide both economic models with a reduced capital cost since wheel loaders, being more mobile than shovels, are not constrained to a specific mine. This reduced the number of coal loading equipment in each LMU by one.
- Coal trucks were changed from 320-ton trucks to 240-ton trucks to match the loading height and bucket size of the wheel loader.
- Overburden and coal truck numbers were changed to reflect updated productivities and truck match with the coal loader.
- For each type of truck, a generic haul route was created using the geologic model and the pit layout and these routes were used to generate the updated productivity numbers using Caterpillar's fleet production calculation (FPC) software program. Appendix A contains the detailed FPC calculations and haul routes.

The calculated overburden truck productivity of 478 BCY/Operating Hour was based on the following haul parameters.

- One-way distance of 10,600 ft.
- 50 ft. elevation gain at an 8% grade
- 0% grade on the remaining length of haul
- Two 90° turns
- 4% rolling resistance.

The calculated coal truck productivity of 495 Tons/Operator Hour was based on the following haul parameters.

- One-way distance of 20,000 ft.
- 300 ft. (average overburden plus coal thickness) elevation gain at 8% grade
- 0% grade on the remaining length of haul
- Three 90° turns
- 4% rolling resistance.

The updated productivities reduced the number of overburden trucks by two in LMU5 and one in LMU6 while coal trucks were reduced by four in LMU5 and three in LMU6.

The capital cost and the hourly operating cost for each piece of mobile equipment was taken from "Mine and Mill Equipment Costs" for 2007⁴

⁴ "Mine And Mill Equipment Costs – An Estimator's Cost Guide", 2007, InfoMine USA, Inc., Spokane Valley WA.

and then inflated 10% to estimate the 2008 costs, except for draglines which are based on manufacturer quotes. This 10% inflation is an approximation to account for steep increases in diesel fuel, lubricants and replacement parts during the past year. In addition, a 7% increase was added to haul trucks for initial tires due to a worldwide shortage of large truck tires. Finally 5% was added to shovels and draglines for delivery and/or erection costs.

Summary tables of all capital for each model are shown below.

Table 3.1 LMU5 Equipment Capital Summary

Equipment	Number	Cost (\$1,000,000s)
110 cyd -Dragline	3	449.0
30 cyd - Rock-Shovel	2	19.6
240-ton OB Trucks	10	35.4
R.T. Dozers	3	2.8
Dozers (D11)	4	7.5
Water Trucks	3	2.6
Motor Graders	3	5.7
OB-Coal Drills	3	9.4
Coal Wheel Loaders	2	11.8
240-ton Coal Trucks	10	35.4
Reclamation Scrapers	4	7.4
Reclamation Dozers (D11)	2	3.8
Miscellaneous Equipment	NA	0.8
Total	NA	591.2

Table 3.2 LMU6 Equipment Capital Summary

Equipment	Number	Cost (\$1,000,000s)
70 cyd - Dragline	2	240.0
30 cyd - Rock-Shovel	1	9.8
240 ton – OB Trucks	5	17.7
R.T. Dozers	2	1.9
Dozers (D11)	4	7.5
Water Trucks	3	2.6
Motor Graders	3	5.7
OB-Coal Drills	2	6.2
Coal Wheel Loaders	1	5.9
240-ton Coal Trucks	5	17.7
Reclamation Scrapers	2	3.7
Reclamation Dozers (D11)	1	1.9
Miscellaneous Equipment	NA	0.8
Total	NA	321.4

Equipment Replacement

Replacement of trucks, wheel loaders, and ancillary equipment occurs every 10 years in each model with replacement of all shovels every 20

years. Draglines are assumed to be life of mine assets with major repairs consisting of roller replacements at 10 year intervals and tub plus roller replacements at 20 year intervals. The total equipment replacement capital estimate is \$649.2M.

Facilities

Mine facilities including office, maintenance shop, warehouse, equipment wash bay, employee change/shower room, potable water system, etc. are required in the initial stages of the mine. The capital estimate for these facilities is \$29M. This scaled figure is taken from the 2005 Norwest report for an annual tonnage of 33.2Mtons. The 2005 estimates were based on experience from similar sized mining projects studied by Norwest. Since this is a shared facility, \$14.5M was added to each economic model.

Coal Processing Plant

Mined coal will be hauled by large end-dump trucks to a coal processing plant. Here the coal will be dumped into steel hoppers and fed via an apron feeder to a primary crusher. Crushed coal then flows onto a conveyor belt to a secondary crushing and sampling system where it is further reduced in size to approximately two inches. This coal can be sent directly to large (~15,000 ton capacity) storage and blending silos or sent directly to a weigh bin and loaded into a unit train. The capital cost of this coal handling plant is estimated at \$70M which is based on previous cost studies performed by Norwest scaled to an annual tonnage of 33.2Mtons. This is also a shared facility and was split equally between each economic model at \$35M.

Rail Line to Miles City, MT

The closest main rail line to Otter Creek passes through Miles City, MT located about 85 miles from the proposed mine. There is an approved rail line, the Tongue River Railroad, which if built would pass within about six miles of Otter Creek. There is no specific time frame for constructing this railroad. Valuation rules require the evaluator to consider only those improvements that are already in place and not speculate on proposed additions. As such, the cost of the entire rail line to Miles City must be included along with a rail spur and loading loop at the mine location. The impact is significant as the estimate for the rail line only (not including the six mile spur or loading loop) is \$187M. This cost was split equally between each economic model. Norwest assumes that Tongue River Railroad Company (TRRC) will own the main line and therefore be responsible for maintenance and property taxes.

Norwest further assumes that the developer must pay for the railroad up front, but will recover the cost with 4% annual compounded interest over the first 15 years of production. The up-front cost of the railroad is included in the cash flow calculation, but not in the capital expenditures. Likewise the recapture is included in the cash flow, but not in the income.

Had the Tongue River railroad been in place, front-end cash outflow would be reduced in years -2 and -1 resulting in a higher NPV of \$124.8M or \$0.10/ton of recoverable coal.

Working Capital

Working capital is money that is typically committed at the front end of a new project to cover operating costs for the first three months to a year. Working capital may vary over the life of the project and is recovered at the end of the project. For this study, working capital is set at \$12.5M, or about equal to three months of controllable cash costs. This shared cost is split equally between each economic model.

Permitting and Exploration Drilling

Capital costs for permitting and exploration drilling were added to each model with the total cost split equally among each model. Capital for permitting is estimated at \$5M with exploration drilling at \$3M

Total Capital

Adding equipment, facilities, coal handling plant, rail spur and loading loop, working capital, and permitting and exploration drilling gives a total estimated capital expenditure required for the project of \$1,711M (see Table 3.3). This capital will support a total production level of about 30Mtpa.

Table 3.3 Total Capital (Mine, Facilities, Plant, Rail Loop & Working Capital)

Capital Category	Cost (\$1,000,000s)
Mine Equipment (initial plus replacement)	1,566.9
Mine Facilities	29.0
Coal Plant	70.0
Rail Spur (6 mi.) & Loading Loop	24.6
Working Capital	12.5
Permitting and Exploration Drilling	8.0
Total Capital Required Over The Mine Life	1711.0

EQUIPMENT OPERATING COSTS

Mobile equipment hourly operating costs were estimated using Mine and Mill Equipment Costs guide. These costs were adjusted to reflect the following locally estimated costs.

- Diesel cost of \$3.63 per gallon
- Electricity cost of \$0.067 per kWh
- Lube cost of \$9 per gallon.

The plant operating cost from the previous model was adjusted to 2008 using the Mining Cost Service - Mill Cost Index⁵.

The productivity levels for each dragline were based on stripping 275,000 BCY/year/CY of bucket capacity, resulting in annual productivities of 19MBCY and 30MBCY for the 70cy and 110cy draglines respectively.

Productivity levels for shovels, loaders and trucks were adjusted to reflect updated productivities based on the following loading assumptions.

- Bucket cycle time of 0.5 min
- 85% loading/operator efficiency
- 15% swell factor
- 90% bucket fill factor
- 5,500 net operating hours per year.

The above assumptions resulted in an annual productivity of 13MBCY for the 30cy overburden shovel and 17Mtons for the 41cy coal wheel loader. Due to the overall tonnage requirements and match with truck fleet size, the wheel loader productivity was reduced to match the productivity of the five-truck coal fleet or 13.6Mtons annually.

The equipment hourly operating costs were combined with the productivity assumptions to generate unit costs for each piece of equipment or fleet. A summary table of equipment unit costs is shown below. The fleet cost for overburden and coal movement, support equipment, and reclamation are combined into a single unit cost.

⁵ “Mining Cost Service”, InfoMine USA, Inc., Spokane Valley WA, 99206

Table 3.4 Equipment Unit Cost Summary

Equipment	\$/Unit	Units
OB Removal Dragline	0.23	BCY
OB Truck – Shovel	0.71	BCY
Coal Loading – Haulage	0.76	TON
Other Support Equipment	0.48 ¹	TON
Coal Handling Plant	0.19	TON
Reclamation	0.33 ¹	TON

¹ Average values for LMUs 5&6.

OTHER CONTROLLABLE UNIT COSTS

Other unit costs include labor, explosives, and other supplies and services.

Labor

A labor unit cost was estimated using the 2007 labor cost data from Mining Cost Service and ton per man-hour data from the Mine Safety and Health Administration (MSHA) for the Decker, Absaloka, and Spring Creek mines for the period 2000 through 2007. This cost was escalated to reflect current 2008 labor costs.

The published average hourly wage in the Mining Cost Service for Montana union employees is \$24.62. The average hourly wage for salaried employees is \$41.11 based on an annual salary of \$85,000 and 2,080 working hours per year. This is based on a breakout of 15% top management at \$135,000/year, 40% senior management at \$90,000/year, and 45% mid/entry level at \$65,000/year.

Benefits were added as a percentage of hourly wages; 55% was added for union employees while 45% was added for salary employees. A weighted average between union and salary employees was taken based on 443 union employees and 95 salary employees (scaled breakout based on Mining Cost Service data). This weighted average hourly wage was escalated to 2008 costs based on the mine labor cost index. The final calculated hourly wage was \$44.33/hr. This cost was then converted to a cost per ton of \$1.43 using the average productivity number of 31 tons per man-hour from 2000 to 2007 for similar Montana mines.

Explosives

An explosives unit cost was calculated using assumed powder factors and unit prices of \$0.44/lb for ANFO and \$0.74/lb for emulsion. An additional 15% was added for explosive accessories.

Powder factors of 0.6lb/BCY for dragline overburden, 1.0lb/BCY for shovel overburden and 0.30lb/ton for coal were used. This was

combined with an allowance for 10% wet holes (emulsion used) to calculate a total cost per ton. This cost was then escalated to 2008 costs by using the Mining Cost Service index for explosives. The final calculated explosive cost used in the economic model was \$0.36/ unit, whether a BCY of waste or a ton of coal.

Other Supplies and Services

A unit cost for other supplies and services was included in the 2005 analysis. This cost was updated to a 2008 cost of \$0.12/ton using the producer price index.

NON-CONTROLLABLE COSTS

Non-controllable costs include taxes, fees, royalties, reclamation bonding, general insurance, corporate overhead, and other costs.

Taxes, Fees, and Royalties

Taxes, fees and royalties were added to each economic model in accordance with Montana and Federal regulations. The rates for each are listed below:

- | | |
|--|---|
| • Black Lung Tax | \$0.55/ton |
| • Severance Tax | 15% |
| • Gross Receipts Tax | 5% |
| • Reclamation Fee | \$0.35/ton |
| • Resource Indemnity Trust Tax | 0.4% |
| • Royalty Payments (Montana and Other) | 12.5% |
| • Property Taxes (Powder River County) | 3% assessed value
(851.56 mill levy) |
| • Lease Annual Fee | \$3.0/acre |
| • Montana Corporate Income Tax | 6.75% |
| • Federal Corporate Income Tax | 35% or 20% AMT |

Property taxes were included for mobile mining equipment and fixed facilities (office, shop, warehouse, train loadout and rail spur, etc.). Property tax was not included on the main line railroad as this railroad right of way is owned by the Tongue River Railroad Company. Any property tax would be their responsibility.

Other Non-Controllable Costs

The reclamation bond premium of \$1.5M/year was estimated using an insurance premium rate of 1.5% and a \$100M bond value for each model.

General insurance, corporate overhead, and an allowance for other costs were escalated to 2008 costs from the previous model to 1.2 cents/ton, 10.8 cents/ton, and 6.0 cents/ton respectively.

COAL PRICE

The coal price used in each analysis was calculated based on the following data sources:

- FOB Mine Price for 8,800 Btu/lb PRB coal: SNL Energy, Vol. 4, Issue 35, September 2008
- Burlington Northern Santa Fe (BNSF) common carrier pricing rates.

This analysis was performed for two specific power plant locations to give a range of coal prices. The locations used in the analysis are Fergus Falls, MN and Miles City, MT.

The FOB mine price for PRB coal averaging 8,800 Btu/lb of \$11/ton was obtained from a current SNL Energy's Coal Report⁶. Rail shipping rates were obtained from BNSF for revision 7 of their common carrier rates set in February of 2008. These rates determined the shipping prices of \$7.11/ton and \$22.17/ton for Miles City and Fergus Falls respectively. By adding the FOB mine price to the rail shipping rates, delivered prices of \$18.11/ton and \$33.17/ton are calculated for Miles City and Fergus Falls respectively. These delivered prices were used as the basis to calculate the FOB Otter Creek Mine price, assuming 8,800 Btu/lb coal, by subtracting out the rail shipping cost as if the coal originated from Otter Creek. By subtracting the shipping cost from Otter Creek to both Miles City and Fergus Falls (\$2.04/ton and \$13.14/ton respectively) from the delivered prices resulted in FOB Otter Creek Mine Prices of \$16.07/ton and \$20.03/ton. From these ton unit prices, a price per MBtu was calculated based on 8,800 Btu/lb. This unit price per MBtu was then used to determine the Btu adjusted prices per ton for Otter Creek. In addition, an allowance for reduced sulfur was added to the final FOB mine price for Otter Creek based on a Sulfur credit of \$145/ton of SO₂. This sulfur allowance accounted for \$0.41 of the unit price.

In summary, the final Otter Creek FOB mine prices ranged from \$16.10/ton to \$19.97/ton. The higher of these two prices was used in the analysis. Table 3.5 shows the average price used in each model

⁶ "SNL Energy's Coal Report", Sept. 8, 2008. Volume 4, Issue 35. SNL Financial LC Charlottesville VA 22902.

utilizing the higher rate. The detailed price calculations are shown in Appendix B.

Table 3.5 Average Coal Price for Each Model

Model	Coal Price (\$/ton)
LMU5	\$19.82
LMU6	\$20.22
Weighted Average	\$19.97

DISCOUNTED CASH FLOW ANALYSIS AND NPV

A cash flow for each model was created using mining rates of 21.2Mtpa for LMU5 and 12Mtpa for LMU6. The detailed model for each LMU depicting annual cash flows by year is shown in Appendix C.

The mine plan developed by Norwest for the combined Otter Creek area was based on achieving a consistent mined coal quality and smoothing the strip ratio from year to year to avoid wide fluctuations in overburden removal requirements. This plan concentrates mining on private coal lands in the initial production years. NPVs were calculated utilizing this mine plan for each LMU using a 10% discount rate. Table 3.6 summarizes the NPV's from each economic model.

Table 3.6 NPV Summary (10% Discount Rate)

Economic Model	NPV @10%(\$1,000s)
LMU5	28,152
LMU6	57,174
Total	\$85,326

VALUATION

The overall value of the unleased Montana state coal according to the above analysis hinges on the manner in which both analyses (LMUs 5 and 6) are combined in an overall project. The unleased Montana state coal refers to Montana owned coal within the Otter Creek tracts which has not yet been leased. Sections 16 and 36 of Township 4S Range 45E were initially owned by Montana prior to receiving the remaining coal lease areas from the federal government; these two sections have already been leased. The remaining coal with the tracts is held in private leases. The majority of these private leases are owned by GNP-LP. The total recoverable tons for the entire property are 1,308.6Mtons of which 572.3Mtons are unleased Montana state coal.

In a review of the market analysis information provided to the DNRC by Global Energy Decisions⁷, the potential market for Otter Creek coal will reach 30Mtpa by 2011 and 33Mtpa by 2015. Taking into account lead time for permitting and mining construction activities (approximately five years total) it is likely that full production for each LMU would not be realized until late 2014. Since the combined full production of each LMU is 33.2Mtpa, it is feasible that the market could handle the simultaneous startup of both LMUs. This would suggest that the manner in which to combine the NPVs from both LMUs is simply to sum the two values. This results in an Overall NPV of \$85.3M for the entire lease area.

The bonus bid amount for the entire coal property is calculated by summing the NPVs for LMU5 and 6 and dividing by the recoverable tons for the entire property. The result equates to a bonus bid of \$0.0652/ton (\$85.3M/1,308.6Mtons). Multiplying this bonus amount by the amount of unleased Montana state coal yields an overall value under the Income Approach of \$37.3M (\$0.0652/ton x 572.3Mtons).

⁷ Memo to: Monte Mason From: Doug Day, Global Energy Decisions, Dated: May 11, 2007. Re: MT Economic Benefits.

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APPENDIX A

DETAILED FPC CALCULATIONS AND HAUL ROUTES

Caterpillar Inc.
Fleet Production and Cost Program

FPC

Job Name:	Otter Creek State Coal Valuation
Description:	Verificaiton of Overburden Truck number assumption. A generic haul route to produce the same productivity is calculated within FPC. This haul route is then compared with the mine plan layout to determine its practicality. Specific gravity of 2.3 (CAT handbook) and 15% swell was assumed.
Prepared For:	Montana DNRC
Prepared By:	Norwest Corp
Date:	July 24, 2008

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240 Truck
July 24, 2008

Fleet Production and Cost Analysis

OB Truck Prod Check final
Montana DNRC

Norwest Corp

July 24, 2008

Description:

Material Qty (BCY)	1
lbs per BCY	3,875
lbs per LCY	3,370

Distance feet	Rolling Resistance %	Grade %	Haul mph Limit	Return mph Limit	Description
625	4.00	8.00			ramp up 50 ft
4,375	4.00	0.00			haul along pit
50	4.00	0.00	5.00	5.00	turn
500	4.00	0.00			haul perpendicular to pit
50	4.00	0.00	5.00	5.00	turn
5,000	4.00	0.00			haul along pit

Caterpillar Inc.
Fleet Production and Cost Program

FPC

Job Name:	Otter Creek State Coal Valuation
Description:	Verificaiton of Coal Truck number assumption. A generic haul route to produce the same productivity is calculated within FPC. This haul route is then compared with the mine plan layout to determine its practicality. Density of 77.6lbs/ft ³ from model for bank, 15% swell is assumed.
Prepared For:	Montana DNRC
Prepared By:	Norwest Corp
Date:	July 24, 2008

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Due to the many variables involved in earthmoving projects and the consequent possibility of inadvertant errors or omissions in preparing reports of this character, neither Caterpillar Inc. nor the dealer can or does represent or warrant, expressly or implicitly, either the accuracy of this report or that the Caterpillar or competitive equipment referred to in the report will in fact achieve the performance indicated on the job to which this report relates.

[illegible]

Fleet Production and Cost Analysis

Coal Truck Prod Check final 240ton

Montana DNRC

Norwest Corp

July 24, 2008

Description:

Material Qty (Tons)	1
lbs per BCY	2,095
lbs per LCY	1,822

Distance feet	Rolling Resistance %	Grade %	Haul mph Limit	Return mph Limit	Description
3,750	4.00	8.00			ramp up 250 ft
4,000	4.00	0.00			haul
50	4.00	0.00	5.00	5.00	turn
4,000	4.00	0.00			haul
50	4.00	0.00	5.00	5.00	turn
4,000	4.00	0.00			haul
50	4.00	0.00	5.00	5.00	turn
4,000	4.00	0.00			haul

APPENDIX B

DETAILED PRICE CALCULATIONS

FOB Otter Creek Mine Coal Price Estimation using Fergus Falls, MN

	PRB 8,800	Otter Creek
Dist. Spring Creek to Fergus Falls, MN		814
Dist. Spring Creek to Otter Creek		273
Dist. Otter Creek to Fergus Falls, MN		541
Dist. South PRB to Fergus Falls, MN	913	
BNSF Price Spring Creek to Fergus Falls, MN		19.54
BNSF Price PRB to Fergus Falls, MN	22.17	
Price per ton-mile	0.024	0.024
Adjusted Price to Otter Creek		13.14

Dist. to Fergus Falls	913	541
\$/ton FOB Mine ¹	11.00	
\$/ton Shipping ²	22.17	13.14
BTU/ton	8,800	9,100
\$/MBTU	1.8847	

FOB Fergus Falls Price	\$ 34.30
FOB Otter Creek Price	\$ 21.16
SO2 Credit	\$ 0.41
Adjusted FOB Otter Creek Price	\$ 21.58

PRB 8,800	
SO2 (lb/MBTU)	0.8
S (lb/MBTU)	0.4
S (lb/ton)	7.04
S%	0.35%

Otter Creek	
S%	0.21%

SO2 Credit	
Diff S%	0.14%
SO2 (lb/ton)	5.68
Credit (\$/ton S)	\$145.00
Credit (\$/ton coal)	\$ 0.41

Total Price per Ton FOB Fergus Falls for PRB 8800 BTU Coal	33.17
minus shipping for Otter Creek	13.14
FOB Otter Creek for PRB 8800 quality coal	20.03
\$/MBTU FOB Otter Creek	1.138246

1. Value from SNL Energy Coal Report Vol. 4 Iss. 35 - 09/08/2008

2. Values from BNSF common carrier pricing (effective 02/07/2008) and adjusted for distance

FOB Otter Creek Mine Coal Price Estimation using Miles City, MT

	PRB 8,800	Otter Creek
Dist. Otter Creek to Miles City, MT		85
Dist. South PRB to Miles City, MT	293	
Price per ton-mile from Fergus Falls Scenario	0.024	0.024
Adjusted Price to Otter Creek	7.11	2.04

Dist. to Miles City	293	85
\$/ton FOB Mine ¹	11.00	
\$/ton Shipping ²	7.11	2.04
BTU/ton	8,800	9,100
\$/MBTU	1.0292	

FOB Miles City Price	\$ 18.73
FOB Otter Creek Price	\$ 16.69
SO2 Credit	\$ 0.41
Adjusted FOB Otter Creek Price	\$ 17.10
Coal to Liquid Plant (no S credit)	\$ 16.69

PRB 8,800	
SO2 (lb/MBTU)	0.8
S (lb/MBTU)	0.4
S (lb/ton)	7.04
S%	0.35%

Otter Creek	
S%	0.21%

SO2 Credit	
Diff S%	0.14%
SO2 (lb/ton)	5.68
Credit (\$/ton S)	\$145.00
Credit (\$/ton coal)	\$ 0.41

Total Price per Ton FOB Miles City for PRB 8800 BTU Coal	18.11
minus shipping for Otter Creek	2.04
FOB Otter Creek for PRB 8800 quality coal	16.07
\$/MBTU FOB Otter Creek	0.913317

1. Value from SNL Energy Coal Report Vol. 4 Iss. 35 - 09/08/2008

2. Values from BNSF common carrier pricing (effective 02/07/2008) and adjusted for distance

APPENDIX C

ANNUAL CASH FLOWS BY YEAR

LMU5 (East, Tracts 1&2) Otter Creek MT State Coal Valuation Model

	Basis	Units	Year -5	Year -4	Year -3	Year -2	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 To 10	Year 11 To 15	Year 16 To 20	Year 21 To 25	Year 26 To 30	Year 31 To 35	Year 36 To 40	Year 41 +	Totals
PRODUCTION																					
Tons Produced (000s)	95.0%	tons/yr						9,053	22,316	22,316	22,316	22,316	111,579	111,579	111,579	111,684	111,579	111,579	109,158	316	877,368
Tons Sold Montana (000s)								1,229	4,583	11,374	8,169	12,061	55,591	44,153	53,924	36,663	42,493	67,459	26,823	0	364,521
Tons Sold Other (000s)								7,371	16,617	9,826	13,031	9,139	50,409	61,847	52,076	69,437	63,507	38,541	76,877	300	468,979
Tons Sold (000s)		Recovery						8,600	21,200	21,200	21,200	21,200	106,000	106,000	106,000	106,100	106,000	106,000	103,700	300	833,500
BCY - DRAGLINE Produced (000s)								18,875	54,625	68,625	67,000	75,875	366,625	372,250	365,125	366,375	369,375	381,000	374,125	625	2,880,500
BCY - TRUCK/SHOVEL Produced (000s)								630	1,385	4,305	4,825	11,835	67,345	75,855	77,370	93,640	134,830	235,795	183,220	210	891,245
Total Units (BCY+ tons)								28,105	77,210	94,130	93,025	108,910	539,970	554,105	548,495	566,115	610,205	722,795	661,045	1,135	4,605,245
Strip Ratio (BCY /ROM Ton)								2.27	2.64	3.44	3.39	4.14	4.09	4.23	4.17	4.34	4.76	5.82	5.37	2.78	3.28
BTU/lb (DB)								11,862	11,900	11,953	11,949	11,927	11,935	11,915	11,901	11,896	11,919	11,957	11,953	11,925	11,925
Sulfur % (DB)								0.28	0.28	0.28	0.27	0.28	0.28	0.28	0.28	0.29	0.29	0.29	0.27	0.24	0.28
LbSO2/MBTU								0.47	0.47	0.47	0.45	0.47	0.47	0.47	0.46	0.49	0.49	0.49	0.46	0.40	0.47
Sodium in Ash%								7.93	7.84	7.49	8.03	7.41	6.73	6.73	6.79	6.80	6.72	6.88	7.43	7.36	6.96
REVENUE																					
Coal Sales Price (FOB Mine)	\$	19.82	\$/TON					19.75	19.79	19.95	19.90	19.85	19.91	19.87	19.82	19.74	19.74	19.74	19.85	19.76	19.82
Total Revenue from Coal Sales								169,853	419,614	422,893	421,869	420,823	2,110,797	2,106,279	2,100,563	2,094,057	2,092,702	2,092,444	2,058,526	5,929	16,516,347
CASH PRODUCTION COSTS																					
Controllable Costs																					
Labor	1.43	\$/TON						12,299	30,318	30,318	30,318	30,318	151,588	151,588	151,588	151,731	151,588	151,588	148,299	429	1,191,967
Equipment, Materials and Supplies																					
OB Removal Dragline	0.23	\$/BCY						4,256	12,317	15,473	15,107	17,108	82,665	83,934	82,327	82,609	83,285	85,907	84,356	141	649,486
OB Truck - Shovel	0.71	\$/BCY						450	988	3,072	3,443	8,445	48,055	54,127	55,208	66,818	96,210	168,254	130,739	150	635,958
Explosives	0.37	\$/UNIT						13,640	36,534	42,745	42,339	48,170	239,169	244,357	242,298	248,805	264,950	306,280	282,724	533	2,012,543
Coal Loading - Haulage	0.76	\$/TON						6,546	16,138	16,138	16,138	16,138	80,689	80,689	80,689	80,765	80,689	80,689	78,938	228	634,474
Other Support Equipment	0.44	\$/TON						3,766	9,284	9,284	9,284	9,284	46,420	46,420	46,420	46,464	46,420	46,420	45,413	131	365,010
Other Supplies & Services	0.12	\$/TON						1,028	2,533	2,533	2,533	2,533	12,667	12,667	12,667	12,679	12,667	12,667	12,393	36	99,607
Coal Handling Plant	0.19	\$/TON						1,667	4,108	4,108	4,108	4,108	20,541	20,541	20,541	20,560	20,541	20,541	20,095	58	161,519
Reclamation	0.35	\$/TON						3,036	7,484	7,484	7,484	7,484	37,422	37,422	37,422	37,457	37,422	37,422	36,610	106	294,255
Total Controllable Costs								46,687	119,704	131,155	130,754	143,588	719,216	731,745	729,161	747,888	793,773	909,768	839,567	1,812	6,044,818
\$/SALES TON								5.43	5.65	6.19	6.17	6.77	6.79	6.90	6.88	7.05	7.49	8.58	8.10	6.04	7.25
NON-CONTROLLABLE COSTS																					
Black Lung Tax	0.550	\$/Ton						4,730	11,660	11,660	11,660	11,660	58,300	58,300	58,300	58,355	58,300	58,300	57,035	165	458,425
Severance Tax	15.0%	% of Revenue						17,500	43,314	43,671	43,559	43,445	218,164	217,671	217,048	216,328	216,192	216,163	212,724	561	1,706,340
Gross Receipts Tax	5.0%	% of Revenue						5,853	14,458	14,577	14,540	14,502	72,741	72,577	72,369	72,129	72,084	72,074	70,928	207	569,038
Reclamation Fees	0.350	\$/Ton						3,010	7,420	7,420	7,420	7,420	37,100	37,100	37,100	37,135	37,100	37,100	36,295	105	291,725
Resource Indemnity Trust Tax	0.4%	% of Revenue						468	1,157	1,166	1,163	1,160	5,819	5,806	5,790	5,770	5,767	5,766	5,674	17	45,523
Royalty Payments MT State	12.5%	% of Revenue						3,035	11,339	28,360	20,320	29,926	138,374	109,667	133,575	90,449	104,864	166,456	66,557	0	902,923
Royalty Payments Other	12.5%	% of Revenue						18,197	41,113	24,502	32,414	22,677	125,475	153,618	128,996	171,308	156,723	95,099	190,759	741	1,161,621
Property Taxes	16,682	\$000s						16,703	16,746	16,746	16,746	16,746	83,732	83,732	83,732	83,732	83,732	83,732	83,732	16,746	686,562
Lease Rental Fee	19	\$000s						19	19	19	19	19	97	97	97	97	97	97	97	19	798
Reclamation Bonding (premium)	1,500	\$000s						1,500	1,500	1,500	1,500	1,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	1,500	61,500
General Insurance	0.012	\$/Unit						336	923	1,125	1,112	1,302	6,453	6,622	6,555	6,765	7,292	8,638	7,900	14	55,035
Corporate Overhead + Joint Facilities	0.108	\$/Unit						3,023	8,304	10,124	10,005	11,714	58,076	59,596	58,993	60,888	65,630	77,739	71,098	122	495,313
Other	0.060	\$/Unit						1,679	4,613	5,624	5,558	6,508	32,264	33,109	32,774	33,827	36,461	43,189	39,499	68	275,174
Total Non-Controllable Cash Costs								76,053	162,566	166,495	166,017	168,579	844,097	845,396	842,829	844,284	851,743	871,855	849,798	20,265	6,709,975
\$/SALES TON								8.84	7.67	7.85	7.83	7.95	7.96	7.98	7.95	7.96	8.04	8.23	8.19	67.55	8.05
TOTAL CASH COSTS								122,740	282,270	297,650	296,771	312,167	1,563,313	1,577,141	1,571,989	1,592,172	1,645,515	1,781,622	1,689,364	22,076	12,754,793
\$/SALES TON								14.27	13.31	14.04	14.00	14.72	14.75	14.88	14.83	15.01	15.52	16.81	16.29	73.59	15.30

LMU6 (West, Tract 3) Otter Creek MT State Coal Valuation Model

	Basis	Units	Year -5	Year -4	Year -3	Year -2	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 To 10	Year 11 To 15	Year 16 To 20	Year 21 To 25	Year 26 To 30	Year 31 To 35	Year 36 To 40	Year 41 +	Totals
PRODUCTION																					
Tons Produced (000s)	95.0%	tons/yr						5,053	12,632	12,632	12,632	12,632	63,158	63,158	63,158	63,158	63,158	63,158	63,158	2,421	500,105
Tons Sold Montana (000s)								106	344	1,490	4,178	4,480	22,658	25,016	30,372	21,483	21,521	32,102	42,181	1,913	207,844
Tons Sold Other (000s)								4,694	11,656	10,510	7,822	7,520	37,342	34,984	29,628	38,517	38,479	27,898	17,819	387	267,256
Total Tons Sold (000s)		Recovery						4,800	12,000	12,000	12,000	12,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	2,300	475,100
BCY - DRAGLINE Produced (000s)								12,125	25,875	26,500	28,000	26,875	142,000	153,000	166,375	166,750	166,125	175,250	173,625	6,500	1,269,000
BCY - TRUCK/SHOVEL Produced (000s)								210	630	1,285	1,495	1,395	11,210	23,880	38,620	39,505	62,285	81,905	117,535	7,230	387,185
Total Units (BCY+ tons)								17,135	38,505	39,785	41,495	40,270	213,210	236,880	264,995	266,255	288,410	317,155	351,160	16,030	2,131,285
Strip Ratio (BCY /ROM Ton)								2.57	2.21	2.32	2.46	2.36	2.55	2.95	3.42	3.44	3.81	4.29	4.85	5.97	2.54
BTU/lb (DB)								12,047	12,012	11,934	11,933	11,930	11,912	11,925	11,983	11,969	11,941	11,944	11,936	11,962	11,946
Sulfur % (DB)								0.28	0.28	0.29	0.29	0.29	0.30	0.29	0.27	0.28	0.28	0.28	0.27	0.26	0.28
LbSO2/MBTU								0.47	0.46	0.49	0.49	0.48	0.51	0.49	0.45	0.47	0.47	0.46	0.45	0.44	0.47
Sodium in Ash%								0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REVENUE																					
Coal Sales Price (FOB Mine)	\$ 20.22	\$/TON (AVG)						20.28	20.16	20.01	20.07	20.09	20.12	20.20	20.31	20.27	20.22	20.23	20.33	20.39	20.22
Total Revenue from Coal Sales								97,337	241,916	240,158	240,849	241,079	1,206,922	1,211,903	1,218,581	1,216,022	1,213,387	1,213,710	1,219,557	46,890	9,608,312
CASH PRODUCTION COSTS																					
Controllable Costs																					
Labor	1.43	\$/TON						6,864	17,161	17,161	17,161	17,161	85,804	85,804	85,804	85,804	85,804	85,804	85,804	3,289	679,428
Equipment, Materials and Supplies																					
OB Removal Dragline	0.23	\$/BCY						2,734	5,834	5,975	6,313	6,060	32,018	34,498	37,514	37,598	37,457	39,515	39,148	1,466	286,130
OB Truck - Shovel	0.71	\$/BCY						150	450	917	1,067	995	7,999	17,040	27,558	28,189	44,444	58,444	83,868	5,159	276,280
Explosives	0.36	\$/UNIT						7,918	18,249	18,706	19,316	18,879	98,628	107,075	117,109	117,558	125,465	135,723	147,859	6,585	939,071
Coal Loading - Haulage	0.76	\$/TON						3,654	9,135	9,135	9,135	9,135	45,673	45,673	45,673	45,673	45,673	45,673	45,673	1,751	361,654
Other Support Equipment	0.51	\$/TON						2,438	6,095	6,095	6,095	6,095	30,473	30,473	30,473	30,473	30,473	30,473	30,473	1,168	241,296
Other Supplies & Services	0.12	\$/TON						574	1,434	1,434	1,434	1,434	7,170	7,170	7,170	7,170	7,170	7,170	7,170	275	56,777
Coal Handling Plant	0.19	\$/TON						930	2,325	2,325	2,325	2,325	11,627	11,627	11,627	11,627	11,627	11,627	11,627	446	92,067
Reclamation	0.31	\$/TON						1,500	3,751	3,751	3,751	3,751	18,753	18,753	18,753	18,753	18,753	18,753	18,753	719	148,490
Total Controllable Costs								26,762	64,433	65,498	66,596	65,834	338,145	358,113	381,681	382,846	406,867	433,183	470,376	20,857	3,081,192
\$/SALES TON								5.58	5.37	5.46	5.55	5.49	5.64	5.97	6.36	6.38	6.78	7.22	7.84	9.07	6.49
NON-CONTROLLABLE COSTS																					
Black Lung Tax	0.550	\$/Ton						2,640	6,600	6,600	6,600	6,600	33,000	33,000	33,000	33,000	33,000	33,000	33,000	1,265	261,305
Severance Tax	15.0%	% of Revenue						10,019	24,973	24,782	24,882	24,882	124,788	125,331	126,059	125,780	125,493	125,528	126,165	4,800	993,457
Gross Receipts Tax	5.0%	% of Revenue						3,360	8,345	8,281	8,306	8,314	41,616	41,797	42,040	41,947	41,851	41,863	42,075	1,620	331,415
Reclamation Fees	0.350	\$/Ton						1,680	4,200	4,200	4,200	4,200	21,000	21,000	21,000	21,000	21,000	21,000	21,000	805	166,285
Resource Indemnity Trust Tax	0.4%	% of Revenue						269	668	662	664	665	3,329	3,344	3,363	3,356	3,348	3,349	3,366	130	26,513
Royalty Payments MT State	12.5%	% of Revenue						270	866	3,728	10,481	11,251	56,972	63,161	77,106	54,423	54,402	81,171	107,172	4,875	525,878
Royalty Payments Other	12.5%	% of Revenue						11,897	29,374	26,291	19,625	18,884	93,893	88,327	75,217	97,579	97,272	70,543	45,273	986	675,161
Property Taxes	9,790	\$000s						9,812	9,855	9,855	9,855	9,855	49,274	49,274	49,274	49,274	49,274	49,274	49,274	9,855	404,000
Lease Rental Fee	9	\$000s						9	9	9	9	9	46	46	46	46	46	46	46	9	380
Reclamation Bonding (premium)	1,500	\$000s						1,500	1,500	1,500	1,500	1,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	1,500	61,500
General Insurance	0.012	\$/Unit						205	460	475	496	481	2,548	2,831	3,167	3,182	3,447	3,790	4,197	192	25,470
Corporate Overhead + Joint Facilities	0.108	\$/Unit						1,843	4,141	4,279	4,463	4,331	22,932	25,477	28,501	28,637	31,020	34,111	37,769	1,724	229,228
Other	0.060	\$/Unit						1,024	2,301	2,377	2,479	2,406	12,740	14,154	15,834	15,909	17,233	18,951	20,983	958	127,349
Total Non-Controllable Cash Costs								44,528	93,291	93,040	93,536	93,379	469,638	475,242	482,106	481,633	484,885	490,126	497,819	28,719	3,827,941
\$/SALES TON								9.28	7.77	7.75	7.79	7.78	7.83	7.92	8.04	8.03	8.08	8.17	8.30	12.49	8.06
TOTAL CASH COSTS								71,290	157,724	158,539	160,132	159,213	807,783	833,355	863,787	864,479	891,751	923,308	968,195	49,576	6,909,133
\$/SALES TON								14.85	13.14	13.21	13.34	13.27	13.46	13.89	14.40	14.41	14.86	15.39	16.14	21.55	14.54

NORWEST
CORPORATION

Salt Lake City / Calgary / Charleston WV / Vancouver / Pittsburgh / Grand Junction / Denver / Golden / Kolkata
www.norwestcorp.com

Footnote 27

**The Value of the Otter Creek Coal Tracts to the State of Montana:
The Dangers of Relying on the Norwest Corporation Appraisal**

**A Report Prepared for Submission to the Montana Land Board
On the Norwest Appraisal of the Otter Creek Tracts**

for

**Northern Plains Resource Council
and
Natural Resources Defense Council**

by

Power Consulting

**Thomas Michael Power
Donovan S. Power**

July 31, 2009

About the Authors

Thomas Michael Power is Research Professor and Professor Emeritus in the Economics Department at the University of Montana. He has a BA in Physics from Lehigh University and an MA and PhD from Princeton University in Economics. He served on the faculty of the University of Montana for 40 years, 30 of those years as Chair of the Economics Department.

Donovan S. Power has a BA in Geosciences from the University of Montana and an MS in Glaciology from the University of Washington.

The Value of the Otter Creek Coal Tracts to the State of Montana: The Dangers of Relying on the Norwest Corporation Appraisal

Executive Summary

The State of Montana owns coal lands in the Otter Creek drainage of the Tongue River Valley of southeastern Montana. It hired Norwest Corporation to analyze the market value of that coal to help inform the Montana State Land Board as it considers if, when, and on what terms it might offer those lands for lease. In particular, if these lands were to be offered for lease, what should be the minimum upfront payment (bonus bid) that the State should require from potential bidders for the right to develop that State coal?

A market valuation or appraisal seeks to determine the price that a well-informed willing buyer and willing seller would agree on given the market context in which the land or product is sold. Analyzing and understanding that market context is crucial to any appraisal. Just as one could not determine the fair market value of a residence or commercial property in a particular Montana city without carefully studying the local real estate market, the same is true when seeking to establish the value of a mineral deposit.

Norwest Corporation's (Norwest) *Montana Otter Creek State Coal Valuation (Appraisal)*¹ provides only a brief review of the market into which the Otter Creek coal would be sold. It correctly characterizes that market in the following terms: "Coals with high sodium content share a limited market due to slagging problems they cause in certain types of power plant boilers. *This limits the market for high sodium coals to a small number of mid-western electric generating plants and some industrial plants.*"² This characterization is consistent with the more detailed market analysis Norwest did in a 2006 report to the Montana Department of Natural Resources and Conservation (DNRC).³

Unfortunately, Norwest does not incorporate this market analysis into its Appraisal. Instead the Appraisal is based on the total recoverable coal estimated to be located in the Otter Creek Tracts. That physical quantity of coal is simply assumed to be saleable into an unspecified market for a price at or above existing Powder River Basin mine mouth prices. This contradicts Norwest's own characterization of the market available for Otter Creek coal as "limited to a small number of mid-western generating plants" and replaces it with a sweeping characterization of the market as effectively unlimited in the last two paragraphs of the Appraisal.⁴

¹ Norwest Corporation, Salt Lake City, Utah 84111, submitted to the Montana Department of Natural Resources & Conservation, Trust Land Management Division, Helena, MT 59620-1601.

² Emphasis added. P. 2-4. This warning about "limited markets" for Otter Creek coal is repeated elsewhere in the Appraisal (pp. 2-3 and 2-5).

³ "Otter Creek Property Summary Report," submitted to Great Northern Properties and Montana Department of Natural Resources and conservation, July 12, 2006, pp. 4-1 to 4-5, Table 4.1, and Figure 4.1.

⁴ Only in the last two paragraphs of the Appraisal does Norwest refer to the available market for the coal it is supposed to be valuing. There, Norwest refers to a second-hand summary memo that was submitted to DNRC by Wesco Resources, one of the primary coal developers in the Otter Creek area and sponsor of

The size of the market into which Otter Creek coal will be sold is crucially important to the valuation of that coal. This is true for several reasons:

- First, full production of coal from the Otter Creek Tracts would involve a very large increase in the production of Montana high-sodium coal. Soon after start up, the proposed Otter Creek mines would be producing almost twice as much coal as Montana has sold each year over the last decade.
- Second, 80 to 90 percent of the coal Montana exports is sold to four northern Midwest states, North Dakota, Minnesota, Wisconsin, and Michigan, where some electric generators have built boilers that can handle Montana's high-sodium coal.
- Third, 90 to 95 percent of the coal produced in Montana is sold in the northern tier of states stretching east and west from Montana where Montana has a transportation cost advantage relative to Wyoming coal.

This means, as Norwest admits, that Otter Creek coal will have to compete to displace the coal from existing **Montana** coal mines currently serving this limited market. Such competition to sell such a large amount of coal into a limited market is certain to drive coal prices down. In addition the inroads that Otter Creek coal is able to make would be at the expense of other Montana coal producers.

Despite the fact that Otter Creek coal would need to compete to displace existing coal suppliers to enter this market, the Appraisal assumes that Otter Creek coal would realize a mine-mouth price per ton that is almost twice the projected mine-mouth coal price for other Powder River Basin coal. This is an unlikely outcome of competition for market share. This result is partially a result of Norwest exaggerating the transportation distance savings that Otter Creek coal would have over Wyoming's southern Powder River Basin coal. Norwest puts this distance advantage as 372 miles when it is actually 208 miles, only about half of what the Norwest Appraisal assumes. Because transportation costs are the primary determinant of the delivered price of coal, this has a major impact of Norwest's estimated mine-mouth price of Otter Creek coal and the bonus bids the State of Montana can expect. Norwest's high estimated mine-mouth price is also the result of it focusing on a single potential customer for Otter Creek coal, the Hoot Lake generating stations in Fergus Falls, where earlier Norwest analysis had found implicit mine-mouth coal prices to be several fold higher than the average for all generating plants in that market area.

the Tongue River Railroad. (Memo to: Monte Mason [DNRC] From: Doug Day [Wesco Resources], Dated: May 11, 2007, Re: MT Economic Benefits. According to DNRC, Wesco Resources contends that this market analysis, which was actually undertaken by another entity, Global energy Decisions, contains proprietary information, and so, apparently, was not shared with Norwest. Norwest relied solely on the memo and Wesco Resources' assertion that that market analysis supported full development of the Otter Creek Tracts. The problems associated with Norwest's reliance on the Day memo in the absence of the underlying data on which that memo is based is discussed further on page 8.

Norwest's estimates of the value of Otter Creek coal and the bonus bids that the State of Montana can expect are also problematic due to the use of a very low cost for the railroad infrastructure that would have to be built in order to market the Otter Creek coal. The costs of that railroad have recently been reported by the sponsor of the Tongue River Railroad to be twice as high as earlier estimated. Incorporating these higher railroad costs into Norwest's comparative lease analysis indicates that that bonus bids would be zero or negative even if the costs of the railroad were only to increase by about 40 percent.

The Norwest Appraisal was prepared based on data gathered before October 2008. The dramatic changes in economic conditions since then render it an inappropriate guide to current coal markets. The important changes include the decline in commodity prices, including energy prices. Coal prices reached peak levels prior to October 2008 and have fallen dramatically since then. Natural gas prices have fallen even more dramatically, partly on the basis of much larger estimates of existing North American natural gas supplies. Cheaper natural gas undermines the market for coal in electric generation. In addition, the national economy has fallen into the worst economic downturn since the Great Depression. This has depressed the market for electricity as well as coal. The financial crisis that compounded the current recession has also made it difficult to raise capital for large risky projects such as the proposed Otter Creek mines and the Tongue River Railroad. Finally political support for carbon regulation has continued to increase with Congress actively exploring legislation to cap carbon emissions. The reality of carbon regulation and the uncertainty about the form it will take and the costs it will impose on coal users are also depressing coal markets.

The markets for Otter Creek coal are also likely to be limited by other competitive forces. These include increased competition from Wyoming coal as a result of both the Tongue River Railroad and a competing proposal to allow Wyoming coal to reach traditional Montana coal markets in the northern Midwest: the Dakota, Minnesota, and Eastern Railroad upgrade supported by Canadian Pacific. In addition, the State of Montana's partner in the proposed development of the Otter Creek Tracts, Great Northern Properties, is developing a coal beneficiation plant in North Dakota along the northern rail route to Montana's traditional coal markets.

In calculating financial benefits to the state government and local schools of developing the Otter Creek Tracts, the likely displacement of current coal producers by the Otter Creek mines needs to be taken into account. What is gained by the production and sale of Otter Creek coal may be lost as a result of the reductions in coal sales from other Montana mines.

The Norwest Appraisal is incomplete, lacks foundation, contains major conceptual and factual errors, and has been outdated by changed economic circumstances. It cannot be relied on as a basis to structure the leasing of the Otter Creek Tracts. Before proceeding with leasing the Otter Creek Tracts the Montana Land Board must commission a new appraisal that avoids the numerous defects outlined in the following comments. Given the current economic, energy market, and financial conditions, it would be imprudent to lease the Otter Creek Tracts at this time on the basis of this Appraisal.

The Market for Otter Creek Coal

Norwest Corporation was engaged by the Montana State Land Board to value the Otter Creek Coal Tracts. That valuation was to determine the fair market value that Montana could expect from potential bidders seeking to lease the rights to develop those coal deposits. That estimated fair market value could then be used by the State Land Board to set the minimum bonus bid that the State would accept from potential developers. State law requires such a publicly reviewed appraisal prior to offering school trust coal properties for competitive leasing. These comments provide a critical economic review of that Norwest Corporation's (Norwest) *Montana Otter Creek State Coal Valuation* (Appraisal).⁵

Norwest used two different approaches to determine the fair market value of the Otter Creek Coal Tracts. One was an analysis of the bonus bids associated with comparable coal leases in Montana (the comparable-lease approach), and the other was an analysis of the net present value of the revenue that could be earned from the development of the Otter Creek Coal Tracts (the income approach).

The comparable-lease approach identified relatively recent leases of Montana coal and the bonus bids paid to obtain those leases. After adjusting those bonus bids to recognize the unique characteristics of the Otter Creek Tracts, those bonus bids, expressed in terms of cents-per-ton-of-extractable-coal, were applied to all of the state-owned coal in the Otter Creek Tracts.

The income approach developed a mining plan for the Otter Creek Coal Tracts and estimated the costs of operating the mines (what was necessary to extract the coal) over a 40-year period. The per-ton value of the coal at the mine mouth was estimated by looking at the delivered price that potential customers were currently paying for Montana coal and subtracting out the reduced transportation costs associated with Otter Creek coal. All of the Otter Creek coal was assumed to be produced at the costs indicated by the mine model and sold at this unit cost to produce a stream of net revenue to the coal developer. This stream of net revenues, discounted in order to include a reasonable return on the developer's investment, indicated the "surplus" that the State of Montana could expect to collect as bonus bids in a competitive-lease process.

Determining the Size of the Market for Otter Creek Coal

It is important to note that both of these approaches assumed that there was a market into which all of the recoverable coal in the Otter Creek Tracts could be sold at prices similar to those indicated by other recent sales of Montana coal. That is, both approaches used the estimates of the total amount of recoverable coal and simply assumed that as soon as the Otter Creek mines could be brought on line, existing coal

⁵Norwest Corporation, Salt Lake City, Utah 84111, submitted to the Montana Department of Natural Resources & Conservation, Trust Land Management Division, Helena, MT 59620-1601.

markets would support the purchase of the annual output of those new mines at current or higher prices.

In order to evaluate these crucial assumptions, we will review the size of the mines at Otter Creek that Norwest assumes are constructed. We will then look at how Norwest has characterized the size of the market into which that coal would be sold.

The Relative Size of the Mines that Would Develop the Otter Creek Coal

The Appraisal assumes a dramatic expansion of Montana coal mining if the Otter Creek Tracts are put up for lease. As a reference point, since 1979 when Montana coal mining first surpassed 30 million tons per year, the average total annual coal production has been 37 million tons. For the most recent decade, 1997-2007, annual Montana coal production has been about 40 million tons per year.⁶

The Norwest Appraisal is built around two mines at Otter Creek producing a total of 35 million tons of coal each year for years 6 through 40 of their operation (during the first five years of operation, the production will “ramp up”). That is, the Appraisal assumes that the leasing of the Otter Creek Tracts will nearly double the level of Montana coal production.

The Otter Creek coal mining operations envisioned by the Appraisal would be huge compared to existing Montana coal mining operations. The largest coal mining operation in Montana in 2007 was the Spring Creek Mine, which produced 15.7 million tons of coal that year. This is less than half of what Norwest assumes the Otter Creek Tracts would produce.⁷ Alternatively, if we use as a reference point the average recoverable coal that was associated with each of the three Montana coal leases that Norwest used as the “comparables” for its Appraisal, the recoverable coal associated with the Otter Creek mines would be 26 times as great as Norwest’s comparables: 1,309 versus 50.7 million tons.⁸

Clearly the projected Otter Creek mining operations around which Norwest built its Appraisal involves a very large increase in Montana coal mining. It is the production of that large volume of Otter Creek at a comfortable profit that is the basis of the \$37 million dollar bonus bid Norwest projects that the State of Montana would receive if it put these coal deposits up for lease. Implicit in these projections of a dramatic increase in the level of Montana mining is a very large increase in the market open to Montana coal.

⁶ Coal Tables Workbook--2008 Update, Department of Environmental Quality, State of Montana, Table C-2. www.deq.state.mt.us/energy/HistoricalEnergy/index.asp

⁷ Ibid. Table C-4.

⁸ Norwest Appraisal Table 2.1. There is a transcription error in Table 2.2. Instead of listing the recoverable coal from the Spring Creek lease (MT 88405), the recoverable coal from the West Hay Creek mine (WYW151634) is listed. Norwest, however, did not use the erroneous number in its calculations of the bonus bid per recoverable ton of coal.

Limits on the Amount of Coal that Can Be Extracted from the Otter Creek Tracts

Montana law and regulation limits the strip mining of coal on alluvial valley floors in order to preserve essential hydrologic functions and protect agricultural land.⁹ The Otter Creek Tracts, as the name suggests, border and in some cases lie within what state geologists have mapped as the alluvial valley floor. It is possible that because of that fact some of the recoverable coal in the Otter Creek Tracts could not be mined.

Norwest Corporation in its 2006 “Otter Creek Property Summary Report” developed four potential mining units for the Otter Creek Tracts. In doing so, it identified the lands that were on the alluvial valley floor and calculated the recoverable coal with and without the coal from the alluvial areas. Norwest explained that “mining could possibly be restricted from this area, should it be classified as an AVF [alluvial valley floor] by the state.”¹⁰

The recoverable coal in the alluvial valley floor was calculated by Norwest Corporation in 2006 to be 87 million tons. However, the total estimated recoverable coal was 1,370 million tons. The alluvial valley floor coal was 6.4 percent of that total. Norwest’s Appraisal is flawed because it fails to exclude the alluvial valley floor coal from its estimate of what is available to be mined.

The Current Market for Montana Coal

Between 2001 and 2007, 90 to 95 percent of Montana coal sales have gone to seven states: Montana, North Dakota, Minnesota, Wisconsin, Michigan, Washington, and Oregon. Geography largely dictates the concentration of sales in these states. They are the states where Montana has a transportation cost advantage relative to Wyoming coal. Often that transportation cost advantage is small and both Montana and Wyoming coal is sold into these markets.¹¹

Since 2001 each state has seen similar percentage increases in sales to these states, about 10 to 15 percent. That, however, masks some changes in competitive advantage. Montana, for instance, has lost all sales to Illinois where Wyoming sales have increased 78 percent. In Michigan and Indiana, Montana sales have been relatively static or declining while Wyoming sales have increased 69 percent and 40 percent, respectively. On the other hand, Montana sales to North Dakota and Minnesota have expanded while Wyoming sales have contracted. Montana sales to Washington have also increased

⁹ Administrative Rules of Montana, Strip & Underground Mine Reclamation Act, 17.24.801 and 802. Montana regulations do not necessarily ban strip mining from lands classified as alluvial valley floors by geologists. The definition of alluvial valley floor provided in the regulations includes only those alluvial areas “holding streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities.” In addition, if the pre-mining land type on the valley floor is “undeveloped rangeland that is not significant to farming,” the ban on strip mining may not apply. ARM 17.24.802. Clearly judgment about “sufficient for agriculture” and “significant to farming” are involved, too.

¹⁰ Submitted to Great Northern Properties and Montana Department of Natural Resources and Conservation, July 12, 2006, p. 3-2 to 3-6 and Table 3.1.

¹¹ Domestic Distribution of U.S. Coal by Destination State, Consumer, Origin and Method of Transportation, 2007, Energy Information Administration, December 2008.

while Wyoming has just begun to compete there. In Oregon, Wyoming sales have been steady but Montana sales have fallen to zero. Meanwhile Wyoming has not been able to gain market share in Montana just as Montana has not been able to sell into Wyoming markets.

Looking at the ebb and flow of sales over this time period, it is clear that it is in the northern states closest to Montana where Montana's market has expanded. The farther south the location, the more inroads Wyoming has made because of its transportation cost advantage. It is the distance by rail to the various electric generators that tends to dictate the markets to which Montana has access.

Norwest's Evaluation of the Market for Otter Creek Coal

Otter Creek coal has a relatively high sodium content. High-sodium levels in coal cause "slagging" in boilers and can interfere with air-pollution-control devices. Because of this, as the Appraisal states, "Coals with high sodium content share a limited market due to slagging problems they cause in certain types of power plant boilers. This limits the market for high sodium coals to a small number of mid-western electric generating plants and some industrial plants."¹²

In an earlier report referenced in the Appraisal, Norwest was more explicit about exactly where that "small number of Mid-western generating plants" that represented the "limited market" available for Otter Creek coal were located.¹³ In a section in that report labeled "Marketing," Norwest points out that Otter Creek coal ash ranges from 5.8 to 8.8 percent sodium, a high level compared to other coals in the western U.S. In the southern Powder River Basin of Wyoming, the sodium averages 1.2 percent while coals in Colorado average about 2.5 percent sodium. Norwest also points out that "most plants avoid burning high sodium coals. Exceptions include the following ten plants which are within the competitive area for Otter Creek currently accepting higher sodium coals."¹⁴ Norwest then proceeds to list the 10 plants: 5 in Minnesota, 4 in Michigan, and 1 in Wisconsin. Those electric-generating plants that Norwest says "would likely constitute the initial target market for Otter Creek coals" are shown on the map below, which was taken from that Norwest report.¹⁵ Note that transportation costs generally limit the area where Montana has a transportation-cost advantage over Wyoming. These areas include a northern tier of states: North Dakota, Minnesota, Wisconsin, Michigan, and Illinois to the east and Washington and Oregon to the west.

The ten electric generators identified by Norwest as the "initial target market for Otter Creek coals" have a total consumption of about 20 million tons of coal per year, only 57

¹² P. 2-4. This warning about "limited markets" for Otter Creek coal is repeated elsewhere in the Appraisal (pp. 2-3 and 2-5).

¹³ Otter Creek Property Summary Report, Volume I of II, submitted to Great Northern Properties and Montana Department of Natural Resources and Conservation, July 12, 2006. The reference in the Appraisal is to a report with the same title dated November 16, 2005, which we assume is simply an earlier draft of the report cited here.

¹⁴ Ibid. p. 4-1.

¹⁵ Ibid. p. 4-1 and Figure 4.1.

percent of the annual production level that Norwest envisions from the Otter Creek Tracts. In fact, Norwest expressed concern that between 2004 and 2005 this market had “decreased to 16.1 million tons. The difference in consumption rates appears to be due to the intrusion of coal from the Southern PRB [Wyoming Powder River Basin].”¹⁶

Electric Generation Plants That Would Likely Constitute the Initial Target Market for Otter Creek Coals

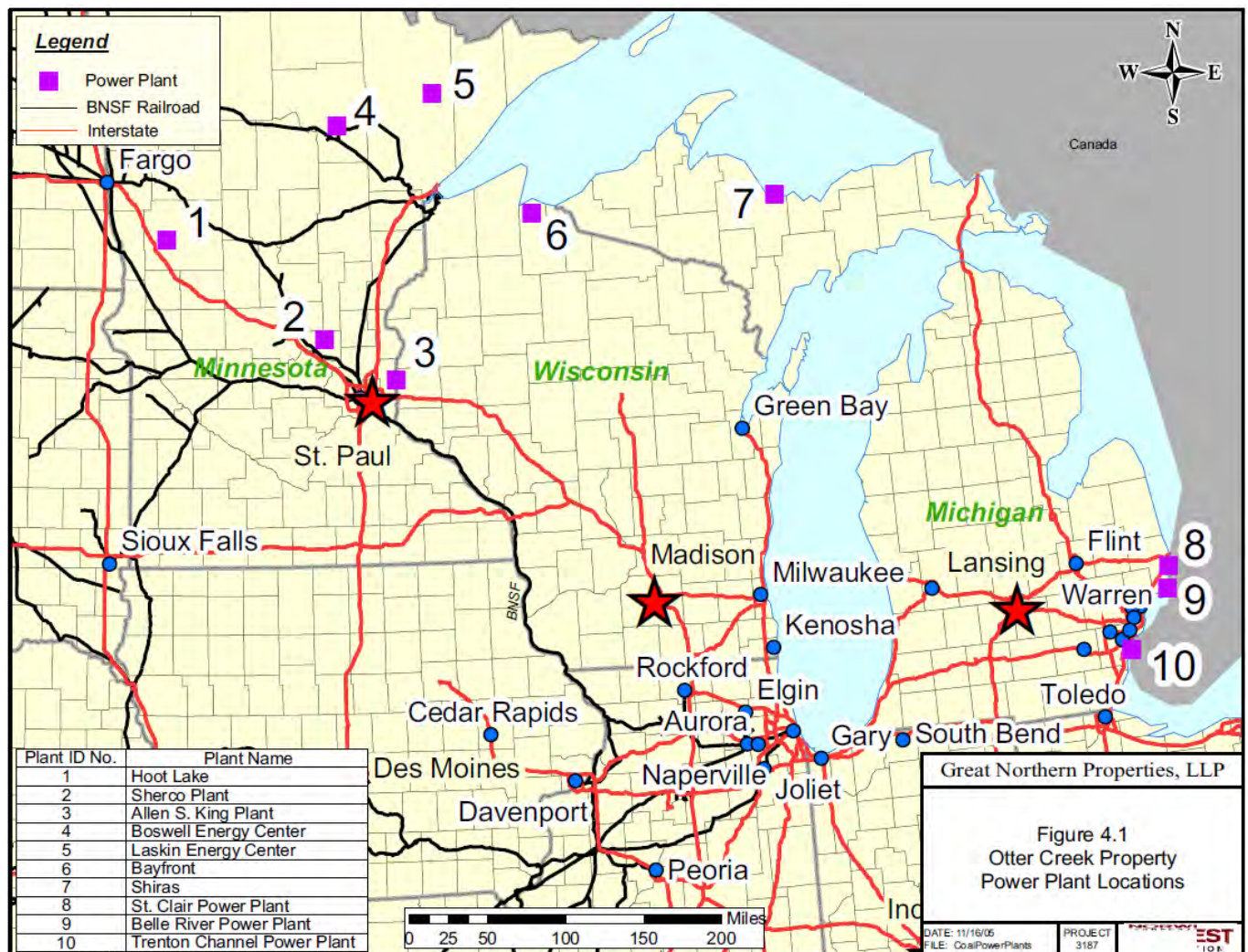


Figure 4.1 from Norwest Corporation’s “Otter Creek Property Summary Report,” Vol. 1, July 12, 2006

Of course, all of these plants are currently served by other coal suppliers. Even if Otter Creek was able to displace 100 percent of the current coal suppliers, more than 40 percent of the Otter Creek coal would have to be sold to plants other than those identified by Norwest in its 2006 report as the “initial target market.” Norwest recognizes

¹⁶ Ibid.

this, commenting that “The volume of coal shipped from Montana to the high sodium-accepting power plants is only about 20 million tpy [tons per year]. Careful effort developing a solid market strategy will be necessary to determine how best to nudge into this market without destroying whatever price discipline, if any, currently exists.”¹⁷

Note that Otter Creek coal would have to both “nudge” its way into this already served market, displacing the current coal producers, as well as fending off competition from Wyoming coal producers. Also note that in doing so, both Otter Creek coal and further inroads into this market from Wyoming coal are likely to drive the price of the high-sodium coal downward as Otter Creek and Wyoming mines compete to take as much of that market away from current suppliers as possible.

In the 2006 Report Norwest also identified another group of 14 generating plants with an annual consumption level of about 30 million tons of coal that might serve as a market for Otter Creek coal. These were plants “also served by Montana mines neighboring Otter Creek, including Rosebud, Absaloka, Decker, and Spring Creek.” The four Colstrip power plants in Montana were included in this additional potential market for Otter Creek coal.¹⁸ This statement underlines who the current coal suppliers are that Otter Creek would have to displace: They are almost exclusively Montana coal suppliers. Only one of the initial ten generation plants and none of the second group of 14 plants were served by a non-Montana mine. The market Norwest expects to support the Otter Creek mine will first have to be taken from other Montana coal mines, ton for ton. As described by Norwest, this is a zero-sum game for Montana: Otter Creek coal can be sold only at the expense of other Montana coal producers.

Norwest suggests that Otter Creek coal is likely to be successful in competing against other Montana coal suppliers for this limited market because the existing mines are old and have high and rising costs. As Norwest puts it:

“All these mines have been operating for many years and are experiencing higher stripping ratios in the range of 3-4:1 at Spring Creek, climbing up to 9:1 and higher at Decker. These higher strip ratios put these mines at a disadvantage with respect to Otter Creek’s projected operating costs, as they each must move more waste to uncover the same amount of coal as at Otter Creek. This higher [operating cost], however, will be offset by Otter Creek’s higher capital recovery / depreciation costs.”¹⁹

Norwest could have added that the cost of financing a spur railroad to carry the coal to Miles City would also be a burden these existing mines will not have to carry.

In the Appraisal, Norwest has laid out how the strip ratio associated with the Otter Creek mines it has modeled would vary over time as the mining proceeds. Interestingly, the

¹⁷ Ibid. p. 4-4.

¹⁸ Ibid. p. 4-4, and Table 4.1.

¹⁹ Ibid.

strip ratio for the larger of the two Otter Creek Logical Mining Units (LMU 5), which will be the source of about two-thirds of the production, begins at 2.3 but within the first five years rises to 4.1. The weighted average of the strip ratio for that mine over its life is 4.5. The strip ratio for the smaller of the LMUs is lower, about 2.5 until the 16th year of production when it rises to 3 and above. The weighted average over the life of that mine is 3.3. Across the life of both mines the average strip ratio is 4.1.²⁰ That is not a low strip ratio. For its comparative analysis, the Appraisal utilized a data base of 31 federal lease sales for the Powder River Basin between 1991 and 2007.²¹ That data base included the strip ratio for each of those leases. The weighted average of those strip ratios was 2.95. That means that Otter Creek coal mines are going to face strip ratios that are more than a third higher than other Powder River Basin leases from the last two decades. Even if we inappropriately ignore the high capital costs associated with opening a new mine and funding a new railroad, mining the Otter Creek coal, overall, is not going to be an unusually low-cost operation.

Eastern Montana has large deposits of coal, much of which is not as isolated and without infrastructure as the Otter Creek coal. As existing mines that have transportation infrastructure in place and equipment on-hand approach uneconomic strip ratios, they will be looking to expand into new coal deposits or open new mines. It is those potential “new” Montana operations with which Otter Creek will also have to compete.

Norwest’s Conclusions about the Market for Otter Creek Coal

In its Appraisal and in its earlier analysis of the markets for Otter Creek coal, Norwest came to the following conclusions:

- i. The high-sodium character of the Otter Creek coal limits the market into which it can be sold.
- ii. The market for Otter Creek coal is “a small number of mid-western electric generating plants.”
- iii. Almost all of those Mid-western electric-generating plants are currently served by other Montana coal mines.
- iv. Otter Creek coal will have to compete with and displace other Montana coal mines to gain a share of that limited market.
- v. That competition will put downward pressure on the price for coal that all Montana mines will face as they compete for market share in this limited market.
- vi. Wyoming appears to be making inroads into the geographic area where transportation costs previously created a protected market for Montana coal.

After making these points about the market that is available for Otter Creek coal, Norwest, inexplicably, reverses itself in the second to last paragraph of the Appraisal and declares that “the potential market for Otter Creek coal will reach 30 million tons per year by 2011 and 33 million tons per year by 2015...[I]t is feasible that the market could

²⁰ Appendix C

²¹ Table 2.1

handle the simultaneous startup of both [Logical Mining Units].” In other words, the Appraisal contradicts itself by concluding that there is not a limited market for high-sodium coal in Montana’s market area and, instead, asserts that Montana could nearly double its coal sales in the next five years by simply leasing the Otter Creek Tracts.

Norwest itself provides no analysis, data, or argument in support of this conclusion that is contradicted by its previous characterization of the market for Montana’s high-sodium coal. Instead it cites “market analysis information provided to the DNRC by Global Energy Decisions.” This is an incorrect characterization of what information was provided to whom. Wesco Resources, a Billings coal development company, hired Global Energy Decisions to provide an updated market analysis for the Otter Creek coal.²² According to DNRC, that study has been labeled proprietary in character by Wesco Resources and not available for review by others.²³ The Manager of Wesco Resources, Doug Day, submitted a very general, two-page statement of conclusions and accompanying tables from that market study to DNRC in a memo dated May 11, 2007.²⁴ That very general two-page memo was then forwarded to Norwest, who, in turn, relied on it, and cited to it, in the Appraisal. Apparently, Norwest, like DNRC, did not review the actual analysis that Global Energy Decisions conducted on the markets for Otter Creek coal. Norwest simply accepted the unsubstantiated conclusions it received third-hand from a self-interested party.

It should go without saying that in order to be able to fully and meaningfully comment on this Appraisal, it is necessary to have access to the data and analysis that the Appraisal utilized in reaching its conclusions. Here, as detailed in the preceding paragraph, the Appraisal relied upon the Day memo, which is founded on a market analysis by Global Energy Decisions that no one – not the State of Montana, not Norwest, not the public – has been allowed to view. The effect of keeping the market analysis under wraps is that part of the Appraisal has, in effect, been cordoned off from evaluation and review. Given the public nature of this process, the failure to ensure access to the Global Energy Decisions’ market analysis is a significant issue and must be remedied.

Moreover, the inability to examine and consider Global Energy Decisions’ market analysis is critically important since the size and character of the market for the Otter Creek high-sodium coal is central to the Appraisal. The conclusion that the State of Montana can expect to receive a minimum of \$37.3 to \$57.2 million in up-front bonus bids if this coal is put up for lease is tied to the quantity of coal that is assumed to be **saleable at a projected price**, not the amount of coal that is assumed to be **recoverable**. The Norwest Appraisal reached its conclusion by focusing on the coal that

²² Wesco Resources is the parent company of Tongue River Railroad Inc. Wesco Resources is also the parent of CoalMont LLC, which was formed to acquire and develop coal reserves in the Ashland and Otter Creek areas.

²³ Email from Monte Mason, DNRC, to Donovan Power, July 17, 2009. Mr. Power, working as a research assistant to Dr. Power, was seeking access to the coal-market data supporting Norwest’s Appraisal. Norwest had cited the Doug Day memo to DNRC to support its market conclusion. Mr. Power was seeking the study on which the memo had been based. He was told that Wesco Resources’ Doug Day was not willing to release the report because it contained proprietary information.

²⁴ See footnote 7, p. 3-12, of the Appraisal as well as the References section, page 4-1.

was **recoverable** rather than following through with its analysis of the limited market available for this coal. That Appraisal is explicit in that it simply estimated a value per ton and then multiplied by the amount of recoverable coal contained in the Otter Creek Tracts.²⁵ The error in this approach is that both the price that will be paid for this coal and the quantity that can be sold are determined by the size and character of the market. Norwest has shown that “Coals with high sodium content share a limited market due to slagging problems. . . . This limits the market for high sodium coals to a small number of mid-western electric generating plants. . . .”²⁶ This fundamental market reality is ignored in Norwest’s Appraisal calculations.

This market reality has been widely discussed. Chuck Kerr, the President of Great Northern Properties, which owns the alternate sections intermixed with the state sections in the Otter Creek Tracts, laid out these market problems in a presentation to the Montana Land Board on July 17, 2006:²⁷

The fact that we do have a different coal needs to be taken into consideration. Unfortunately, high sodium coal is not in high demand. The market is very finite. The southern Powder River Basin [Wyoming] right now is mining and selling over 400 million tons of coal per year. The high sodium market is 20 million tons per year. So, that is the market we are looking at. Even though we have a wonderful resource you have to look at what you can do with the coal if you dig it out of the ground. Right now that market is being fed by Spring Creek, Decker, and another mine or two. So in order to break into that market you will have to either displace that market or figure out a way to handle sodium.

Note the reference to the market for high-sodium coal being only 20 million tons per year and that market is currently being served by existing Montana mines while the Appraisal projects Otter Creek production to be 35 million tons per year.

Mr. Kerr went on to indicate that both of the alternatives he mentioned to open markets for Otter Creek coal might be possible. He argued, as does the Appraisal, that over time, the existing mines serving these high- sodium markets would face higher and higher strip ratios and, therefore, higher operating costs; accordingly, a new mine at Otter Creek would initially have lower strip ratios and might be able to displace the existing Montana mines now serving the high-sodium market. However, and ignoring the fact that the economics of developing the Otter Creek tracts will also be determined by the capital cost associated with opening a new mine and building a railroad, existing Montana mines that already have access to transportation and have mining equipment in-hand are likely to expand into new coal deposits or open new mines. It is also against those “new” Montana coal operations that Otter Creek coal will have to compete.

²⁵ See pages 2-1 and 2-10.

²⁶ Appraisal, p. 2-4.

²⁷ Montana Land Board minutes, p. 15.

Mr. Kerr also saw hope on the technological front: “We also believe that due to modern technology sodium will be taken care of, new plants will be built and designed that will be able to handle high sodium. . . . We think there is a package that we can put together to be able to break into other markets other than high sodium. So we think that technology will advance.” Although technological breakthroughs are always possible, it is not appropriate to base an appraisal on such hopes or beliefs. It is unclear *why* new coal-fired electric generators would be designed to handle high-sodium coals when there are large quantities of low-sodium coals available from Wyoming’s southern Powder River Basin at very low cost. In addition, since Mr. Kerr made this presentation to the Land Board, uncertainty about carbon regulation and the economy has led to most planned coal-fired plants in the nation to be put on hold or abandoned.

At the current time (July 2009), Mr. Kerr’s earlier characterization of the market for Otter Creek coal remains correct. To sell that coal, existing Montana mines will have to be displaced or a currently unknown technological breakthrough to handle the sodium problem will have to be discovered. Basing public policy on the latter would be an imprudent gamble. Understanding the former is crucial to a real appraisal of the value of the Otter Creek Tracts to the State of Montana.

The Impact of Coal Markets on the Value of the Otter Creek Coal to Montana

As discussed above, Otter Creek coal will have to compete with existing Montana mines (as well as with Wyoming mines) in order to break into the limited geographically accessible high-sodium coal market that Norwest has described. That competition to displace existing suppliers has important implications for the price that the Otter Creek mines can expect to receive for their coal. It also has implications for the benefits that the State of Montana and its schools can expect to receive from leasing the Otter Creek Tracts.

Norwest’s Determination of Otter Creek Mine Mouth Coal Prices

Norwest calculates that Otter Creek coal will be sold at a mine-mouth price of about \$20 per ton even though the average mine-mouth price across the Powder River Basin is estimated to be \$11 per ton, which is only a little more than half of that price. This is a spectacular result.

Norwest estimated the mine-mouth price that Otter Creek coal would receive by calculating what the delivered cost of coal would be to a western Minnesota site, Fergus Falls, the site of the Otter Tail Power Corporation’s Hoot Lake coal-fired plants. Those plants are currently served by the Montana Spring Creek Mine near Decker, Montana, close to the Wyoming border.

To estimate the Otter Creek mine-mouth price, Norwest used an estimated mine price for 8,800 Btu/lb Powder River Basin coal as of September 2008 at \$11 per ton.²⁸ To this Norwest added the transportation costs of getting that coal to Fergus Falls. This produced a delivered price \$33.17 per ton.²⁹ Norwest estimated that the transportation costs of moving Otter Creek coal to the same location would be over 40 percent cheaper because of the more direct transportation route through Miles City. Norwest assumes that the developer of the Otter Creek coal would be able to pocket all of these transportation cost savings (\$9.03 per ton). Adding this transportation cost savings to the \$11 per ton regional mine-mouth coal price suggested a mine-mouth coal price for Otter Creek coal of \$20.03 per ton. Norwest adjusted this for the actual BTU content and sulfur credits of Otter Creek coal and concluded that the coal from the Otter Creek Tracts would sell initially for \$19.97 per ton.³⁰

Recall that this figure is almost twice as high as the regional mine-mouth coal price. Norwest then proceeded to value **all** of the recoverable coal in the Otter Creek Tracts at this high mine-mouth price. Of course, all of the coal could not be sold to that one particular electric generator, the Hoot Lake plants, on which Norwest chose to focus. In 2004-2005 that plant received only 4 percent of the coal shipped to the 10 plants Norwest, in its 2006 Otter Creek Property Summary report, identified as the initial market for Otter Creek coal, for a total of only 600,000 tons of coal in 2005 or less than 2 percent of the expected annual output of the Otter Creek mines at full production. Norwest assumed that all of the remaining market into which Otter Creek coal might be sold would produce the same high mine-mouth price. But Norwest knew that that was not the case.

In its 2006 Otter Creek Property Summary Report, Norwest did this same calculation for each of the ten electric-generating stations that it believed would be the initial market for Otter Creek coal, including the Hoot Lake plants at Fergus Falls. The average mine-mouth price for Otter Creek coal that Norwest calculated for these ten plants that spread across the market area it had identified was \$4.61 per ton in 2004 and \$3.82 per ton in 2005, only a fifth or a quarter of the mine-mouth price it calculates now.³¹ Interestingly, the mine-mouth price for Otter Creek coal that Norwest calculated in 2006 for the Hoot Lake plants outside of Fergus Falls was \$13.95 for 2004 and \$16.70 in 2005. These were significantly higher Otter Creek mine-mouth prices than for any of the other potential purchasers of Otter Creek coal that Norwest analyzed. That is, Norwest in the current Appraisal chose the site that allowed it to calculate the highest mine-mouth price in 2006 and based its projection of the price that Otter Creek could get for **all** of its coal on that one example, carefully ignoring the other nine plants that indicated much lower mine-mouth prices for Otter Creek coal because they were located farther away from Otter Creek.

²⁸ Norwest cites SNL Energy's Coal Report, Sept. 8, 2008, Vol. 4, Issue 35. The Energy Information Administration's Coal News and Markets lists the Powder River Basin 8,800 Btu coal spot market price for the first two weeks of September 2008 also at \$11 per ton.

²⁹ Fergus Falls, MN, is the headquarters of Otter Creek Power which also operates the Hoot Lake coal-fired generating stations outside of Fergus Falls using Spring Creek Mine coal.

³⁰ Appraisal p. 3-11.

³¹ Table 4.1, page 4-2. Norwest commented that these were "unrealistic" mine-mouth prices.

The broader 2006 analysis clearly indicates that choosing just one site to characterize the entire market could be a seriously misleading and biased approach, especially if the location that produced the highest estimated mine-mouth price was the site chosen as “typical.” Norwest was aware of this problem in 2006 and urged that “In further work on the mine feasibility, special focus should be directed to these elements [the low estimated mine-mouth prices for Otter Creek coal].”³² Instead of doing this focused work for the Appraisal, Norwest simply used the highest-valued site from its 2006 analysis and ignored all the contradictory information.

In evaluating the plausibility of Norwest’s high mine-mouth price, it is important to keep in mind that the Otter Creek mines would sell about twice as much coal into this market as is currently being sold. It is difficult to imagine how this additional amount of coal could be absorbed in that market without having a depressing effect on coal prices.

Norwest had already indicated that Otter Creek would have to compete to “nudge into” a relatively limited market. Its Appraisal is also based on the sale of a very large amount of coal into that limited market while also competing with Wyoming coal, which is also attempting to enter that same market. In that situation, it is startling to find Norwest projecting such a high mine-mouth price for Otter Creek coal. Norwest essentially assumes that Otter Creek will operate in a non-competitive setting where Otter Creek can proceed to take away large amounts of market share from other Montana mines but none of the other economic players will respond. This is not how markets work. One would expect all of the following responses from other important economic players as Otter Creek seeks to take over a significant part of a limited existing market:

- i. Existing mines that are serving these electric generators will lower their prices to try to maintain their market share. Given most of their original investment costs are already depreciated existing mines can compete down to a price that just covers their operating costs. Otter Creek, on the other hand, has to set prices at levels that will recover the new investment in the mine, expensive mining equipment, and a new railroad.
- ii. Electric-generating plants will be aware of the transportation cost savings that Otter Creek will enjoy and will negotiate vigorously to capture some of those cost savings for themselves.
- iii. If Otter Creek is actually enjoying a mine-mouth price almost twice what other regional mines are receiving, the railroad companies will recognize that and will attempt to capture some of that value in higher transportation charges.
- iv. If \$20 per ton mine-mouth prices can actually be earned, the vast array of coal mining possibilities across Montana and Wyoming will be explored for other mines that can earn this level of return. Existing coal mines will

³² P. 4-4.

expand into new coal deposits and potential new coal mines will come on line to take advantage of the profitable opportunities like those Norwest imagines for Otter Creek. Many or most of them will not need to build expensive new railroads.

All of these competitive responses will tend to significantly reduce the price Otter Creek can get for its coal and the volume of coal that Otter Creek will, in fact, be able to sell. In that sense, the Appraisal's findings are unrealistic because it assumes a noncompetitive market where all economic actors but Otter Creek fatalistically surrender to Otter Creek's efforts to take over existing markets while enjoying an unusually high price for their product.

Norwest has proceeded with its analysis as if the Otter Creek mine were just one of many small players in a large regional coal market. In that setting, any one coal mine could change its production significantly without expecting to have any impact on the market and the price it could get for its coal. But that is not the case with Otter Creek and the market it faces. The market, as Norwest has said, is "limited" "to a small number of mid-western electric generating plants." At the same time, the projected annual production from Otter Creek is almost twice the size of that entire market. In this setting, Norwest's approach to estimating the value of the Otter Creek coal is entirely inappropriate.

Errors in Norwest's Calculation of the Otter Creek Mine-Mouth Price

As discussed above, Norwest made conceptual errors in concluding that all of the Otter Creek coal could be sold for a \$20 per ton mine-mouth price. In addition, it appears to have made some calculation errors.

Norwest's high mine-mouth price is based on adding the transportation cost savings associated with shipping coal from Otter Creek rather than shipping it from Wyoming's southern Powder River Basin mines to the regional mine-mouth price for Powder River Basin coal. The reduction in the shipping distance is the difference between shipping the coal from the southern Powder River Basin to Miles City and shipping the coal from Otter Creek to Miles City. The rest of the route to Fergus Falls is the same for coal from either of the sites.

In its calculation of this shipping reduction when it compared shipping from both sites to Miles City, Norwest used the correct mileage.³³ The distance saved is 208 miles (293 – 85). But in the calculation that Norwest used to establish the \$20 per ton mine-mouth price, it assumed the distance saved was almost 80 percent larger, 372 miles. It obtained this number by subtracting what it said was the distances to Fergus Falls from the southern Powder River Basin mines and the Otter Creek mines (913 – 541). However, neither of these numbers is accurate. The distance from the southern Powder River Basin is 813 miles not 913 miles and the distance from Otter Creek is 605 miles,

³³ Appendix B, second page of tables: "FOB Otter Creek Mine Coal Price Estimation Using Miles City, MT.

not 541 miles. If the correct numbers are subtracted, 813 – 605, the reduced shipping distance is the same as the results shown by Norwest using the Miles City destination: a reduction of 208 miles. Norwest's own numbers confirm this. Independent analysis of the rail miles confirms it. Norwest's 2006 report on Otter Creek confirms it.³⁴

As one might expect, an 80 percent error in the calculation of the location advantage that Otter Creek coal has over southern Powder River coal has a substantial impact on Norwest's calculation of the value of the Otter Creek coal. Recall that Norwest values all of the recoverable coal in the Otter Creek Tracts at the \$20 per ton mine-mouth price it calculated using this exaggerated location advantage.

Appendix B of the Appraisal provides Norwest's "detailed price calculations" of its estimate of a mine-mouth price of \$21.58 for Otter Creek coal. If that same calculation is carried out using the correct distance savings, the estimated mine-mouth price would have been \$17.37, which is about 20 percent lower. That would have reduced the estimated revenue from the sale of the Otter Creek coal by 20 percent. This would have reduced the estimated bonus-bid value by a much larger percentage as most of the costs would remain fixed while the revenues were reduced.³⁵

Using the \$20 per ton mine-mouth price, Norwest estimated that the proposed Otter Creek mines would earn a net revenue of \$87.3 million in discounted net present-value terms. That was the basis for calculating the bonus bids that would be made for the coal. That net revenue was what was projected to be earned on more than \$3.8 billion in coal sales, which was also expressed in discounted net present-value terms. That is, the net revenue is only about 2.3 percent of the gross sales revenue. This is not as tiny a return as it might appear since a 10 percent discount rate was used, implying that investors were earning a 10 percent return on their investment. The 2.3 percent earning on total sale is in addition to that return on investment.

However, a very small change in the projected mine-mouth price of the Otter Creek coal would wipe out all of the 2.3 percent earnings on total sales that is the basis for the calculated bonus bid. In fact, a price reduction in the mine-mouth price of the Otter Creek coal of just over 3 percent would reduce the bonus bid to zero. A 20 percent reduction to correct for Norwest's exaggeration of the transportation distance savings would entirely eliminate the bonus bid and indicates that the State of Montana would have to make a substantial payment to potential bidders to get them to lease the coal.

³⁴ The coal market analysis in the 2006 study showed the distance from Otter Creek to the Hoot Lake generating stations to be 600 miles. Table 4.1.

³⁵ The taxes tied to gross value of sales would change as the mine-mouth price changed. These total about 32.5 percent of the price. The taxes paid on net revenue (state and federal income taxes) would also vary as the value of the coal and, therefore, the net revenue varied. They total about 22 percent of net revenue.

Recent Changes in Coal Markets and the Economic Environment

Norwest concluded the research for its Appraisal in October 2008. Energy markets, economic conditions, and political reality have changed significantly since then. Those changes are very important when evaluating Norwest's conclusions based on those earlier conditions.

The most important economic conditions that have changed since October 2008 include the following:

- i. In the years and months leading up to October of 2008, commodity prices, including energy prices, were rising rapidly. Since then commodity prices have plummeted, including energy prices.
- ii. Natural gas prices had risen very dramatically, making that fuel appear to be too scarce and expensive to be relied on to generate electricity. Coal appeared to be the "obvious" low-cost fuel for electric generation that faced an expanding market.
- iii. A federal government that was hostile to or at least skeptical of the idea of human-caused global warming and rejected the idea of regulating carbon has been replaced with one that is more receptive to limiting and then reducing carbon emissions.
- iv. The estimated cost of the Tongue River Railroad has doubled.
- v. The expansion of the American economy, including "booms" in various sectors, that began following the 2001 recession, has ended in a steep downturn that already has lasted longer than any downturn since the Great Depression.
- vi. Investment funds, which once were readily available at relatively low interest rates for even quite risky projects, have largely dried up and are not available for even relatively safe investments.

Each of these earlier conditions would have created a more favorable climate for investments in expanding coal supplies than presently exists. Let me discuss each of these changes in turn.

The End of the Commodity Bubble (i)

Some observers explained the rise in commodity prices, including metal, energy, and food prices, as due to a permanent increase in the demand for these land-based resources as a result of the economic growth taking place in China, India, Indonesia, Brazil, etc. As with the technology stock boom of the 1990s and the real estate boom of the 2000s, we were assured that these high and rising prices were here to stay. The speculative, irrational exuberance that feeds such bubbles was ignored. Although it was the collapse of the financial pyramid and its impact on the real economy that brought demand tumbling down, rapid expansion in the supply of many commodities that was driven by the high prices ultimately would have also brought those commodity prices

down. We have been through enough commodity-price cycles that we should be skeptical about any claim that “this one is permanent.”

Changes in Energy Markets (ii)

As energy prices rose during the 2000s, exploration and development of new oil, natural gas, and coal supplies expanded, too. Very supportive federal policies encouraged thorough exploration and development of most public lands. Sources of supply that previously had been considered too expensive to produce became economically viable. Alberta’s tar sand came into large-scale commercial production. Shallow natural gas sources such as coal bed methane were exploited on a large scale. Shale fields of very low porosity have been successfully developed using fracturing techniques. Largely as a result of this successful development of “unconventional” natural gas sources, the U.S. Potential Gas Committee increased the estimated natural gas reserves in the nation by 35 percent earlier this year. At the same time, natural gas prices that had risen as high as \$13 per million BTU in July of 2008 had fallen to about \$3.50 by late July of 2009. This has led some producers, such as EnCana, to shut in their higher-cost wells. Natural gas again appears to be cheap and plentiful. Given its substantially lower carbon emissions, this may again make it an attractive alternative to coal as the fuel for electric generation.

Coal prices have also tumbled. In October of 2008 when Norwest finished its research for the Appraisal, Powder River Basin coal commodity spot prices were \$14.50 per ton. In mid-July 2009 that price had fallen to \$8.75. Coal prices nationwide have also tumbled dramatically. Appalachian coal, for instance, has fallen from between \$140 and \$150 per ton to \$50 per ton or less.³⁶ Across the nation many proposed and planned coal-fired electric generating facilities such as the Highwood Station outside of Great Falls have been canceled, delayed, replaced with natural gas generators, or blocked by regulators. Some of this, of course, is due to the depressed state of the economy, especially the decline in demand by industrial customers. But the difficulties that proposed new coal-fired generators have faced preceded the current economic downturn.

The Increased Likelihood of Carbon Regulation (iii)

As a result of the 2008 November election, the likelihood of federal regulation of carbon emissions has increased significantly. Even before the federal government began to act, some leading states and regional groups of states had begun considering carbon regulation. The U.S. House of Representative has passed comprehensive energy legislation that caps carbon emissions. The character of carbon regulation and the relative costs it implies for coal and other fossil fuels remains uncertain as the Senate has not yet acted and the legislative process is far from finished. Even after a carbon regulation framework is adopted, it is likely to be implemented over a lengthy period of time. Coal, as the most carbon intensive of the fossil fuels, is the most vulnerable to a carbon tax, a market-set price on carbon emission permits, and/or the cost of removing

³⁶ EIA Coal New and Markets, July 20, 2009.

carbon from the effluent stream associated with burning coal.³⁷ The uncertainty about the cost of carbon regulation is likely to discourage large financial commitments to new coal-fired electric generators for some time. This could have a substantial impact on the size of the future market for coal.

The Cost to Montana of the Necessary Railroad Infrastructure (iv)

The cost of the transportation infrastructure that is necessary for the development of the Otter Creek Tracts is an important element in the Appraisal's calculation of the likely bonus bids that potential developers would be willing to make to lease that coal. At the estimated cost of a railroad running from the Otter Creek Tracts to Miles City of \$187 million dollars, Norwest calculated that the bonus bids that the State of Montana would otherwise receive for the coal would be reduced about 70 percent to pay for the railroad. Norwest's comparative-lease approach funds the railroad dollar-for-dollar through reductions in the bonus bids paid to the State and Great Northern Properties, the other owner of the Otter Creek Tracts. The State of Montana thus contributes a proportional share of the cost of the railroad through a reduction in the bonus bids it is expected to receive.³⁸ According to the Norwest Appraisal, the implicit cost to fund this private railroad is 12.3 cents per ton in reduced bonus bids or about \$70 million for Montana's share of the coal.

In Norwest's income approach to the Appraisal, it calculated the net present value of the cost of funding the necessary railroad link to Miles City. Norwest assumed that the coal developer who obtained the lease on the Otter Creek Tracts would lend the cost of the rail link to a railroad company that would build the railroad and repay the loan at 4 percent interest over fifteen years. That below-market-interest-rate loan represents a real cost to the coal developer and Norwest assumes it is entirely taken out of the bonus bids that coal developers will offer to obtain the lease. In the income approach the bonus bid is reduced from \$54.6 million to \$37.3 million or about \$17.3 million by the need to subsidize the building of the private railroad.³⁹ Because the cost is simply the below-market interest on a loan, its impact on the projected bonus bids is smaller than the impact of the railroad's costs on the bonus bids under Norwest's comparative-lease approach discussed in the previous paragraph. In that approach the full cost of the railroad was shouldered by the coal developers, not just an interest subsidy.

³⁷ Because of the tendency of high-sodium coal to foul pollution control equipment as well as coal gasification equipment, regulation of carbon and the pressure to capture and sequester carbon or reduce the carbon content of the effluent stream may even further discourage the use of high sodium coal like the Otter Creek coal.

³⁸ Appraisal Table 2.5 and pages 2-9 and 2-10. Based on the percentage of the recoverable coal that is owned by the State of Montana (44 percent), its share of the \$187 million railroad costs would be about \$82 million. Norwest adjusts the cost of the railroad per ton of coal produced for the purchasing power of the dollar in earlier years because it is using comparative coal leases that were entered into at different years in the past. As a result, the implicit cost collected to fund the railroad is somewhat less than the full estimated \$187 million cost.

³⁹ Appraisal p. E-2 and pp. 3-11 and 3-12. Norwest does not explain its calculation of the benefit to Montana if the state does not have to subsidize the construction of the railroad. It simply asserts a value in the Executive Summary that is not discussed in the main body of the report. We calculate that the cost may be about a third greater than this, about \$23 million, compared to Norwest's \$17.3 million estimate.

All of these calculations assume that the estimate of the cost of the rail line from the Otter Creek Tracts to Miles City will be \$187 million. Norwest does not provide any citation for this estimated cost. Assumedly, it is taken from projections provided by the Tongue River Railroad, which estimated the cost to be something over \$300 million for the entire line between Miles City and the Spring Creek spur of BNSF railroad. In early July 2009, however, the Tongue River Railroad announced that its revised estimates of the cost of the railroad had almost doubled to \$600 million.⁴⁰ If, as one would expect, the cost of the portion of the Tongue River Railroad from Miles City to the Otter Creek Tracts area south of Ashland, will also double, this has significant implication for Norwest's Appraisal. If the cost of the necessary rail link is \$374 million rather than \$187 million, Norwest's comparative-leases approach would have to subtract about 25 cents per ton from the bonus bids associated with the comparative leases rather than the 12 cents Norwest used. That, however, would lead to a bonus bid that was substantially negative, -\$39 million rather than +\$31 million. That is, the State of Montana would have to pay potential coal developers to lease the coal. If the cost of the necessary rail link were only to rise 44 percent, less than half what the Tongue River Railroad is now forecasting it will cost, the bonus bid to the State of Montana would be zero.

Norwest's income approach to the estimation of the bonus bids also has to be adjusted for the doubling of the cost of the rail link. Because in this approach Norwest only assumes that the State of Montana subsidizes the railroad with a loan at a below-market interest rate, the impact is not as great. The bonus bid the state could expect would fall from \$37 million to \$25 million.

From Economic and Energy Boom to Bust (v)

Some of the impetus for the development of the coal in the Otter Creek Tracts was the increasing demand for electricity as the American economy expanded after the recession of 2001. Rising energy prices, including coal prices, seemed to signal a shortage of coal and expanding market opportunities. It is not surprising that Montana coal developers saw opportunities for further coal development in Montana. As it turned out, the American economy began to contract in early 2008 and is now deep in the worst recession since the Great Depression. Speculative commodity activity including energy markets kept many commodity prices rising even though the economy was actually contracting. Coal prices reached their peak in mid-2008 just as Norwest was completing its research for the Appraisal.

During 2009 the demand for just about everything has declined and along with it the demand for the fuels that energize our industrial and commercial sectors. The U.S. Energy Information Administration reported in the July 2009 *Electric Power Monthly* that "The drop in coal-fired generation was the largest absolute fuel-specific decline from April 2008 to April 2009 as it fell by 20,551 thousand megawatt hours, or

⁴⁰ **Billings Gazette**, July 8, 2009, Associated Press story quoting "Railroad developer Gustafson." http://www.billingsgazette.com/news/state-and-regional/montana/article_b89b2974-6be5-11de-bd82-001cc4c03286.html

13.9 percent...The April decline was the third consecutive month of historically large drops in coal-fired generation from the same month in the prior year, though it was not as precipitous as the drop of 15.3 percent in March or the decline of 15.1 percent in February. The April national level decline was the fourth-largest percentage decrease in generation since 1974.”⁴¹ The EIA also reported that the U.S. coal demand fell to the lowest levels since 2002 during the first quarter of 2009.

As a result of this decline in coal sales, some of the nation’s largest coal companies are reporting declines in profits or actual losses for the second quarter of 2009. Peabody Energy reported that its second quarter profits declined by two-thirds.⁴² Arch Coal, which mines much of its coal in the Powder River Basin, reported a loss for the second quarter, citing a 20 percent drop in sales and production cutbacks. Arch Coal executives identified the same economic problems discussed above: declines in industrial activity, low natural gas prices, and the build up of huge stockpiles of coal.⁴³

The decline in the industrial demand for electricity has led investment advisory firms to warn investors about the weak and declining value of the stocks of utility companies for whom industrial customers are a dominant sector. *Morningstar* in late July 2009, for instance, asked rhetorically whether the falloff in demand for electricity from industrial firms because of the economic downturn was “A Ticking Time Bomb in Utility Earnings?” “All else equal, we view utilities that rely heavily on industrial sales as less attractive even in a favorable economic environment. This reliance becomes a still-greater liability during a cyclical downturn; manufacturers tend to cut the lights first and keep them off longest.” This clearly has implications for the demand for coal and the strength of the market for coal.⁴⁴

The Financial Crisis and the Ability to Raise Capital for Risky Projects (vi)

Proposals to build the Tongue River Railroad and develop the various coal deposits in the Ashland and Otter Creek region have been around for about 30 years. Although the portion of the Tongue River Railroad from Miles City to south of Ashland, which could serve the Otter Creek Tracts, has been permitted since 1986, it has yet to be built. Similarly, the Montco coal mine that this section of the railroad was intended to serve was not developed, and the mining company’s lease on the coal was canceled by the State of Montana due to a lack of due diligence by the lessee. During much of the 1990s and 2000s, capital flowed freely, probably too freely, to many different and relatively risky, potentially high-yield projects: telecommunications, energy development, technology startup companies, real estate development, for example. Yet the Tongue River coal and railroad projects were not able to raise the capital necessary to proceed.

⁴¹ http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html?src=email

⁴² *Wall Street Journal*, July 21, 2009, <http://online.wsj.com/article/BT-CO-20090721-711115.html>

⁴³ *New York Times*, July 24, 2009, <http://www.nytimes.com/aponline/2009/07/24/business/AP-US-Earns-Arch-Coal.html>

⁴⁴ By Ryan McLean, July 23, 2009. <http://finance.yahoo.com/news/A-Ticking-Time-Bomb-in-ms-1701340187.html?x=0&.v=1>

American and worldwide capital markets are now in disarray although, hopefully, no longer teetering on the brink of collapse. Although interest rates are relatively low and at times near zero, financial institutions are hesitant to lend or invest. Having clearly underestimated the risks associated with past investments, financial institutions are now focused on digesting those bad investment rather than on taking on new, risky investments. It is to that traumatized and partially frozen financial market that the developers of the Otter Creek Tracts and the Tongue River Railroad will be turning for the hundreds of millions of dollars needed to fund these coal projects.

As discussed above, these coal and railroad developers will be seeking this massive infusion of capital just as the American economy finds itself mired in the worst economic downturn since the Great Depression. As of mid-2009, that economy has yet to show signs of sustained recovery and most economic observers expect ongoing economic difficulties well into 2010. The depressed demand for just about everything has reduced the demand for electric energy and the coal that is used to produce it. It would be in this depressed economic climate that the State of Montana would be offering to lease the Otter Creek Tracts if it proceeds to put these coal deposits on the market in the near future.

New Competitive Threats to Otter Creek Coal Markets

In addition to the difficult economic and financial conditions that will be faced by potential Otter Creek coal mines and the railroad that is necessary to ship this coal, there are also three additional competitive threats that the Appraisal fails to consider.

The Tongue River Railroad

The Appraisal assumes that only a rail line from near the Otter Creek Tracts to Miles City will be built. That gives Otter Creek coal a transportation cost advantage over both Wyoming's southern Powder River Basin coal and Montana's Decker and Spring Creek mines in serving the northern Midwest markets.

But there are plans for a longer rail line that links Decker to Miles City, namely the Tongue River Railroad, has already received federal permits (although those permits are challenged by legal action in the Ninth Circuit Court of Appeals) and claims that it will find financing once the Otter Creek Tracts are leased and there is assured traffic for that proposed railroad. If the Tongue River Railroad was constructed, it would provide Wyoming's huge southern Powder River Basin mines with significant cost savings for reaching the same markets that Norwest indicates are the targeted markets for Otter Creek coal. Decker and Spring Creek coal would also be provided with a shortcut to the northern Midwest markets. With the Tongue River Railroad in place, the transportation cost advantage on which Norwest's Appraisal bases its high mine-mouth price for Otter Creek coal would shrink dramatically. Competing coal from mines just to the south of Otter Creek would no longer face a long trip to the northwest and then back to the east to reach Miles City and beyond. The competing coal could zip right by the Otter Creek

Tracts on the Tongue River Railroad. As discussed above, if Norwest's projected mine-mouth price for Otter Creek coal is pushed much below \$20 per ton by competition for markets, the projected bonus bids to the state will quickly decline or disappear.

This is not speculation or a new issue. In the 1994 hearings before the Interstate Commerce Commission on the extension of the Tongue River Railroad from the Ashland, Montana, area to the BNSF spur at Decker, creating a continuous path from Miles City to the Wyoming BNSF rail lines, concern was expressed about the use of that rail line by Wyoming coal producers to reach what at that point in time were Montana markets in the northern Midwest.⁴⁵ John Duffield of Bioeconomics submitted a report on "The Tongue River Railroad Extension and the Marketability of Montana Coal."⁴⁶ That report concluded that the mine that the Tongue River Railroad was supposed to support, the Montco Mine and other nearby mines outside of Ashland, would "not be developed until well beyond the turn of the [twenty-first] century – if ever." It also pointed out that providing a shortened rail route for Wyoming coal to the northern Midwest would reduce the transportation cost advantage Montana coal had in reaching that market, raising the likelihood that existing Montana mines would lose part of their market. The Duffield projection that the Ashland area mines would not develop until some time after the turn of the century, if ever, has proved correct.

The federal Surface Transportation Board (STB), in its October 2007 decision on the third phase of the Tongue River Railroad, emphasized that the Tongue River Railroad **would** carry Wyoming coal to northern Midwest markets: "BNSF states that the new routing would benefit it and its utility customers because BNSF would use TRRC [Tongue River Railroad Company] as a bridge carrier for Wyoming coal. BNSF explains that its northern route for Wyoming coal, which runs through Forsyth, MT, would be shortened by the availability of this new line."⁴⁷ " . . . [T]he record clearly shows that BNSF has been providing monetary and staff support for this project, and that TRRC and BNSF have been discussing a potential arrangement whereby BNSF would operate over the Decker to Miles City line."⁴⁸

Great Northern Properties, the owner of the majority of the coal in the Otter Creek Tracts, also expects the Tongue River Railroad to be used by competing coal mines in Wyoming to reach the northern Midwest markets now served by Montana mines, the markets that Otter Creek coal will also seek to break into.⁴⁹

The Tongue River Railroad folks have proposed a common carrier line that goes from Miles City, Montana, down to Spring Creek-Decker spur and would connect with the Burlington Northern-Santa Fe line. They have

⁴⁵ Finance Docket No. 30186 (sub-No. 2), 1994.

⁴⁶ A report for the Northern Plains Resource Council, John Duffield and Chris Neher, Bioeconomics, Inc. Missoula, MT, January 1994.

⁴⁷ STB Finance Docket No. 30186 (Sub-No.3), Tongue River Railroad Company, Inc.—Construction and Operation—Western Alignment, Service Date October 9, 2007, p. 8.

⁴⁸ Ibid. p. 12.

⁴⁹ Chuck Kerr, President Great Northern Properties, July 17, 2006, Minutes of the Montana Land Board, p. 15.

been working on that for 20 years and I know there is some concern that that may open competition from the south across this track. We, as Great Northern have been concerned about that as well. . . we believe, structured correctly, we can make sure Montana is adequately protected and, in fact, there may be an opportunity where we can have the Wyoming [coal] developers pay for part of this line. They will use this line to ship their coal across it and we believe there is a price to be paid for that. So we think Wyoming coal can help pay for Montana rail.

Great Northern Properties preferred a rail line that went all the way through from Miles City to the Decker-Spring Creek BNSF spur to the south despite the competition it opened up from Wyoming coal because “. . . if you can solve the sodium issue, maybe technology will do it or this technology that this company [a company working with GNP] has will work, then that rail going south we can start working on not just the finite sodium market but the market that the other PRB mines are selling into. If we’ve got a lower cost of fuel we can be competitive if we can solve the sodium problem. So having access to the south as well as to the north we believe is very important.”⁵⁰ Note the importance of “solving the sodium issue” before Otter Creek coal has access to more than a limited market and the hope for a technological fix.

The Dakota, Minnesota, & Eastern Railroad

The Tongue River Railroad is not the only railroad eyeing a shortcut for Powder River coal getting to northern Midwest electric generators. The Dakota, Minnesota, & Eastern (DM&E) Railroad has also gotten permits to upgrade its rail infrastructure so that it can take advantage of the lengthy and round-about BNSF routes from the southern Powder River Basin to these markets. DM&E recently (September 2007) was purchased by the Canadian Pacific Railway. Currently the BNSF rail lines from the southern Powder River Basin can reach the northern Midwest markets only by either going northwest and then circling back east or going southeast and the circling back north. The Tongue River Railroad would solve the first problem and BNSF is now supportive of that proposal not only because it would make their route more competitive but also because it would help BNSF avoid expensive repairs and upgrades on the longer route and address congestion on their mainline. The DM&E-Canadian Pacific proposal aims to create a different solution by transporting southern Powder River Basin coal directly east towards Minneapolis, Chicago, Detroit, and the Great Lakes (see the map below). Both the Tongue River Railroad and the DM&E Railroad would open the northern Midwest markets that Montana coal currently serves to Wyoming’s southern Powder River Basin coal. As a result, Otter Creek coal will also have to compete directly with Wyoming coal, including Wyoming coal that is not burdened by its high-sodium content.

The federal Surface Transportation Board in its October 2007 decision on the Tongue River Railroad noted the role that the proposed DM&E upgrade would play in providing

⁵⁰ Ibid, p. 16.

competition to Montana coal in the northern Midwest markets and to the Tongue River Railroad:⁵¹

As the Board concluded in the 1998 DM&E decision, some markets that use Montana coal might switch to Wyoming coal if DM&E could deliver the coal at a reduced cost. That could happen in the Great Lakes market, which includes power plants served by vessel with rail service to Great Lakes transloading facilities. However, a BNSF-TRRC-BNSF-vessel route would have a mileage saving over existing BNSF routes to some plants in eastern Michigan. Therefore, BNSF/TRRC could lower their joint rate to these plants in response to competitive pressure from DM&E. This could reduce the chance of BNSF and TRRC losing market share. Accordingly, we are satisfied that the construction and operation of the new DM&E line would have little impact on TRRC's proposed line, even where TRRC and DM&E would compete for customers.

Generating and Industrial Plants That Could Potentially Receive PRB Coal Via CP/DM&E and Connecting Carriers



Source: Pace Global⁵²

Of course, neither the DME nor the Tongue River railroads have yet been built. Each is simply a competitive possibility at this point. The point is that the Appraisal fails to factor these competitive threats to Montana's traditional coal markets into its analysis.

⁵¹ STB Finance Docket No. 30186 (Sub-No.3), Tongue River Railroad Company, Inc.—Construction and Operation—Western Alignment, Service Date October 9, 2007, p.19.

⁵² Canadian Pacific Railway's Acquisition of Dakota, Minnesota, and Eastern Railroad: A Positive Development for Coal Shippers, Fourth Quarter 2007.

<http://www.paceglobal.com/paceglobal/pdfs/company/unique-market-analysis/Canadian%20Pacific%20Railway.pdf>

The Great Northern Power Development's South Heart Coal Beneficiation Project in North Dakota

Great Northern Properties Limited Partnership (GNP), the other owner of the coal in the alternating sections of the Otter Creek Tracts, is also attempting to build a coal beneficiation facility in South Heart, North Dakota. Chuck Kerr, the head of GNP, is also the president and CEO of Great Northern Power Development, which is sponsoring the project to upgrade coal, such as North Dakota's lignite, into a cleaner and higher BTU fuel.⁵³ Norwest, the source of the Appraisal that is being reviewed in this report, is also doing the geological studies for this North Dakota beneficiation project.

As *International Mining* describe the proposed technology:⁵⁴

The beneficiation process converts low rank coal into a cleaner and more productive fuel by removing up to 80 percent of its water content, together with ash, sodium, and other impurities that interfere with clean combustion. As well as increasing the thermal value of the coal by 50-60 percent, the upgraded coal is easier to transport and handle, and produces significantly less carbon dioxide, nitrous oxide and sulphur dioxide emissions than if the low grade reserves were to be used without pre-treatment.

The process is said to produce a high-quality coal briquette that could be shipped to electric generators or industrial coal users. The South Heart beneficiation project, however, has been presented as the first step in the process of building a coal gasification plant at the same site in North Dakota. Although construction of the coal beneficiation plant began in 2008, legal challenges to the permitting necessary for the coal beneficiation plant have since delayed construction.

To the extent that such a plant can upgrade North Dakota lignite and produce a product that can be sold into the northern Midwest markets currently served by Montana coal, the South Heart facility could displace existing Montana coal as well as provide competition for Otter Creek coal itself. South Heart is located on the main BNSF rail line linking Montana to its northern Midwest coal markets.

With natural gas prices as low as they currently are and with the U.S. natural gas supply now estimated to be much larger than previously thought, the South Heart coal gasification project may well not go forward. If coal prices remain depressed, the coal beneficiation project may also not proceed for the same reasons that the development of the Otter Creek coal and the Tongue River Railroad may not proceed.

⁵³ See the promoters' press release: <http://www.reuters.com/article/pressRelease/idUS124525+04-Apr-2008+BW20080404> .

⁵⁴ <http://www.im-mining.com/2008/04/06/australian-technology-to-underpin-14-billion-coal-gas-project-in-us/>

Impacts of Otter Creek Coal on School and Government Finance

The Norwest Appraisal and the Letter from the Montana Department of Natural Resources and Conservation that accompanied its distribution detailed revenues that putting the Otter Creek Tracts up for lease could bring to the State of Montana. The DNRC's letter and its Otter Creek Frequently Asked Questions document⁵⁵ point out that these revenues from leasing the Otter Creek Tracts would flow into the Montana School Trust Fund and be used for the support of public education in the state. The Frequently Asked Questions document also lists the various taxes that a mining operation on the Otter Creek Tracts would bring to state and local governments.

In the following analysis, we place these government revenue expectations in the context of the competitive market into which the Otter Creek coal will have to be sold.

The School Trust Fund and the Funding of Public Education in Montana

Although revenues derived from Montana School Trust lands must be spent on public education in Montana, neither the Montana Constitution nor Montana statute specifies exactly how much money the State of Montana should spend on public education. Because revenues from the Montana School Trust Fund cover only a small part of the cost of public education, the Legislature has to decide how much more money needs to be appropriated to supplement the money from the Trust Fund. As a result, having more money flowing from the Trust Fund does not necessarily increase the amount of money that goes to public education. The Legislature can and does estimate how much money is needed to provide a public education of an appropriate quality to students in Montana, takes into account how much money is coming from the Trust Fund, and then adds the amount of money to reach the targeted total level of school funding. If more money is coming from the Trust Fund, the Legislature can reduce the amount of money taken from the State General Fund. In fact, the Trust Fund dollars and General Fund dollars get pooled, establishing a total amount of funds that are used to fund almost all state government programs. In that sense, revenues from the School Trust Fund actually help fund **all** state programs, not just school programs.

At the Land Board meeting on May 19, 2008, during a discussion of the Otter Creek Tracts, this fundamental reality about the funding of public education in Montana was acknowledged. Superintendent of Public Instruction Linda McCulloch was asked by Governor Schweitzer "if the more revenue generated by trust land automatically means more money for the schools or if there were additional steps to funding the education system?" The Superintendent of Public Instruction "verified that more revenue generated by trust land activity does not automatically equal greater funding for schools, and stated that trust land revenue comprises approximately ten percent of education funding." The Governor asked whether a large inflow of money from trust fund lands "would have impacted the amount of money allocated to schools" by the previous legislature that had reduced K-12 education funds? The Superintendent of Public

⁵⁵ http://dnrc.mt.gov/trust/MMB/otter_creek/2009/FAQ.pdf

Instruction responded that “it would not have affected the monies granted by the legislature for K-12 education. The legislature uses the money made by the trust as a basis from which to start building funding for Montana’s schools.”⁵⁶

Because of the relatively small role that school trust funds play in the building of the total budget for public education in Montana and because the Legislature controls that total budget, increases in school trust fund revenue do not by themselves cause an increase in the total level of school funding. That is not to say that there is not benefit to public school funding. As the pool of funds available to fund all state programs rises, it is easier for the Legislature to spend more money on education, just as it is easier for it to spend more money on the provision of all valuable state government services.

Competition within a Limited Market for Additional Coal Sales: Implications for Government and School Finance

As discussed above, the primary market for the high-sodium coal that the Otter Creek Tracts would produce is the same market current served by other Montana coal mines. In addition, to the extent that leasing the Otter Creek Tracts provides a sufficient customer base to allow the Tongue River Railroad to be financed and become a reality, Wyoming coal will become more competitive with existing Montana mines, including Otter Creek mines, in reaching Montana’s traditional markets in the northern Midwestern states.

As outlined in Norwest’s 2006 analysis of the target market for Otter Creek coal, Otter Creek’s gain is likely to be some other Montana coal producer’s loss. In addition, if the Tongue River Railroad allows Wyoming to gain market share in that same limited market, it will also be at the expense of other Montana coal producers. If that may be the outcome, then it is important to consider what the net impact would be on Montana state government finances, school finance, local schools, and existing coal communities.

If Otter Creek coal displaces other Montana coal producers one-for-one, the impact on state coal production taxes (the severance tax, the gross receipts tax, and the Resource Indemnity Tax – RIT) would cancel each other out. Otter Creek would not increase the revenue from those taxes. To the extent that some Montana mines shut down as the Otter Creek mines come on line and reach full levels of production, the local county property tax revenues may simply shift from one Montana coal-producing county to another. That is, property tax revenues would not increase, they would just shift from one Montana mine to another with potentially disruptive, but in the aggregate offsetting, impacts on Big Horn, Rosebud, and Powder River counties.

In this situation of a zero-sum competition, the benefits of a new mine to the state government would have to come from the benefits that derive from Montana actually owning the coal that the Otter Creek Mine would produce: the bonus bids paid to obtain the lease of Otter Creek coal and the assumed 12.5 percent royalty payments to the

⁵⁶ Page 8.

state as the coal is produced.⁵⁷ As discussed above, the size of the bonus bids may be much lower than the Norwest Appraisal estimated because the cost of the railroad will be higher and the mine-mouth price of Otter Creek coal will be lower than Norwest assumed in its Appraisal. This leaves the royalties paid to the State of Montana on the coal it owns as the only additional revenue stream that would be unique to the Otter Creek Tracts as opposed to other Montana coal mines where the state government does not own the coal. However, if the coal being produced at the displaced Montana mines is federal coal, half of the royalties paid to the federal government are transferred to the state government. In that case half of the royalties flowing to the state government from the Otter Creek mines could be offset by the decline in federal royalty transfers from the displaced mines.

Clearly in a competitive situation where the Otter Creek mines displaced existing Montana mines, the benefits to the state government could be quite modest compared to the total calculated in the Appraisal, which assumes that Otter Creek does not have to compete for market share but, instead, can simply sell into unspecified new and expanding markets. One cannot just sum up state coal taxes, coal mine property taxes, bonus bids, and royalties – the real-world equation is far more complicated.

If the Tongue River Railroad is built because of the leasing of the Otter Creek Tracts and it provides Wyoming competition that also displaces Montana coal producers and constrains the sales or reduces the price of Otter Creek coal, Montana's state government could, on net, be worse off financially as coal production declines.

Mines that have to reduce production or shut down have significant negative impacts on local communities as hundreds of well-paid jobs disappear, local spending drops, local businesses decline, local tax bases shrink, and local government finances (including local school finances) suffer. Of course, Montana families would suffer too. It is not clear that this would be an appropriate outcome of Montana state government involvement in the coal business.

The dilemma that the Otter Creek Tracts present to the State of Montana is tied to their isolated location that can be reached only by building a new rail line. If, instead, in the New World Mine settlement, the State of Montana had requested federal coal properties that were located near existing mines where rail infrastructure was already available, the development of that state-owned coal could have supported existing as well as new Montana mines, mining families, and mine-dependent counties. The value of the coal would also have been greater because the necessary transportation infrastructure was already in place.

It might be argued that the State of Montana has nothing to lose by putting the Otter Creek Tracts up for bid. At worst, no one would bid. If there were bids, the State of Montana would get an upfront payment regardless of whether the coal developer actually proceeded with developing the coal. If the Otter Creek coal got fully developed,

⁵⁷ There is also an annual rental of \$3 per acre of state land leased. This, however, will contribute little to annual state revenues, about \$25,000 per year.

the State of Montana would reap a bonanza of royalty and tax payments. The problem with this analysis is that it ignores the same market reality that the Norwest Appraisal ultimately ignores: The limited market for Montana coal and the competitive pressure that development will put on existing Montana mines.

Given that public education in Montana is primarily financed through local property taxes and a very diverse set of taxes that flow into the state government's general fund, the primary focus of those concerned with school funding should be on expanding that tax base rather than on the possible earnings the State of Montana might receive from speculative mineral developments that could undermine the existing tax base along with local communities, schools, and families.

Conclusions

The Norwest Appraisal is fatally flawed in all of the following ways:

- It ignores Norwest's own characterization of the market for Otter Creek and other Montana coal as very limited.
- It ignores the impact of competition from Otter Creek coal in a limited market on the market price for Montana coal and the likely displacement of existing Montana coal production.
- It ignores the competition to these limited Montana coal markets that the Tongue River Railroad will create from Wyoming coal.
- It assumes that Otter Creek coal can be sold at a mine-mouth price nearly twice as high as its projected price for other Powder River Basin coal, despite the fact that this is a very limited market that will also be challenged by Wyoming coal.
- As a result of calculation errors, it significantly exaggerates the transportation cost advantage of Otter Creek coal relative to Wyoming coal, an error that could have a significant impact on financial returns to the State of Montana.
- It based its estimate of the Otter Creek mine-mouth price on sales to a single Minnesota electric generation site that it knew was associated with an implicit mine-mouth price that was much higher than the average price associated with other regional generators.
- It significantly underestimates the cost of the railroad infrastructure necessary to develop the Otter Creek coal, as well as the likely impact of that infrastructure cost on the financial returns to the State of Montana.
- It has been rendered unreliable and misleading by changes in economic conditions, energy markets, and the politics of carbon regulation since the Appraisal was prepared.
- Given the current economic, energy market, and financial conditions, it would be imprudent to lease the Otter Creek Tracts at this time on the basis of this Appraisal.

For all of these reasons the Norwest Appraisal cannot provide a conceptual or factual basis around which the Montana Land Board can structure a leasing process for the

Otter Creek Tracts. In addition, the current economic downturn and accompanying financial crisis have created a seriously depressed market for coal. Leasing the Otter Creek coal at the present time would not be financially prudent. The Montana Land Board needs to commission a new appraisal of the Otter Creek Tracts that avoids the conceptual and factual errors outlined in these comments. Such an appraisal would provide the Montana Land Board with a much more secure foundation upon which to make the important public policy decisions associated with the Otter Creek Tracts.

Footnote 42a&b

September 22, 2015

Subject: Comments on the Tongue River Railroad DEIS, Docket #30186

Dear Mr. Blodgett,

My wife and I currently own the Fix Ranch that is located about 20 miles SW of Miles City in the Tongue River Watershed. I am also the chair of the Coal and Tongue River Railroad Task Force for the Northern Plains Resource Council. Northern Plains organizes Montana citizens to protect water quality, protect family farmers and ranchers and protect the unique quality of life we have in Montana. I have been a member of Northern Plains for many years, and am a past chair of the organization. These comments are in addition to the comments that I have submitted at the hearings in Miles City.

The draft Environmental Impact Statement (DEIS) for the Tongue River Railroad (TRR) is very difficult to read and does not give us any idea which direction the TRR is headed. I would suggest that the DEIS be redone and eliminate some of the alternatives. The scope is so large that the details of the route that may be chosen cannot be covered in this draft. The information supplied is inadequate and you cannot derive a final Environmental Impact Statement (EIS) from the DEIS.

There are two alternatives that cross my ranch. The Tongue River alternative and the Moon Creek alternative. There are two different routes for each of these alternatives near the proposed Otter Creek mine. I will address the Tongue River alternative first. The proposed Tongue River alternative would cross about 3 miles of our ranch.

If completed, the Tongue River Railroad (TRR) would traverse the ranch I have lived on for almost twenty four years. The TRR would devalue my property and injure my economic interests by interrupting my ranching operations. In particular, the Railroad would form a wall that would prevent my cattle from getting to the Tongue River for water. It would go through my calving pasture and could separate cows from their calves. Calves could get onto the track and be killed by the trains. The stock crossings proposed are only culverts and the cows may not learn to use them. I would need to drill wells and supply water to the cattle in the new pastures created by the fencing of the railroad easement. There is no power available so I would either

have to pay an excessive price to provide power to these wells or install solar panels to provide power to water the stock.

The TRR could start fires. A few years ago a 60 mph wind pushed a fire across the Tongue River and came very close to our house. A county or state road would need to be built along the TRR easement so that firefighters stationed in Miles City could respond to fires created by the TRR. This road will probably require more taxes to build the road and to maintain it. The road will bring more traffic and it will require more acres of my ranch that will be taken out of production. It will bring more dust to the area if it is a gravel road. It will serve as a closer path to Miles City for some of the people up the river and it may become their preferred road. Along with traffic, I will have the possibility of vehicles or the people in them starting fires. There will be easier access to my stock if they want to steal some of them. The increase in traffic could bring more noxious weeds to the area as well.

TRR personnel have made it clear that they have the right of eminent domain and intend to use it. It is a terrible strain knowing that the TRR can come and take our land for very little money. I have a private bridge across the Tongue River and am concerned that it may be condemned to use for construction and maintenance of the TRR. The weight of construction equipment going across the bridge could cause it to fail prematurely. It may require that I will have to redeck the bridge. I may have to accept liability for people injured on the bridge. It is a one lane bridge and two cars cannot meet on it. The route to the bridge is not direct from the highway and semi-trucks may have to go past my house to gain better access. I may have to build a different access road so that there is a more direct route to the bridge from the highway.

Noxious weeds will be another problem associated with the TRR. The TRR easement will serve as a corridor that will allow weeds to proliferate. Leafy Spurge or Spotted Knapweed will likely follow the TRR easement and then we will have to fight these weeds on our property as well. This will be an additional economic burden on us.

The TRR will bisect our pastures and negatively impact our cattle. The TRR would create a smaller pasture inside of my calving pasture on the riverside of the grade. This pasture has lots of Cottonwoods and Chokecherry bushes that protect the cattle from the wind and weather in the spring. The pasture created near the river will be smaller and may not be usable for calving out as many cows as in the past. In addition this pasture is subject to ice jam flooding. Animals could be trapped by the railroad grade and may not be able to get away from the rising

water. The train could frighten the baby calves and make them jump into the Tongue River and drown. The pasture created on the other side of the tracks will be very small and may not be usable like that. I would probably have to refence the area into another bigger pasture. I may have to remove an existing fence. I would have to study the area to figure out the best way to utilize the land. Another pasture the TRR goes through would be split as well. The river side of the track would be smaller and would not be usable without opening the fence into another area. I currently have my circle pivot fenced out but may have to move the fence there as well to utilize the ground better. There is a small access to water from this new pasture and a fence would probably have to be removed so that cattle could access the river. I also have a hay yard where I store hay that may have to be moved. It would be close to the TRR and if a fire started it could burn the hay very quickly. Farther up the river in this pasture the TRR would go through a dam. They have said that they would move the dam, but it is unknown which side of the grade they would put the replacement dam. If the road goes along the route, there may not be room for a dam. There would be a culvert in Circle creek that goes through this pasture and it drains a lot of country. My current access road has a culvert in the bottom, but it doesn't handle all the water. When the creek runs full the water runs over my road. I have also had water back up over this road on Circle Creek from ice jam flooding in the Tongue River. The railroad grade would dam up this creek and could be washed out in a large rain event. The grade and size of culvert(s) is a concern on Circle Creek. This may be an area where a trestle would be better. It would allow more water to pass and allow the cattle to pass underneath. The pasture that is created above the railroad grade may not have enough water. There is one dam in the pasture and it usually dries up by the end of the summer. I use this pasture in the early spring and then the fall and through the winter. I would probably have to drill a new well so that I have a reliable water source for this pasture. I may need access culverts so that cattle can get to the river or to my artesian well for water. The artesian well flow has decreased in flow over the last few years and I am currently working on a solar system to pump the well in the winter time. The pasture above the grade may not be accessible if it is a snowy winter. Currently the cattle go back into the hills for cover when a bad storm comes and they will not be able to do that easily if the TRR grade is there. Again, the cattle may not want to go through a culvert that goes under the railroad. It would only be usable if the culvert also goes under the road that needs to be built. That makes the culvert longer and less likely for the cattle to use. It will be a lot of trial and

error to see what will work if the TRR is ever built. I have a set of portable corrals at the exit to this pasture and I may need to make the corral better so that I can haul cattle more easily. I usually bring the cattle home to wean them, but the route through the railroad culverts and the chokecherries and across my bridge may make it difficult to do that any longer. I would probably have to wean the cattle at the corrals I just mentioned. The TRR would also go through a 100 acre pasture next to my calving pasture. This pasture would be cut off from water and I may have to fence it into a larger pasture to use it. I currently put 50 heifers in this pasture for about 20 days for the start of the breeding season. The next pasture the TRR goes through would be cut off from the river for water. I would probably have to drill a well in that pasture to provide water, so that the cattle wouldn't have to go to the river. I may want a culvert there to access the river if I cannot get any water. Once again, it will be a trial and error system. There will be a pasture of the neighbors that will be cut off and I may end up buying that property to add to my pasture if they cannot use it. I would have to negotiate with them to buy the property if it becomes available. That would require refencing as well.

The easement will need to be fenced to keep livestock from getting on the track. The TRR has not made a firm commitment to any timely and necessary repairs of the fence. In all likelihood, we will be responsible for repairs to keep our cattle off the grade. The TRR has not determined whether we will be paid for livestock that are killed on the railroad grade.

Culverts will need to be added to allow cattle to cross between our pastures that would be bisected by the TRR. Cattle may not readily go through the culverts to utilize the pasture and may have to be herded to the other side to utilize the grass. Some may never learn to go through the culvert. We may have to put the cattle in a corral and transport them across the track to utilize the pasture. This will require additional corrals to gather and load the animals. We may need to corral the cattle next to the culvert to try to train them to go through the culverts. Culverts may fill with ice or water and be unusable for livestock.

In addition to culverts we will need grade crossings as well to take wide machinery across the track. Grade crossings may not be easily accessible. We may have to drive up or down the TRR easement to find a crossing to move our machinery. Grade crossings will need cattleguards so that we will not need to open gates to get across the grade. Hopefully, TRR will provide the cattleguard and maintain it. Cattleguards tend to fill with dirt and have to be cleaned occasionally. We may need to clean the cattleguards if TRR or the County does not do it.

We may have to accept more liability if the TRR is built. Our insurance could go up. All phases of our operation will cost us more to operate if the TRR is built.

TRR land men came to my ranch several years ago to talk about obtaining an easement or right of way across my property. My neighbor at the time and I talked with them and discussed the location of the railroad easement and where the crossings would be located. I tried to convince TRR personnel to move the route farther away from the river off of the floodplain and out of my calving pasture. They refused to consider the route I asked for. They informed me at the time that they intended to move the route over ½ mile on my place. I was considering putting an irrigation circle pivot on the property across the river, but was holding off to see if the railroad was going to be built on its original route. They told me that the new route would be used. I felt that I could then put the circle pivot where the original route was planned. I noticed that when the TRR III EIS came out they actually showed both routes approved by the Surface Transportation Board. I am thankful that the new DEIS does not show the original route any longer. But this is just a draft and I do not know what route will be chosen for a preferred route. The Environmental Impact statement talked about double tracks in several places along the route and I don't know if I have double tracks or not.

My personal and Northern Plains' conservation interests in fish and wildlife species and their habitat will be harmed if the Tongue River Railroad is allowed to proceed without the environmental safeguards required by law. The Railroad would result in the degradation of habitat and further decline of populations of species such as the pallid sturgeon, bald eagle, sage grouse, other fish and wildlife, and sensitive plant species.

I take pleasure in knowing that pallid sturgeon, bald eagles, sage grouse, other fish and wildlife, and sensitive plants are nearby. The Surface Transportation Board failed to determine the baselines for these species and how they will be impacted from the Railroad. Many of the areas were not looked at for the DEIS. The fires of 2012 had ravished a large area and the wildlife was gone. Some of my neighbors wanted to have a three year study done to make sure the wildlife had moved back. The Surface Transportation Board and the TRR did not allow this to happen. No studies were done in those areas. I allowed ICF on my property to study the wildlife and they have found a Sage Grouse Lek on the Moon Creek alternative across our ranch.

We have lots of wildlife on our property. There are Mule deer and Whitetail deer, antelope, Sage hens, pheasants, prairie dogs, ground owls, beaver, numerous song birds,

including meadow larks, swallows, mourning doves, woodpeckers, hawks, eagles, ducks and Canada geese. Elk are starting to migrate into this area and one of my sons saw a nice bull elk across the river a few years ago. There are coyote, fox, badgers, raccoons, skunk, porcupine and wolves have been spotted nearby. Bobcats and mountain lions have been spotted on my ranch. There was a bear captured in Miles City a few years ago and relocated to the Custer Forest south of our ranch. The prairie dog numbers rise and fall as bubonic plague comes and goes through the area. If the Railroad is completed, I fear I will no longer be able to view and enjoy these fish, wildlife, and plants to the extent I do now.

We allow public hunting on our property via Block Management which provides additional income. We usually have a couple hundred hunter days a year on our ranch. The wildlife numbers will be affected by a railroad running through the property and it could make management of the block management area more difficult. We may be forced to curtail the Block Management hunting during construction of the TRR and will have to make a decision as to whether we will continue it if the TRR is built. This is true both for reasons of liability (we are concerned about being liable in the instance that a hunter or his property are damaged by the railroad), and due to over-hunting concerns detailed below.

The Tongue River Ranch that adjoins our ranch was recently purchased by the State of Montana and is being used by the public for hunting. The current access to that ranch is from Interstate 94 through the Moon Creek exit. If a road is built along the TRR, the distance to the Tongue River Ranch would be shorter from Miles City and traffic will increase to access hunting on the Tongue River Ranch. This will increase the traffic on the new road that will be built along the TRR grade. Hunters may try to sneak into my property and hunt on it. I will have to post signs more visibly than I do now (an additional personal cost and effort on top of the need to watch my property more closely). One sign on my bridge is sufficient now.

I fish in the Tongue River and have caught some nice catfish. I have also caught smallmouth Bass, Goldeye and Carp. There are more species of fish coming into my section of the river since the upstream bypass was installed on the Tongue and Yellowstone diversion dam. I am worried that the TRR would injure my recreational interests in fishing. The DEIS needs to do a better baseline study on how many fish are in the river or how railroad construction would impact the fish.

The fish in Tongue River are in grave danger. The survival of the Pallid Sturgeon is tied to the Tongue River. The Tongue River was used for the Pallid Sturgeon to spawn many years ago. The TRR will produce sediment and other environmental impacts on Pallid Sturgeon and other aquatic resources. These impacts were never quantified. How much sediment will be brought into the Tongue River from all of these different alternatives? The cumulative effects from the TRR and Coal Bed Methane development and development of the Otter Creek Mine and other mines upstream may permanently damage the Tongue River. The river water quality is already exceeding the non-degradation thresholds from CBM development.

The Tongue River Railroad would also be loud and noisy. It would not allow me to enjoy the solitude of the area as I do now. The ranch is beautiful and we can hear birds singing and coyotes howling. The noise from trains honking at crossings and the rumble will definitely disturb this tranquil environment.

If the Surface Transportation Board permits the Tongue River Railroad, my economic, aesthetic, conservation and recreation interests will be injured. Fish, plant, and wildlife species will continue to decline and their habitat will continue to be degraded and I, other Northern Plains members, and the general public will suffer substantive harm.

As I get older I would like to pass the ranch on to my sons. The TRR has been hanging over our heads for many years. I have lost many of my neighbors who were friends because they did not want to deal with the TRR. I do not want to pass on the problems that are associated with fighting an unneeded railroad.

The Moon Creek proposal will split my ranch in half, with an east half and a west half. I have not looked at this alternative as long as the Tongue River alternative. I have been thinking about the Tongue River alternative since 1991 when we bought the ranch. I only began looking at the Moon Creek alternative for the last year or two. It appears that the route through my big pasture would go over the top of the well and windmill that is in the State section. The DEIS says that the well will be sealed. I would probably need to have two wells drilled to replace it, one in each pasture that is created from the railroad easement being fenced. There is no power there so two solar wells would need to be installed to water the cattle. The west half of the big pasture does not have much water and the new well would be critical to watering that pasture.

The route appears to go over the top of a sage grouse lek that is in this pasture. Given the level of national concern about sage grouse, the proposed TRR's impact on sage grouse leks needs to be taken seriously.

I doubt that I can get the cattle to use culverts to go under the track. I would probably have to put the cattle in one pasture and then move them to the other after they have grazed the first pasture. I may have to corral the cattle and haul them across the tracks to the other side. This would require an-at grade crossing near the corral at the south end of the ranch. Currently the corral is on the East side of the proposed Moon Creek alternative. I would probably need to build a corral on the West side of the tracks as well to be able to gather and haul the cattle back across to the East side.

There would be the same concerns with fires and weeds that we have for the Tongue River route. The operation of the railroad would cause fires and this area is far enough away from the ranch that I may not see the fires until they are out of control. The Moon Creek alternative would also need a county road alongside of it to help fight fires and spray for weeds. The road would need to start near Interstate 94 and go south through my ranch and then up the Tongue River until the SH ranch. The road would have to be continued after the Harwood ranch to the Brandenburg Bridge to gain access to the area along the track. The DEIS is deficient because it neither identifies locations for roads like these nor discusses their particular impacts.

When the route goes out of my big pasture into the North pasture, the grade is quite steep. The DEIS did not say whether a helper unit would be required at this point or not. The DEIS did also not address if any sidings would be installed on the Moon Creek route and where they might be.

The cut near the top of the Moon Creek and Tongue River divide would be large and it appears that the drainage path for water could be altered and water that normally goes into the Moon Creek drainage may go into the Tongue River drainage. The drainage path to the first reservoir on the top of the grade would be crossed by the TRR. A culvert may not be enough to fill this reservoir, since some of the drainage would be diverted into the Tongue River drainage. It is difficult to fill and only fills under certain conditions.

The route is on top of my access road in the North Pasture. I would have to build a new road to have access into this pasture. It is owned by the BLM and I do not know whether they will allow a new road to be built or not.

If a county road is built parallel to the track I may be able to use that for access into the pasture. The road would give access to the public for hunting in this pasture. It would also give access to the State land. The State Land has an agreement with block management to allow the landowner to restrict use via the block management system. The hunters would first need to sign a permission slip to hunt in this state land. The BLM land does not have that sort of agreement and the public could hunt there without permission. The private land in the North pasture is not fenced separately from the private land, so hunters may not know when they are leaving the BLM land and entering the private land. I do not know if I would continue the block management program or not. If an unlimited number of hunters come into the BLM land, I may have to cut down the number of hunters I let in to hunt. The road would give the public access for stealing cattle, the same as a road for the Tongue River route.

The North pasture would also be cut in two by the TRR and the fences installed for it. I may need to take out the South fence in the North pasture and make it into an east and west pasture that would be combined with my big pasture. I doubt I could get the cattle to use culverts to cross from East to West in the North pasture and it is too difficult to haul cattle into the North Pasture. I may be able to leave the South fence in and herd the cattle to the North into the North Pasture from the big pasture, after I haul them over the tracks. It would make it very difficult to operate the ranch, and increase the time spent herding cattle.

I would need to have some at grade crossings in the North pasture to be able to access areas on each side of the tracks. The dams in the North Pasture to the west of the tracks may not have sufficient water for the cattle and an additional well may be required. It would also need to be solar powered, as there is no power available there. The east section could also use an additional well. It is very difficult to get vehicles into the north pasture and well drillers may not be able to access the area to drill a well.

Once the final EIS is complete, the TRR has a permit and can utilize their eminent domain authority. I have suffered financial loss from the fact that a permit was allowed across

my property. I have included the verified statement that I have submitted for the permit application to describe that financial loss. I do not want to have additional loss from another permit and that is why I am recommending the no action alternative.

I visited with the folks at the hearing in Miles City. I explained that I could not download the Google Earth program because our internet is so slow. The ICF and Surface Transportation Board said they would send me a map on disc that I could use. I have never received the map.

I have also included the testimony that I gave in Miles City. Due to the time restraints, I gave part of the testimony in the first session and the rest of it in the second session.

During scoping, maps were available that showed where a siding was supposed to be on the Tongue River Route. It was located on the Hirsh Ranch. The newest DEIS does not identify that as a possible siding location and no other siding locations are identified. There is only general discussion about where there may be sidings. We cannot comment about how a siding may impact our operation without knowing whether we have a siding or not.

I have looked over the maps provided on the internet site for the different routes. These maps are not available in the DEIS and are very useful to know where the routes are proposed. I looked over the Tongue River Road route and I am concerned about the section near the Tongue and Yellowstone Irrigation Dam (T&Y). The route goes through the Leonard and Dustin Muggli Farm and then across the Tongue just above the T&Y dam. The berms created and the supports in the river will be a concern. The existing T&Y dam holds back ice during ice jam flooding and often flood the Leonard and Dustin Muggli Farm. The water in the past has even gone around the T&Y diversion dam. The dam has been modified to allow fish to swim upstream past the dam and there is also a downstream bypass to allow fish to go back into the river instead of being trapped in the irrigation ditch. There was work that was done for the upstream bypass on the West side of the T&Y. It included a large berm to support the upstream bypass channel. This berm should protect the possible washout from ice jam floods that try to go around the diversion dam on the West side. The new construction for berms to support the bridge for the TRR will change the dynamics of the Tongue River in that location and could cause the ice jam flooding to be even more severe and may cause the flood waters to go onto the ranch belonging to the

Murnion family. The construction there may cause the water to go around the diversion dam and cut a new river channel. It will surely cause more flooding on the Muggli Farm as well.

The DEIS does not look at the possibility of flooding at Miles City and how the TRR berm will affect that flooding. The city of Miles City has done a study on the possibility of rebuilding the dike that protects Miles City and it has not looked at the TRR berm at all. I have included the study that was done for Miles City for a new dike. The interaction of the TRR berm and the Tongue River will affect ice jam flooding and normal flooding all along the Tongue River alternative. It must be studied in the EIS to determine how the two things will interact with each other.

The Burlington Northern (BN), which owns the track that goes through Miles City, has recently increased the speed limit to 60 mph through Miles City. They have stated that they merely have to build the track to a new specification and can increase speed because the roadbed is capable of it. This has caused quite a bit of concern in Miles City and I have included several newspaper clippings talking about the increase in speed. I have looked at the wye proposed at the BN tracks at Miles City and it does not appear that trains could go 60 mph on the wye going up Tongue River. Can the TRR move the tracks and make the turns gentler so that they can go 60 mph through those curves? If so, wouldn't that require an additional bridge across the Tongue River, go through Spotted Eagle Lake and take out more businesses and homes? Also if the curve going to the West was upgraded to accommodate a 60 mph speed limit, wouldn't that go through most of the Fish Hatchery? There is quite a bit of concern regarding upgrades to the crossing going to Spotted Eagle recreation area with the new 60 mph speed limit. The existing crossing only includes flashing lights and does not include a protection arm. There is also concern about how far train cars will go in a derailment at 60 mph versus 30mph.

I also included a newspaper clip talking about relocation of the railroad crews at Forsyth to Laurel. This seems to indicate that Burlington Northern has no intention of ever building and operating the Tongue River Railroad.

There is no need for the Tongue River Railroad anymore. The Otter Creek mine does not exist and will probably never be built. The cumulative impacts associated with the remnants of Coal Bed Methane (CBM) in Wyoming, plus the problems associated with the Decker Mine, the

Spring Creek Mine and the new proposed mine on Young's Creek in Wyoming all affect the Tongue River Watershed. The water quality this spring is worse than we have ever seen in the Tongue River. Development of the Otter Creek mine would only make the water quality worse. It would damage our irrigated lands, possibly destroying their productivity. The waters released from developing the Otter Creek mine are high in salts and would destroy our soils when they are discharged into Otter Creek and the Tongue River.

Not long ago, I went to Denver and testified to the EPA regarding climate change. I have included my testimony to the EPA. We are seeing dramatic changes due to climate change and the weather is changing dramatically. It is making it more difficult to raise crops and run cattle. Food supplies will be in danger as well as water supplies if we do not work to slow down coal production and the burning of coal. Building a new coal mine on Otter Creek would only make climate change worse. The application and the DEIS do not say where the coal will be used. The DEIS only suggests that it will replace existing coal. The DEIS also says that the coal consumption forecast is the same whether the TRR is built or not. If OEA's logic is correct, this would mean that there is no new market for Tongue River coal, and there is no need for the TRR, as all it would do is displace existing mines and mining jobs while decreasing the value of ranches like mine, and making them notably more expensive and difficult to operate.

I participated in the draft Programmatic Agreement in the DEIS. I do not feel that the culture can be protected if the railroad is built.

I can only see one alternative that will work and that is the 'no action' alternative. I encourage the Board to select it.

Mark Fix
Fix Ranch
Miles City, Montana

Ken Blodgett
Attention Environmental filing, Docket No. 30186
Surface transportation Board
395 E Street SW
Washington, DC 20423-0001

Dear Ken,

My family and I own and operate Rocker Six Cattle Company, a cow-calf livestock operation in Southeastern Montana. We are potentially impacted by several of the proposed railroad alternatives of the Tongue River Railroad project. This project would severely impact our operation. According to the Draft Environmental Impact Statement, the proposed Colstrip Alternative and the original Tongue River Alternative would cross our land. We stand strongly opposed to the project for reasons raised below.

These comments explain how the Draft EIS for the TRR failed to address impacts to our ranching operation. This is not a complete list of every impact the railroad would cause, many impacts would not be evident until the project would be built.

Nearly all of the concerns we have with this project as it applies to our ranch would be “negotiated” with the applicant after the certificate would be issued. This is unacceptable, as the applicant has no guidelines or incentive to be sensitive to our issues. In fact, at the DEIS hearing in Lame Deer, David Coburn, the attorney for the applicant, made the comment to an acquaintance that the applicant looked forward to receiving the certificate so they could immediately file condemnation proceedings against the landowners, because it was the only way to bring landowners to the table. I believe that statement speaks volumes; they have no intention of “negotiating” any of our concerns, but will rely on wielding the club of federal eminent domain as leverage. The term “negotiate” needs to be clearly defined. If a landowner attempts to negotiate an annual fee for an existing livestock pipeline that the railroad would cross, and the railroad refuses, does this constitute a negotiation? If landowners attempt to negotiate a Right of Way (ROW) easement rather than fee title, and the applicant refuses, is this considered a “negotiation”? I think not. The negotiation guidelines need to be very clear within the mitigation section.

The EIS never once mentions cows. It does mention threatened and endangered species, and mentions wildlife in general terms, but does not once mention cattle, or the impacts to cattle. Nearly every acre of the Colstrip Alternative crosses private grazing land utilized by cattle, and yet the impacts to livestock and the livelihoods of the landowners crossed are not addressed.

During construction, (9.3.12,) 297 million gallons of water would be needed on the Colstrip Alternative. The document claims that this water would be negotiated with the landowner. It also mentions that this water could come from wells. Our wells are limited for volume, and will pump air. Does the TRR have the power to condemn for water? Would the TRR pay for the electricity to pump this water? How would the water be transported? The applicant has claimed that all construction impacts would be within the ROW. If water is trucked from a well that is outside of the ROW, it will have huge impacts on private access roads, dust, ruts, and if these huge volumes of water would be hauled, the county roads would be impacted as they were in the Bakken oil fields and in Wyoming during Coal Bed Methane development. The county roads were destroyed. There is no mention of these impacts within the DEIS. Just prior to shipping our calves in the fall, (our only cash crop and only payday) the cows and the calves on them have had issues with dust on dry years. This dust is from the adjacent county road. In dry dusty conditions, cattle get “dust pneumonia” which impacts the respiratory tract. Cattle die from this condition. If this massive volume of water would be hauled on trucks on a dusty county road, this would have a severe impact on cattle health. This also brings water rights into question. There simply is not enough well water

to be used for construction. Rosebud Creek has a minimal amount of water as well. What would the impacts be if they dropped the level in the Rosebud by pumping water? Could they condemn to get this water? Water in the Tongue River is over allocated as well. If the Tongue River Water Users refuse to lease water, could the applicant condemn? Would downstream users have an opportunity to challenge?

Where would the work camps be located? The document claims they would be in Ashland, but could this change? Could the applicant condemn for this too?

What would the logistics be to keep cattle from crossing the ROW during construction? I have seen projects such as this, and the fence issue is a nightmare. Who would be responsible for keeping fences functional during the construction phase? The applicant or the landowner? The FEIS should be very clear that if landowners are expected to drop what we are doing and gather cattle out of the construction area, they should be compensated robustly for their time. This should not be “negotiated”; the burden of keeping the fences intact and functional during construction at the expense of the applicant should be added as a mitigation requirement.

Where would the staging areas be located? The document claims that they would be located within the ROW. The ROW is 200 feet wide; this is not enough room for ROW construction and a staging area. If the staging areas would not be allowed by the landowner, could the TRR condemn for these areas?

There is no mention in the document as to how a landowner could use isolated parcels of land. This is land on the Colstrip Alternative that lies between the railroad Right of Way (ROW) and the Greenleaf/Lay Creek county road. These parcels would be isolated from the rest of the pasture, and would have no water source, rendering them useless for continued grazing. Would the applicant drill wells, at their expense, on these parcels so we could continue to graze these parcels? Would the applicant or the BN compensate landowners for electrical use of the wells? One of the “solutions” that was mentioned by a STB member at the hearings was to sell the parcel to a neighbor. This is not a solution, and demonstrates the lack of comprehension of the impacts this unneeded project would create. In 12.2-29, under Severance of Contiguous Properties, where is the 147 acres of land impacted and 136 acres of irrigated farmland? Is it on the Amish community? Have the Amish been contacted? It also states that the severance would “...be rendered unsuitable for its current use”. Once again, there is no mitigation, which is contrary to the purpose of the EIS process. To make this statement with no mitigation is, once again, a complete failure and a mockery of the EIS process. This document should acknowledge that a railroad IS severance, not just to a few isolated parcels. Landowners should not be burdened with negotiating the problem they did not cause. Any agricultural losses through severance and isolation should be addressed to the landowner’s satisfaction before any permit is issued, and be specifically mitigated in the document.

Under the Colstrip Alternative, (9.3.12), it states that 9 wells would be permanently closed. Where are they? Who are the landowners? Will the applicant replace these wells at their expense? If the wells would be replaced, the water right priority date would not transfer to the new well. Stripping people of senior water rights in an area where water is tightly allocated, and on a ‘first in time, first in right’ basis TRR/BN would be impacting and violating water rights under Montana Water Law. It is outrageous that eliminating wells does not have mitigation spelled out in the DEIS. The assumption is that the landowner would absorb the loss, and these wells would be replaced at the landowner’s expense. This should not be “negotiated”. The STB should require any well taken out of production be replaced, and the mitigation language needs to be in the FEIS.

At grade crossings are an issue. They can be negotiated, but the landowner assumes the liability for these crossings. BN requires the landowner to prove that he has at least \$1 million in liability insurance before negotiations even begin. The BN agreement also requires the landowner to be responsible for the cost of maintaining the crossing. If the landowner fails to maintain the crossing the BN reserves the right to do the maintenance themselves, and charge the landowner up to \$800 per hour for the service. If the

landowner assumes liability, could the landowner force the applicant to negotiate access to those crossings? Could the landowner deny access to the railroad? We participate in the Block Management Program, which administers free public hunting access to our private land. If a hunter is hit on the crossings, and is injured or killed, who is liable? The landowner is liable. This is a huge impact, and is not addressed in the document. This information comes from documents directly from the BN.

The Amish community on Tongue River would be bisected by the Colstrip Alternative. The Amish do not carry liability insurance. How could they “negotiate” with the BN for crossings needed for children to get to school, or for work teams and buggies to cross? This issue is not addressed in the document

The culvert design, (figure 2.7) or “cattle passes” mentioned in 2.2.8 are unacceptable. They are too small for cattle to naturally use. From a cows perspective she knows that she cannot fit through the far end, because perspective makes it look like she will get stuck. Therefore, she will stand at the entrance and not move. This is why cattle are struck and killed on railroad tracks. They crawl through the ROW fence instead of utilizing the culvert, and are struck by the train. Water builds up in the bottom of a culvert, which cattle find undesirable to walk through. In colder weather, ice builds up in these culverts, complicating movement. Horses also are very reluctant to enter culverts, and it is difficult to enter these “tubes” horseback. Leading a horse through water or over ice is also unacceptable. This is a classic example of someone designing something that has no idea about cattle psychology or the movement of cattle. Culverts are designed to move water, not herds of cattle. The BN line north of Colstrip has at least 17 trestles. Cattle can move easily under the tracks, water moves well underneath, and if needed, a livestock water pipeline could be placed within the width of a trestle. Cost of a trestle should not be a deciding factor in construction. The expense landowners are expected to absorb should this railroad be constructed should be the deciding factor, not the bottom line of the applicant. It is imperative that a trestle be constructed in the Greenleaf Creek channel along the route. This would allow cattle to move at will under the tracks, and would allow us to move cattle horseback. The legal description of this site is 1 South, 43 East, SW ¼ of Section 11. This is a reasonable request, and is common on many other lines in the area operated by BN.

There are 3 “set aside” or double track areas within the Colstrip Alternative mentioned in the document 2.2.12.3. Each set aside is 8,500 feet. This equates to 5 miles of track designed for stopped trains. Where are they? There will not be 5 miles of set asides that do not have a crossing. If trains are on the set asides, this cuts off access for wildland fire access, feeding in winter, hunting access, moving cattle across the ROW, and general ranch access that currently exists. We simply cannot be expected to wait for the train to move to gain access to our own property. These set asides also impact cattle culverts mentioned above. These culverts would be longer than the dimensions in the document, contributing to further problems with cattle movements.

Under Socio Economics, 15-25, it states that on the Colstrip Alternative, agricultural losses would be \$188,960 per year. This equates to \$4,500 per mile per year. Will Arch/BN/TRR annually compensate landowners or will the landowners absorb these losses? The mitigation for this issue needs to be added to the mitigation requirements. Any compensation for these losses should not be a onetime affair; the impact compensation should be set on an annual basis.

There would be one residence displaced. Where is it? Who is the owner? What does “displaced” mean? Would BN/TRR replace the residence?

Under 15.5.2.2, Populations and Housing, there is estimated to be over 400 workers needing housing. Where is the available housing? Table 15.2 contradicts available living space for workers. Therefore the only other alternative would be work camps. Where would these be located? Within the 200’ ROW? Or would they be located on private land on areas to be determined? Could the work camps be constructed

on private land against the landowners will, and could federal condemnation be used to take land for the camps?

Where are the access roads to the ROW located? Will these access roads be negotiated with the landowners? If access is denied, would the TRR have the power to condemn? Were these access roads surveyed by the Section 106 crews? On the 3 bridge site alternatives at the mouth of Lay Creek on Tongue River, how would access be gained to the other side of the river? Under Mitigation and Unavoidable Environmental Consequences, 12.2.4.4, it states that the TRR would "...coordinate with landowners while mitigating easements and *access points*..." (Emphasis added) During the Section 106 conference calls, I asked where the access roads on the Colstrip Alternative would be located, and was told by the applicant's lawyer that there would not be any access roads needed to the ROW. The above quote is a contradiction to that comment. If there are access roads, where would they be located? On whose land? Were there cultural surveys done? This is a typical bait and switch, and they will not be "negotiated", Federal condemnation will be exercised by the TRR. In 14.5.1.1, it claims that the TRR would "relocate" a road to a natural gas well. Where is the location of this well? Since this road would fall under the Area of Potential Effect, have the cultural surveys been conducted on this proposed new road?

In 2.3.3.1 induced mines are mentioned. The Montco mine permit was pulled because of the complexity of reclamation. The Canyon Creek Mine would be under land owned by Forest Mars. Is Forest Mars a proponent of coal development, or did he buy into the TRR project to prevent it from being built across his property? Is he in favor of opening a mine on his land, but opposed to the railroad? You can't have it both ways, Mars's actions do not mesh with the claim that a mine may happen on his land. These "induced mines" are pure speculation, and are a diversion from the only market which is Asia, which should be recognized as such.

Under the Q and A section, S.4.3, access for field surveys is mentioned. The Colstrip Landowner Group met with the ICF Wildlife Survey biologist who was seeking access to our private land. We had just experienced the 250,000 acre Ash Creek fire in July of 2012, the 2nd largest fire in Montana history. This fire burned approximately 50% of the Colstrip Alternative. We were interested in granting access to the study area, but were told they wanted the surveys done within a few months. The Ash Creek fire had not re-vegetated, it was still ash, and we said we would allow access if ICF would allow the ground to go through at least one growing season. The reason was that there was no habitat, as regrowth had not happened, and if there is no habitat, there is no wildlife. ICF declined to do the studies, therefore it cannot be construed that the landowners denied access. We offered access with conditions, and we were turned down. This is a prime example of "negotiations". When any conditions are implied; the railroad interests refuse to truly negotiate.

The Q and A also claims that ICF only surveyed 51% of the alternatives for cultural sites due to access issues. This is deceiving and blatantly untrue. ICF had access to nearly 90% of the Colstrip Alternative, and signed access agreements in hand, and turned down offers to be guided on land east of Tongue River by a landowner. To claim that only half of the sites were accessible is simply not true. Further, many of the cultural sites were not properly recorded, were recorded incorrectly, or simply not recorded at all. There were several burial sites that were found, and yet there are no records of them anywhere. The credibility of these surveys is in question. The landowners allowed access assuming the surveys would be legitimate. Unfortunately they were not. In fact, of all of the Alternatives, the Colstrip Alternative had the most recorded sites, (figure 11-10) but in S.4.4.7, it claims that the fewest tribal resources were found on the Colstrip Alternative. This is a flat lie. The most resources were found on the Colstrip Alternative because it had the most access. ICF needed to be more specific about the different routes, not average sites in one lump to make it appear that cultural sites were sparse. This is an underhanded attempt to skew actual numbers.

According to maps used on the archaeological surveys on the proposed Colstrip Alternative, there would be several Greenleaf/Lay Creek county road re-locations and crossings. These details were not shown in the EIS document. This is an added loss of production, as the road relocations would eliminate more acreage than the 200' ROW. These relocations would also create isolated parcels mentioned above. Also, these archaeological maps showed in detail at least 6 county road crossings. All of the crossings would have 2 hairpin turns per crossing so the road would cross the railroad at a 90 degree angle. This further takes grazing land out of production, and creates safety questions for the rural users of these roads as well as public use. This is an impact that was not shown in scoping or the DEIS process and is a substantial agricultural impact to all landowners. Could condemnation be used in road relocations? Who pays for road relocations? The applicant? The county through taxes? Where would the fill dirt come from? Gravel? Would it come from inside the ROW of the railroad, or would it come outside of the 200' railroad ROW? Could the applicant condemn for use of gravel and fill dirt? From these maps, I estimated that close to 6 miles of county road would be relocated along the Colstrip Alternative. This is a huge impact on lost acreage, and is glossed over in the document.

In 2.2.12.2, there is mention of communication towers. Where would they be located? Inside of the ROW? Would there be access roads from a public road to these sites? Would these access roads have had Section 106 surveys done since they are within the APE? Could the applicant condemn private land for these access roads? Could the applicant condemn private land for tower sites?

There are several livestock pipelines that would be crossed by the Colstrip Alternative. These lines vary from 1 1/4" to 2" PVC and HDPE pipe. This pipe occasionally fails and needs to be repaired or replaced. I doubt that the BN/TRR would allow us to shut down train traffic for a few days while we would dig up the pipe under the railroad grade. If the pipe would fail, we would be out of water on the other side of the tracks. This is a huge impact. We need the ability to maintain and continue to use these water lines. They existed long before the construction would commence, and we need assurance that their use would continue. Historically, the railroad has been unwilling to even consider maintenance for infrastructure under the rails not owned by the railroad. This is unacceptable. Rosebud County pumps water from the Yellowstone River at Forsyth to water the Rosebud County Cemetery. The water line is routed through a culvert under the railroad grade. BN charges Rosebud County \$546, (up from \$90 in 2009) per year for the line. Range Telephone in Forsyth paid a huge sum to lay phone line in the ROW to businesses in Forsyth, and pays a substantial annual fee for rent. This issue needs to be clearly addressed in the document to the satisfaction of the landowner, not the applicant. If a pipe breaks under the ROW, and the BN will not allow us to fix the pipe, then the BN should be required to drill a well, at their expense, on the other side of the ROW so we could continue to water cattle. This is another example of severance and isolation. Anything less is a taking.

In 12.2-29, 38 acres outside of the Colstrip Alternative ROW will be affected by road relocations. Where are the maps of these crossings? Where is the land loss along the alternative?

The section on fire Chapter 4, (p. 21) is also deceiving and misleading. This area is a magnet for lightning. In 2012, we (through the DNRC and Rosebud County) fought over 500,000 acres of fire within 20 miles of my house. This year, (2015) we have fought over 20 fires within the same radius. We have a very good sense of fire behavior, and the fire section within the document does not reflect fire activity. Railroads do start fires, many of them, and the reason they are reportedly relatively small in acreage is because most railroad fires are not reported. Existing railroads have several barriers to prevent the spread of fire. An example is the BN line along the Yellowstone River. If a train starts a fire, the fire spread is reduced by the river as a barrier, a frontage road, and an interstate highway as well as irrigated farmland. On the TRR Alternatives, there are no barriers, and fire will spread very quickly. The fire section of the EIS is an absolute failure, and is unacceptable. The 5 miles of set aside tracks mentioned above also prevents access to fires. The railroad is an obstacle to accessing fires, and set aside tracks with unit trains sitting

on them are an added burden to landowners trying to access a range fire. Railroads not only start fires, they restrict access to naturally occurring fires.

For over 30 years, we have dealt with the threat of the construction of this project, and have held off on any capital improvements. The original 89 miles would have impacted natural migration of our cattle to grazing ground on the Tongue River. We had planned on cross fencing our summer ground, but if the Tongue River portion of the railroad had been built, it would have negated the project and it would have rendered it useless, and there would be no compensation by the railroad for it. Then the railroad was planned to turn up Roe and Cooper Creek, through the middle of our summer ground. Once again we held off fencing and water projects until we knew the railroad would again fade away. Currently, the applicants preferred alternative is the Colstrip Alternative, which creates new challenges for our long term plans. For 30 years, we have been holding off any of these improvements until a decision is made. We are sick of it. My father is pushing 80 years old, I am anxious to implement these improvements which would make the ranch much more efficient to operate, and yet if we would implement these expensive improvements, and the railroad would be permitted, the railroad would bisect and render useless these improvements. We would be forced to “negotiate” these impacts, and would not be compensated for the loss.

The Colstrip Alternative, according to the document, would create the least amount of jobs, have the highest amount of impacts on minority populations, has the most recorded cultural sites, has moderate to high adverse impacts, has the 2nd largest amount of wells destroyed, has the most impact for noise receptors, and has the largest amount of county road crossings and delays. For these reasons, the Colstrip Alternative should be taken off the Alternative list, and because of the lack of public convenience and necessity and highly speculative markets, the STB has no choice but to choose the “No Action Alternative” for the entire project. Anything less would be a disservice to the public and the landowners along the proposed routes. A for-profit, private corporation should not have the power to use (and abuse) federal eminent domain to condemn private property so it could financially benefit by exporting coal to Asia at the expense of private landowners in a sparsely populated area.

The Environmental Impact Statement process is designed to mitigate the negative impacts of a project, should the project go forward. Yet, nearly every concern that we have as landowners is reduced to “negotiation” with the applicant. None of our concerns are mitigated or addressed. There is no other entity that has more to lose and is more heavily impacted than private landowners. And yet there is no standard or specific mitigation for livestock water loss, liability for crossings, severance, noise, and the simple task of moving cattle. According to the EIS, the TRR assumes no responsibility for impacts it creates to livestock operations; it assumes all concerns raised by landowners will be negotiated after the permit is granted. If public convenience and necessity would be valid (which it is not) then the STB should be required to specifically mitigate the issues we have raised within these pages BEFORE the permit is granted (or denied) and it should be in print and specifically addressed within the Final EIS. Anything less is a failure of the purpose of the EIS, and will be challenged by the public, and rightfully so.

Clint McRae
Rocker Six Cattle Co
3633 Rosebud Creek Rd
Forsyth, MT

Footnote 45

**BEFORE THE
SURFACE TRANSPORTATION BOARD**

STB FINANCE DOCKET NO. 30186

**TONGUE RIVER RAILROAD COMPANY, INC.—RAIL CONSTRUCTION
AND OPERATION—IN CUSTER, POWDER RIVER AND
ROSEBUD COUNTIES, MT**

**VERIFIED STATEMENT OF CLINT MCRAE IN SUPPORT OF
NORTHERN PLAINS RESOURCE COUNCIL AND ROCKER SIX
COMMENTS ON TRRC’S APPLICATION**

My name is Clint McRae. My family and I have operated our ranch, Rocker Six Cattle Company, for four generations. The ranch is located in Southeastern Montana, and sits between Rosebud Creek and Tongue River. I have been a member of Northern Plains Resource Council for 25 years. I offer this Verified Statement in support of Northern Plains’ comments on TRRC’s December 2012 application to construct the Tongue River Railroad from the proposed Otter Creek mine to Colstrip, Montana.

The Tongue River Railroad in one form or another has interfered with our ranch for more than thirty years. In the mid-1980s, the Interstate Commerce Commission (“ICC”) gave TRRC the right to build TRR I from the proposed Montco Mine to Miles City, Montana. That route went through our ranch and a number of neighboring ranches. (See Attachment 1).

TRRC was eventually successful in getting a license to extend TRR I from the proposed Montco Mine site south to tie in with an existing railroad near Decker, Montana. TRRC claimed that if the ICC granted a license for the southern extension (“TRR II”) it could have the railroad up and running within three years. The ICC granted the permit, placing a three-year time limit on the construction. The ICC also required TRRC to submit quarterly reports on their progress.

The reports TRRC submitted did nothing more than claim that TRRC was lobbying the legislature and doing other busy work. TRRC made no progress in construction. Within that three-year time span, the ICC became the Surface Transportation Board (“Board”) and this time limit was removed.

TRRC again tried to modify the line in the mid-1990s with the “Western Alignment” or TRR III, which “refined” the TRR I route through our ranch. The route remained the same until TRRC abandoned it in 2012 in favor of the “Colstrip” alignment, which also runs through our ranch. TRRC chose this route after the Board’s scoping hearings closed on the Miles City alignment, which followed the “refined” TRR I. We were the only landowner along the Colstrip Alignment that testified at the scoping meetings; the rest of our neighbors had no idea this latest version of the TRR, the Colstrip Alignment, would cross their property and had no opportunity to testify at the scoping hearings. Notice was not provided for land owners along the Colstrip Alternative as compared to individuals along the Tongue River route that would be similarly affected.

Whether TRR I, the “refined” TRR I, the Miles City Alignment, or the Colstrip Alignment, the Tongue River Railroad has interfered with our ranch going on four decades. Ranching is not an easy business and we need to be efficient to compete in a global market. We have put our business and lives on hold because any improvements we make to the ranch could be severely impacted by TRRC’s eminent domain rights. We would not be compensated for these losses. The restrictions TRR proposals have placed on our ranch has caused uncertainty in our future.

One of the projects the railroad has interfered with is improving our pasturing efficiency by cross-fencing larger pastures. This project has been on hold for the last 20 years. This makes

it easier to gather the cattle (less crew and man hours), utilize our grass more efficiently, and run more cattle without hurting the ground. Currently, our summer pasture is approximately 15 square miles, or about 11,520 acres. It takes a crew of eight to ten horseback riders over the course of three full days to gather this pasture. It is not flat; it is timbered and rough, which makes gathering this pasture a very time and energy intensive task. If we could cross-fence this pasture, we could break the pasture into quarters and have a much smaller area from which to gather the cattle.

Additionally, we could rest and rotate grazing of these new parcels. In other words, we could graze one parcel while allowing another to rest, growing much more forage to be grazed the following year. This is a very efficient system that maximizes the potential for grazing without hurting one of our most important resources, grass. To create this system we would need to build several miles of fencing, dividing either our summer pasture or a neighboring pasture into quarters. The threat of this railroad and all the alternatives presented thus far prevents us from building the cross-fencing necessary to be competitive and efficient.

Since cross-fencing our larger pastures has been on hold for 20 years, we have been compounding annual costs with hiring and putting crews on horseback to gather cattle. We are not getting even grazing of our pastures and cannot maximize cattle numbers. If these improvements were constructed, we could gather the same amount of cattle with a fraction of the time and labor that we spend now. Our pastures would be better utilized for grazing, our cattle breeding conception rates would improve, and we would buy less bull seed stock which is extremely expensive.

Waiting for the railroad's permitting and construction has also stalled our plans to install several miles of pipelines to fill water tanks throughout the ranch. We want to use the pipelines

and tanks to lure cattle from the lower riparian areas to the uplands where they congregate less. The benefit is more evenly distributed grazing of pastures, which preserves the grass, making the ranch more competitive and efficient. Ideally we would construct 13-15 total miles of pipeline from electric wells into different pastures. These pipeline projects are designed through the Natural Resources Conservation Service, and are designed with well depth, static water level in the well, elevation of pumping water along with length of line and topography. We do not want to spend the money to install the wells, dig trenches for the pipelines, and then lay the pipe because the railroad could use its eminent domain rights and wreck the system.

A railroad is also a barrier, an obstacle, and if we cross-fenced our larger pastures, the railroad would bisect these fence-lines. We would have portions of grazing land on one side of the tracks and the water source on the other. The railroad would not drill replacement wells for use on the “dry” side of the railroad nor would they reimburse the cost of construction. This is a significant cost that we would have to absorb. In two areas of our operation, the proposed routes would bisect these pipelines. If the railroad grade were constructed over these lines, the pipe eventually would need replacing. The railroad would not let us shut down train traffic while we used a backhoe to dig through the railroad grade to replace the pipe. These lines need to be covered to prevent freezing, and as far as I know, no one has had successfully replaced a pipeline under an operating railroad. Because maintenance would require digging under and around the rail, the railroads do not allow it.

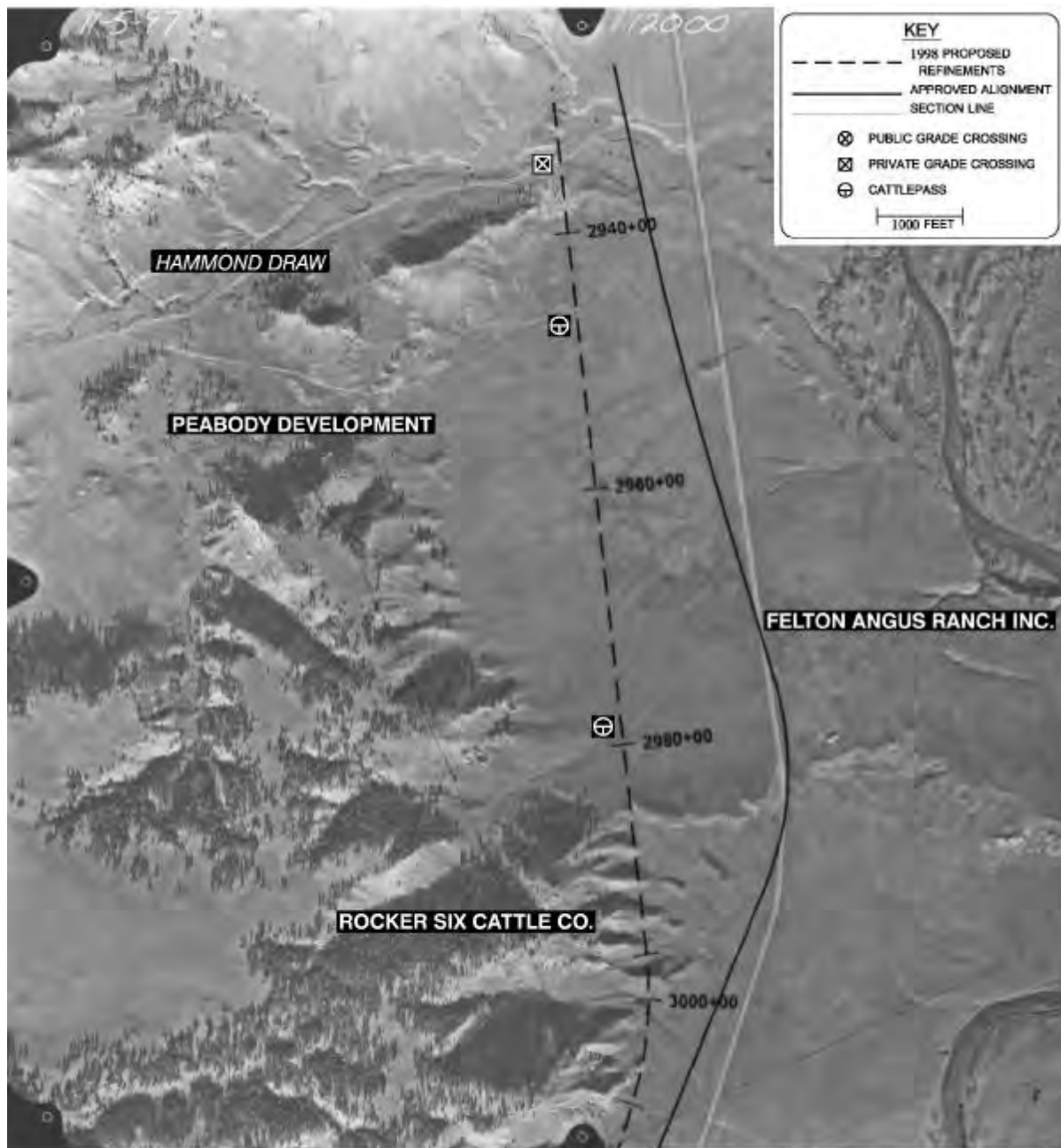
Overall the ranch would operate much more efficiently and we would be better able to compete in the market. Having these projects placed on hold has cost us thousands of dollars in returns.

VERIFICATION

I, Clint McRae, hereby verify under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge and belief.

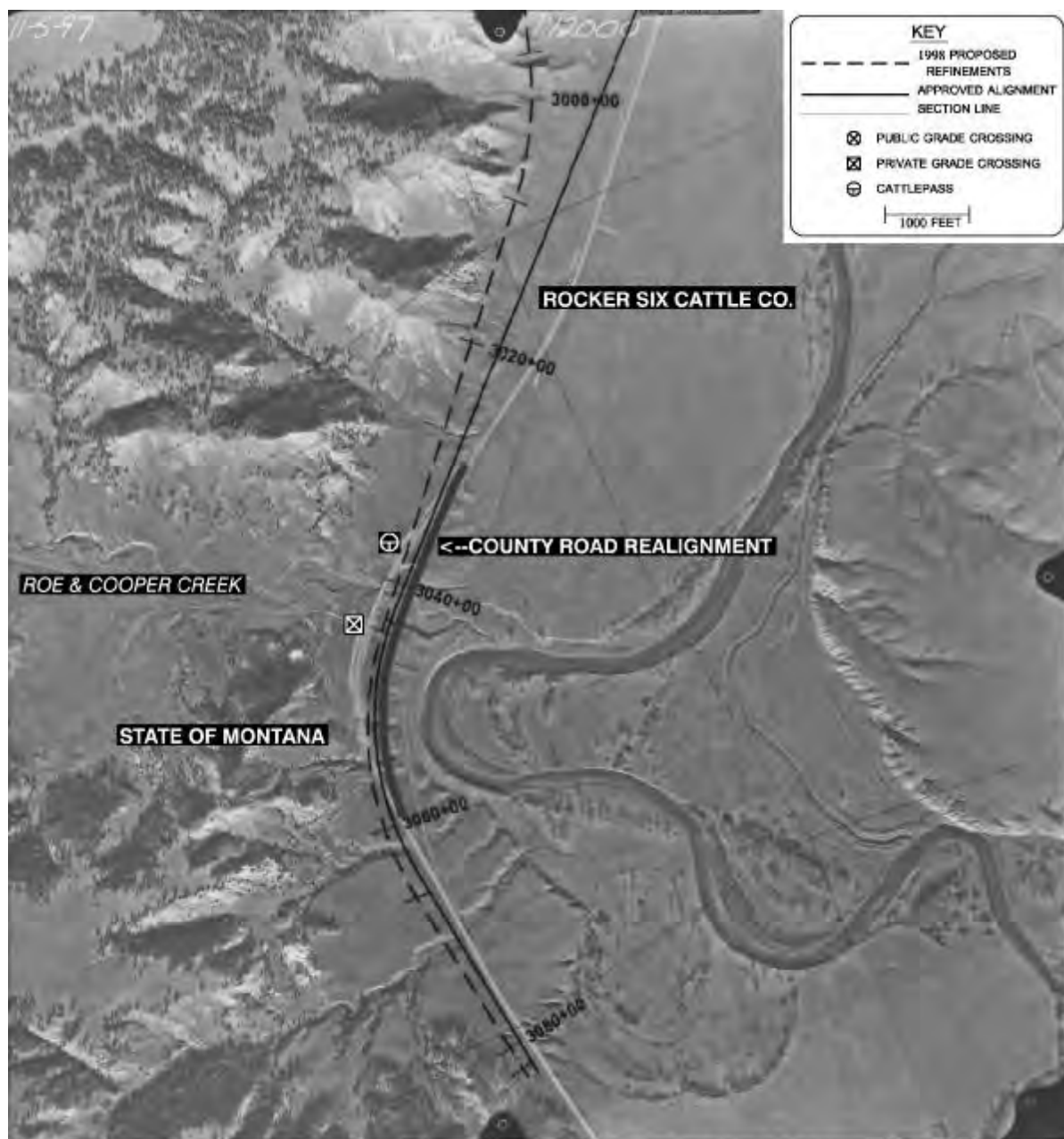

Clint McRae

Dated this 20 day of March, 2015.



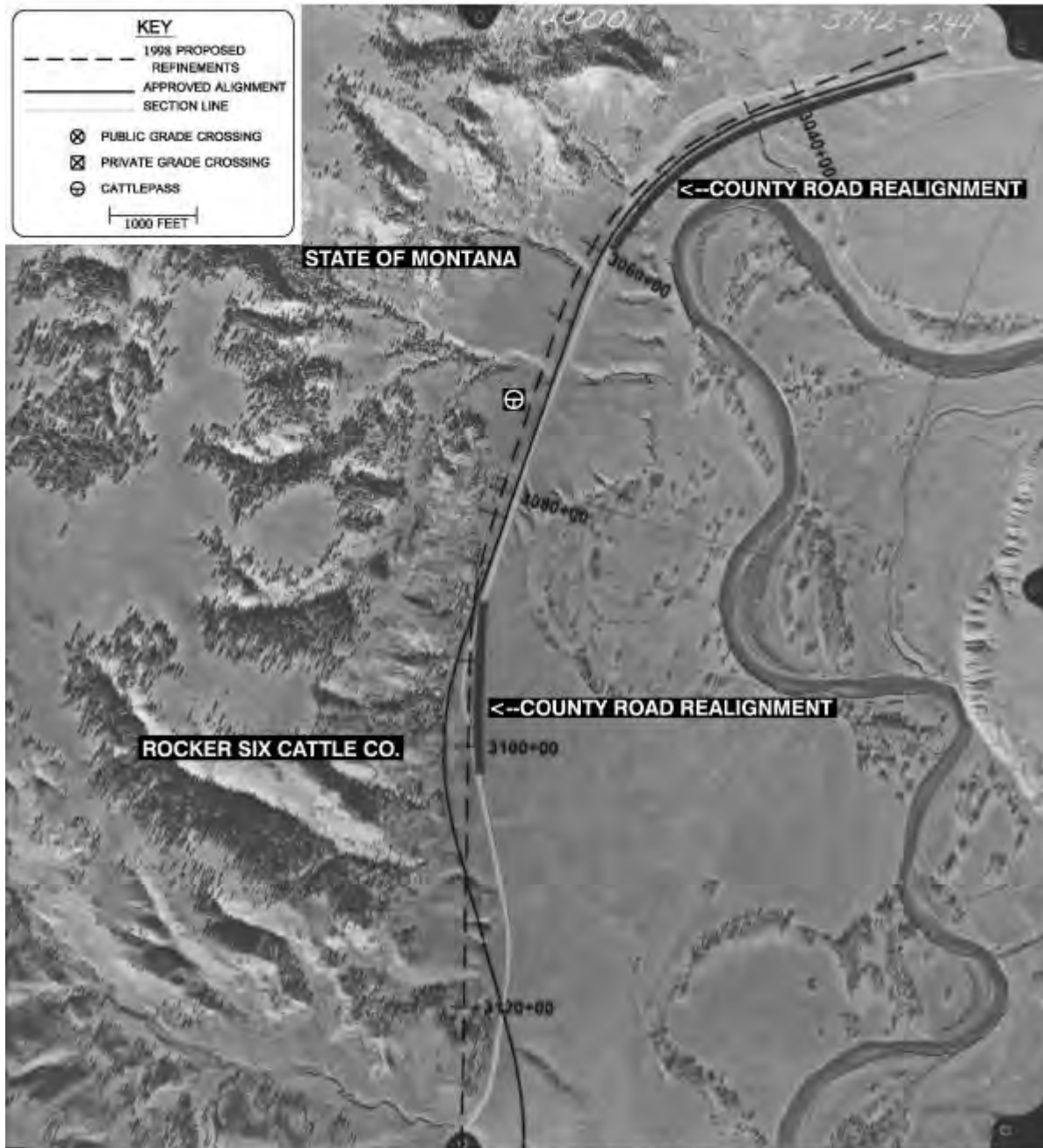
Cattlepass and Private Grade locations are approximated based upon discussions with property owners during the early 1980's and the late 1990's. These locations are subject to change based upon final right-of-way negotiations and agreements

Figure A-41
Aerial Photographs of Alignments
Miles City to Ashland



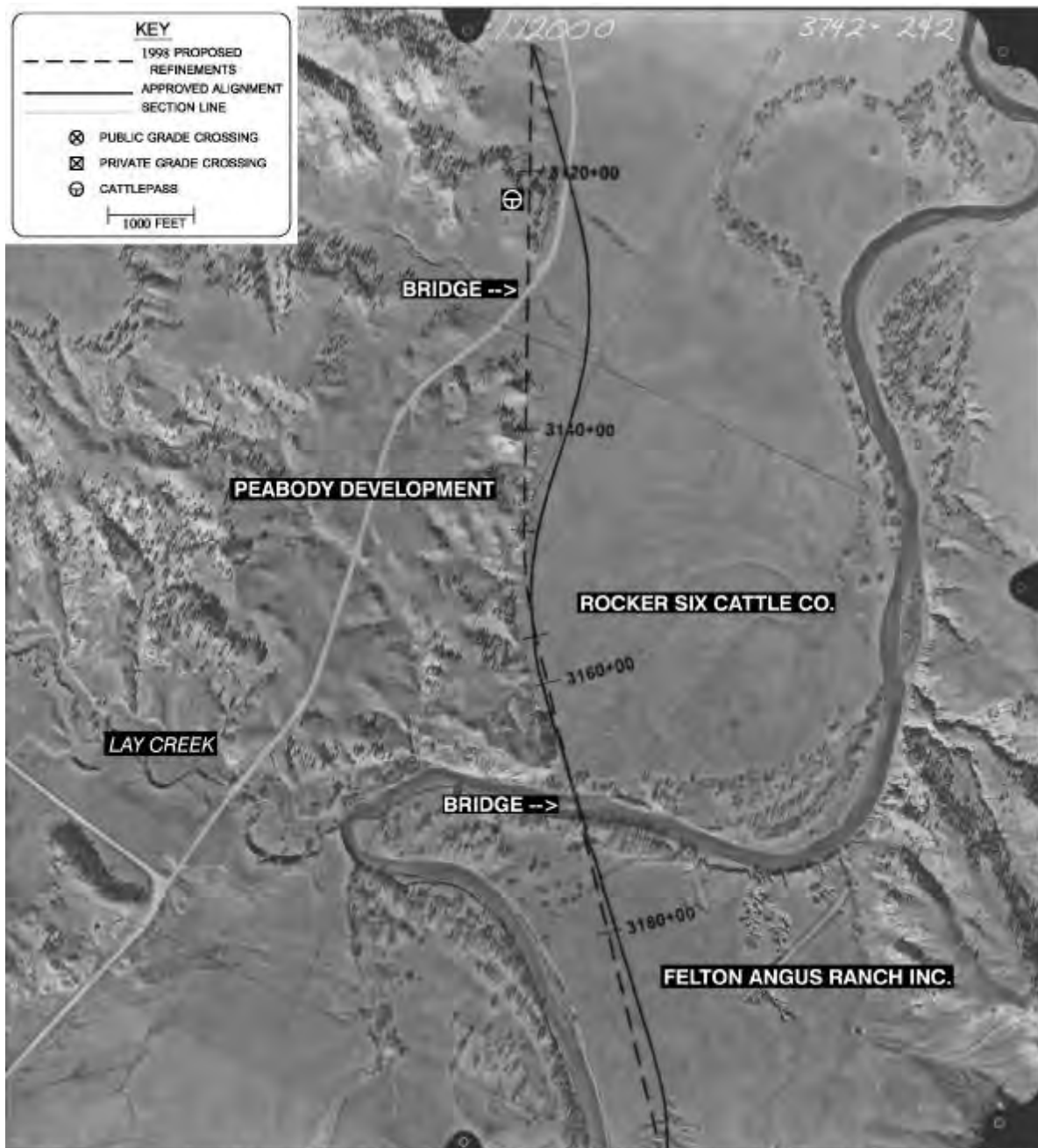
Cattlepass and Private Grade locations are approximated based upon discussions with property owners during the early 1980's and the late 1990's. These locations are subject to change based upon final right-of-way negotiations and agreements

Figure A-42
Aerial Photographs of Alignments
Miles City to Ashland



Cattlepass and Private Grade locations are approximated based upon discussions with property owners during the early 1980's and the late 1990's. These locations are subject to change based upon final right-of-way negotiations and agreements

Figure A-43
Aerial Photographs of Alignments
Miles City to Ashland



Cattlepass and Private Grade locations are approximated based upon discussions with property owners during the early 1980's and the late 1990's. These locations are subject to change based upon final right-of-way negotiations and agreements

Figure A-44
Aerial Photographs of Alignments
Miles City to Ashland

Footnote 46

**BEFORE THE
SURFACE TRANSPORTATION BOARD**

STB FINANCE DOCKET NO. 30186

**TONGUE RIVER RAILROAD COMPANY, INC.—RAIL CONSTRUCTION
AND OPERATION—IN CUSTER, POWDER RIVER AND
ROSEBUD COUNTIES, MT**

**VERIFIED STATEMENT OF MARK FIX IN SUPPORT OF
NORTHERN PLAINS RESOURCE COUNCIL AND ROCKER SIX
COMMENTS ON TRRC'S APPLICATION**

My name is Mark Fix. I am one of several ranchers who have been impacted over the last thirty years by proposed development of coal tracts in Ashland, Montana and the railroad that would serve them, the Tongue River Railroad. My wife Debra and I own and operate a 9,700-acre ranch since 1991, a period of about twenty-four years. Of those acres, 7,300 are deeded and we lease the balance from the State of Montana and the Bureau of Land Management. The ranch is located about 20 miles southwest of Miles City, Montana along the Tongue River. My mailing address is 584 Tongue River Road, Miles City, MT 59301. I have been a member of Northern Plains Resource Council for about 23 years. I offer this Verified Statement in support of the Northern Plains Resource Council's comments on the Tongue River Railroad's December 2012 Application.

The original alignment of the Tongue River Railroad (TRR I) approved in the 1980s and the proposed refinement to TRR I ran through my ranch. (See Attachment Fix-1). When my wife and I bought the ranch in 1991, we were told by our realtor that it was highly unlikely the TRR I railroad would ever be built. I did not realize it at the time, but I felt that I was able to buy the property for a discounted price because the TRR was proposed through the ranch.

Shortly after we bought the ranch TRRC approached me to buy a right-of-way across our ranch. A TRRC lawyer and landman came to our house and told us that TRRC has the right of eminent domain and could condemn our property if we could not come to an agreement on selling them the right-of-way. This was a stressful and difficult time for my wife and me. Their right-of-way ran directly along the Tongue River, through my calving pasture, and the Tongue River floodplain. This route would have significantly disrupted the operation of my ranch in several ways. My wife and I were planning to install a series of circle pivots to more efficiently irrigate our land to grow alfalfa. Additionally, TRR was never clear whether they would use a double track, which would seriously alter my use of a parcel of my own land. Finally, the TRRC intended to fence off the railroad tracks which would have cut off my cattle's only access to the river; their only source of fresh drinking water in some of the pastures where the railroad was proposed. I told TRRC I did not agree with their route, however, because they had the right of eminent domain I proposed a different one that would have less impact on my property. The TRR representatives told me that the route I proposed would require moving too much dirt and refused to consider it.

TRRC's representatives later told us that they had altered the proposed route, and moved the track over one half of a mile as is shown in the map I provided. I believe this change was part of the refinements to TRR I proposed with the southern extension of the TRR in the early to mid 1990s known as TRR II and III, although communication was limited and the routes were often unclear. At the time, I had planned to install a circle pivot and irrigate the land where TRR I crossed my land. Installing a circle pivot requires a substantial investment and a great deal of planning. It requires installing a concrete structure and running a pipeline to the pivot. Once installed, the circle pivot irrigates about 120 acres of land.

The TRR I route would have gone right through the middle of the circle pivot I was proposing. The new route was farther North and I could install the circle pivot to the South of the tracks. I was planning to grow alfalfa for hay and this irrigation system would yield about 5 tons per acre. Growing additional alfalfa or hay would be beneficial to my ranch. Not only could I use it to feed my own cattle rather than buying it from a third party, I could also sell the excess for additional revenue.

Because of the size of the investment in installing a circle pivot I wanted to see where the railroad might be built so the pivot would not be torn down in the construction process. I did not want to pay for the pivot twice and decided not to install it given we really did not know when or where the railroad was going to be built. This came at a significant cost. I estimate that I lost about \$45,000 per growing season assuming \$75 per ton of alfalfa, 5 tons per acres, and 120 acres. After 9 years of waiting to see what would happen with the TRR I gave up and decided to build the pivot. I estimate my losses for those 9 years at \$405,000 for which I've never been compensated. Had I known the line was never going to get built I would not have waited to build the circle pivot.

I was also frustrated about the uncertainty regarding the consideration of double tracks and the railroad's failure to address my concern about land between the tracks. My neighbor and I had about three miles of railroad through our property. His three miles contained forty acres that the TRR wanted to buy and our three miles contained eighty acres. The landmen did not mention any decision about double tracks to me, so I had concerns that my acreage was twice as much because they intended to double track the route through my property. The TRR II EIS stated that several double track locations and several set out tracks were required, but no landowner I talked with had any indication that there would be double tracks on their property.

The TRR II EIS showed a deviation to the route on my property. The TRR III EIS showed both the TRR I alignment and the new alignment proposed in TRR II. I did not know if this was an oversight or if both routes were approved and I would be left with a large parcel of land stuck between the two sets of railroad tracks.

TRR never clarified their plans, and never took action to begin construction. As a result, I was concerned a parcel of land between the two tracks would be impossible to utilize efficiently. It would not be cost effective to try to graze a parcel like this and it would be difficult to irrigate that parcel as well, as there is a big hill between the two sets of tracks. There is good hunting on the hill that is between these two sets of tracks and the hunters affectionately refer to it as “Buck Mountain.” That may be the only suitable use of the land, but the hunters would need to be careful not to shoot towards trains.

Finally, TRR told us that they intended to place culverts under the railroad grade for my cattle to use to go under the tracks. They assumed this would be a sufficient work around so that they could build a track that would cut off the cattle’s access to drinking water. Culverts are extremely problematic, however, as cattle may never learn how to go through the culverts. If the culvert is long enough to go under two sets of tracks, the cattle are even less likely to use it. The possibility of two sets of tracks also means that I could have a train parked on the extra set of tracks, blocking passage across the tracks for incredible amounts of time and requiring me to go an extra mile or more to cross the tracks with my cattle or to access my ranch.

Eminent domain takes away our right to negotiate for a fair market value for the right of way. It is basically a “take it or leave it” situation since we have no recourse other than fighting eminent domain in court, which is costly, time consuming, and we would be unlikely to prevail against the resources of something like the TRRC. Some years ago TRRC offered my neighbor

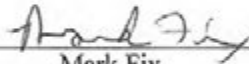
\$100 an acre for his land. The right-of-way crossed about three miles of his ranch so the total offer would have been about \$4,000. He did not sell the property since \$100 an acre is an incredibly low price. The price may be indicative of agricultural land value at that time, but it does not compensate a landowner for the damages done to the property. It would not cover costs to make the land functional again. For instance, water wells may have to be drilled and installed to provide the cattle with water. The price for prime land near the river would be more than land further away from the river.

My wife and I have had to deal with the uncertainty of the TRR ever since we bought our ranch. TRRC has tried to obtain a right-of-way several times through our property, about every five years or so. We inevitably get a letter to let us know that a landman will be coming or that there were updates to the TRRC's plans. We have spent a lot of time, effort, and money dealing with these issues. I became a party of record during TRR II and III so we would not be left out of the process and to see what was happening. Although TRRC apparently now has no plans to build a railroad through our ranch because it has chosen the Colstrip alignment as the preferred alternative, I am concerned that the company may change its mind once again and decide to build a line through my ranch.

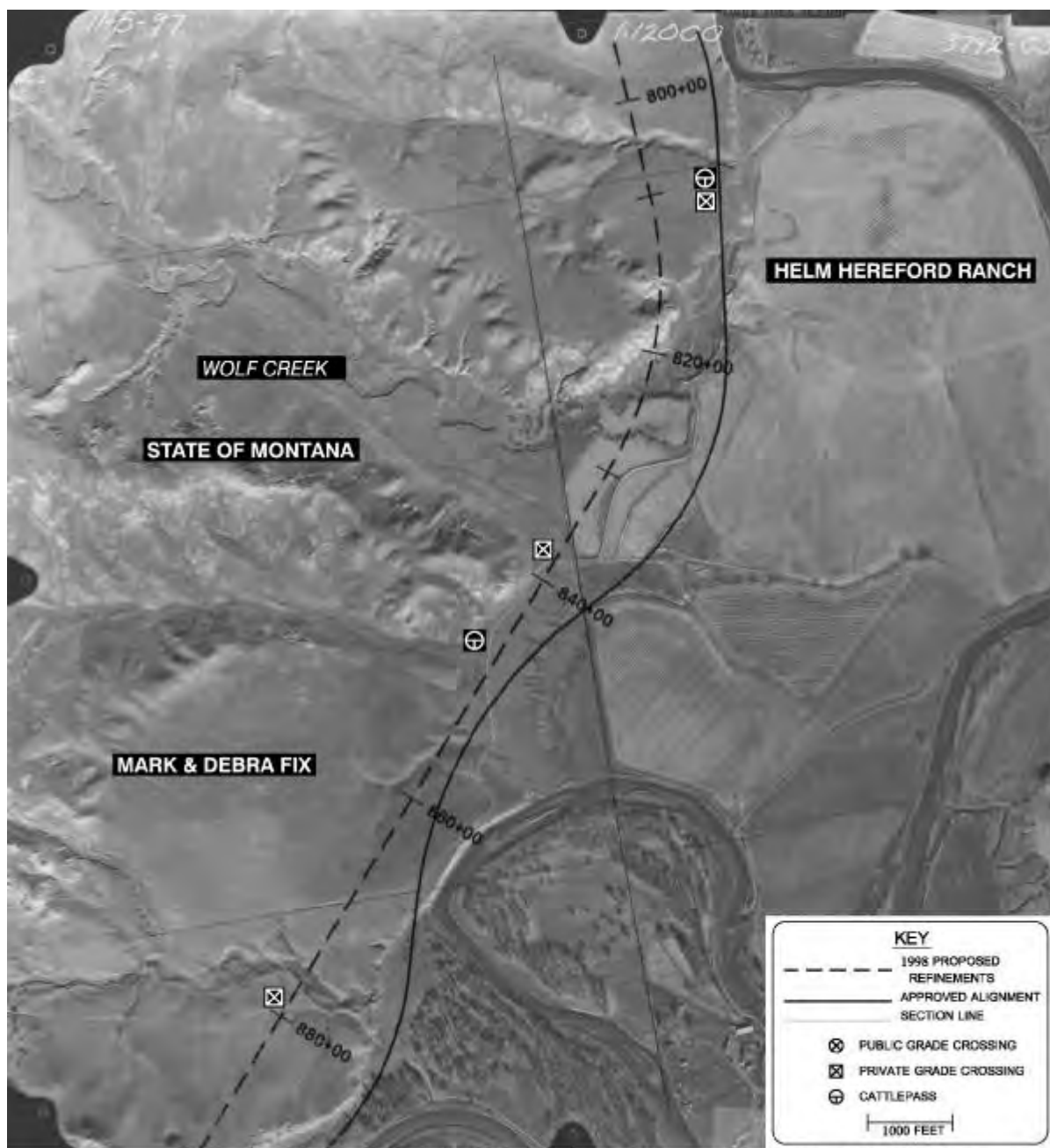
The Board's decision to grant a license for railroads causes real hardship for landowners in the path even if the line is never built. Our ranch is a business and our livelihood; holding it in limbo harms my employees and my family. I had plans to make the best and most efficient use of my ranch possible that have been put on hold for more than a decade because of a railroad that will never get built. The Board should make sure these lines will, in fact, get built and are truly needed before putting us or others through the same kind of ordeal we have had to go through.

VERIFICATION

I, Mark Fix, hereby verify under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge and belief.

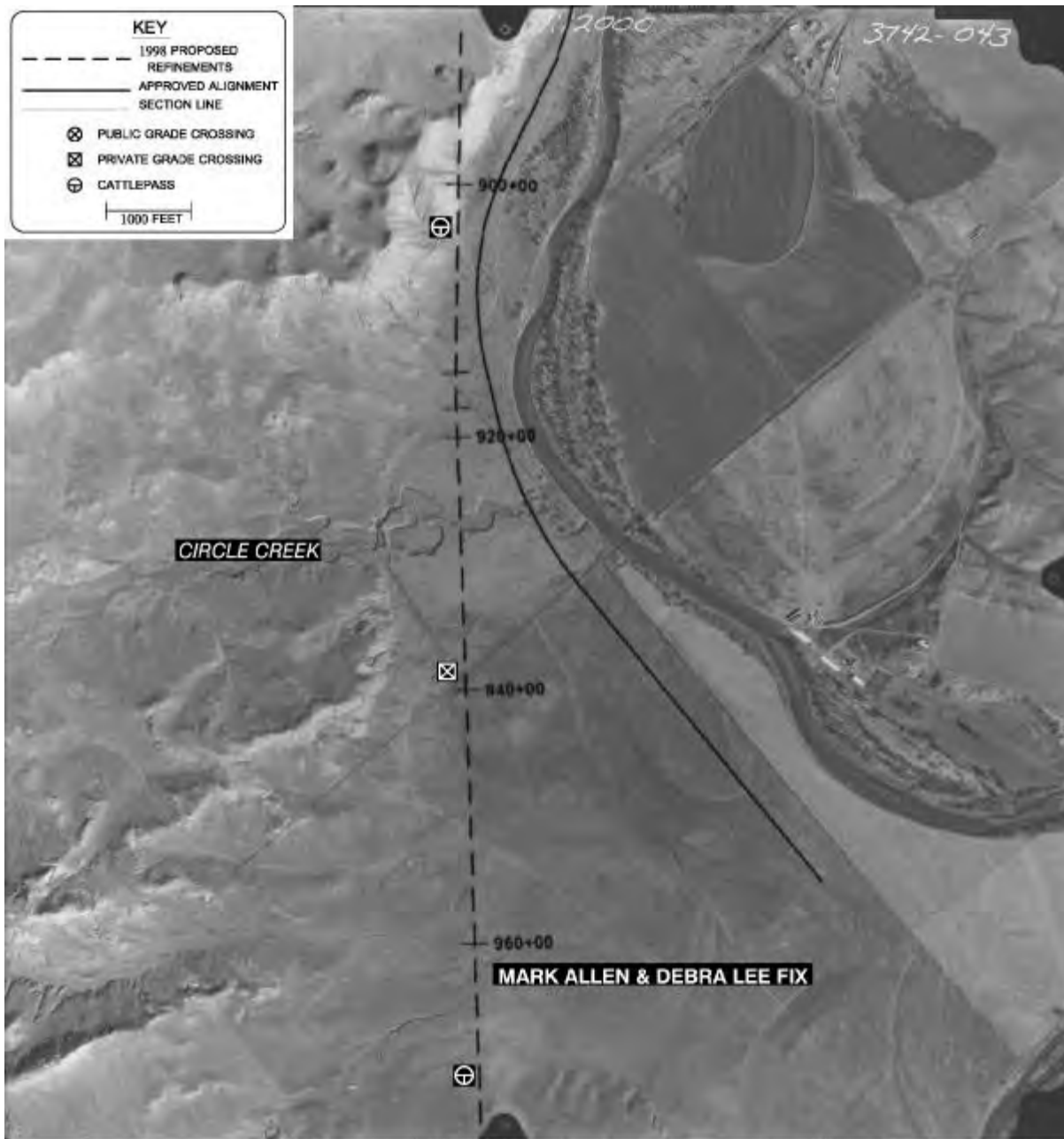

Mark Fix

Dated this 23 day of March, 2015.



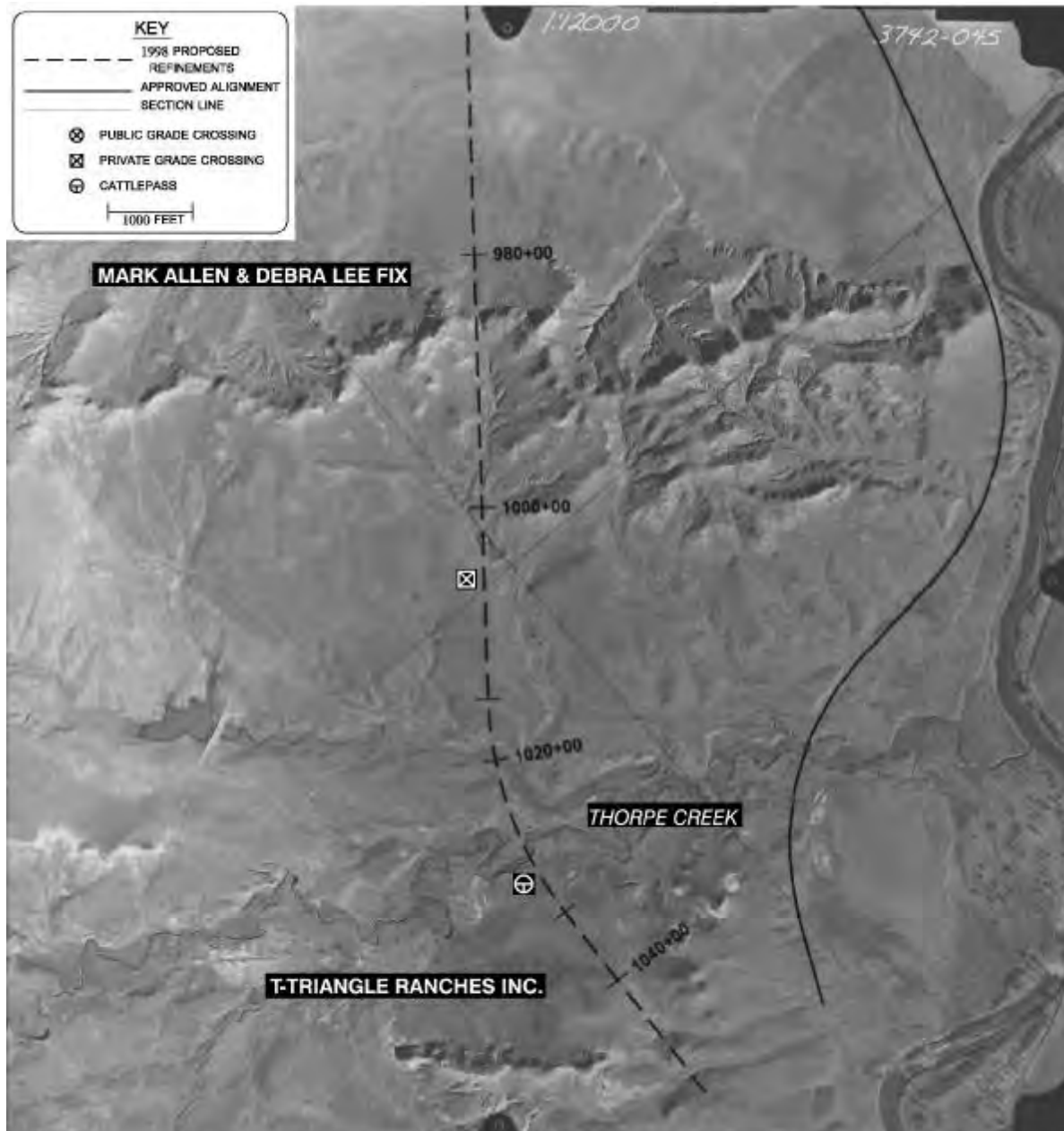
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Figure A-11
Aerial Photographs of Alignments
Miles City to Ashland



Cattlepass and Private Grade locations are approximated based upon discussions with property owners during the early 1980's and the late 1990's. These locations are subject to change based upon final right-of-way negotiations and agreements

Figure A-12
Aerial Photographs of Alignments
Miles City to Ashland



Cattlepass and Private Grade locations are approximated based upon discussions with property owners during the early 1980's and the late 1990's. These locations are subject to change based upon final right-of-way negotiations and agreements

Figure A-13
Aerial Photographs of Alignments
Miles City to Ashland

Footnote 47

**BEFORE THE
SURFACE TRANSPORTATION BOARD**

STB FINANCE DOCKET NO. 30186

**TONGUE RIVER RAILROAD COMPANY, INC.—RAIL CONSTRUCTION
AND OPERATION—IN CUSTER, POWDER RIVER AND
ROSEBUD COUNTIES, MT**

**VERIFIED STATEMENT OF ROGER JACOBS IN SUPPORT OF
NORTHERN PLAINS RESOURCE COUNCIL AND ROCKER SIX
COMMENTS ON TRRC'S APPLICATION**

My name is Roger Jacobs. I am a licensed real estate professional and auctioneer. I am currently employed by Premier Intermountain Properties ("PIP Montana"), which is a firm established by agricultural producers to serve a regional client base of property owners in Montana and Wyoming. PIP Montana represents prospective buyers and sellers of large ranches in the intermountain west, including Montana's Powder River Basin.

I have worked for PIP Montana as a real estate professional since 1985 and have extensive experience representing buyers and sellers of ranch properties. In addition, I have decades of experience in agriculture and livestock. I was born and raised on a farm and ranch in North Dakota and graduated from North Dakota State University with a B.S. in Animal Science. I worked as a regional manager for the American Angus Association and Angus Journal from 1977 to 1983. In 1983, my wife and I started Jacobs Livestock Sales Inc., which is a purebred livestock auction company.

I am offering this Verified Statement on behalf of Northern Plains Resource Council and Rocker Six Cattle Company. The purpose of my testimony is to inform the Surface Transportation Board ("Board") about the serious hardships the Board will create for landowners if it grants the Tongue River Railroad license to construct—even if the line is never built. As the Board knows, when it grants a license to construct a railroad the railroad company gets the right to condemn property along the railroad right of way. This right creates a serious cloud on properties along the railroad's path and in my experience can make it impossible to plan ranch operations or sell the property.

I've seen this happen with ranches along the original Tongue River Railroad route, known as TRR I. In the 1980s, TRRC was given the right to build a railroad in Montana's Powder River Basin that would connect coal reserves in Ashland, Montana to Miles City, Montana. The TRR I route went through a number of ranches, including a ranch called the Ball Ranch, which is located on 22,340 acres southwest of Miles City along eight miles of the Tongue River. The Ball Ranch was an excellent property. It was run as a cow-calf operation with 600 cows, and included a feedlot. It had an excellent irrigation system along with 33 miles of pipeline to tanks in various pastures to ensure cattle were never more than a mile from water. The ranch also had the irrigation capacity to produce corn, hay, and alfalfa. It also had ideal wildlife habitat, with extensive populations of deer, elk, antelope, and game birds, which made it attractive to outdoor enthusiasts.

The Ball Ranch's owners hired me to help them sell the ranch in July of 2012. When I spoke to prospective buyers, I had to disclose the fact that TRRC had the right to build a railroad line through the ranch. Even though that right existed since the mid-

1980s and the future of the railroad line was fairly speculative, the mere mention of TRRC's right to take property within the Ball Ranch made it impossible to sell. Buyers were either completely uninterested in the ranch or were unwilling to pay the value of the ranch without the TRR cloud hanging over it. However, I was able to sell the Ball Ranch once TRRC abandoned its plans to construct TRR I.

In my experience, buyers simply will not buy a ranch when the possibility of a railroad through the property hangs over its future. It's too risky. The railroad could cross irrigation lines, making maintenance difficult or even impossible. Any wells, circle pivots, water tanks, and fencing dividing the pastures that have been built on the property may get destroyed. Dealing with railroad crossings, limited access points, waiting at crossings, and the added difficulty of trailing cattle over crossings all add to the cost and difficulty of operating a working ranch. Even if buyers are willing to consider a ranch under these conditions, they are only willing to pay the discounted value of the property, which is typically a price point at which the owner is unwilling to sell.

As the Board knows, TRR I was never built even though TRRC had the authority to build the line as far back as the mid-1980s. Property owners along the TRR I route, including the owners of the Ball Ranch, were never compensated for the interference TRRC's right to condemn created or the loss in property value. The Board needs to consider these real harms in deciding the current TRRC application.

VERIFICATION

I, Roger Jacobs, hereby verify under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge and belief.

A handwritten signature in blue ink, appearing to read "Roger Jacobs", is written over a horizontal line.

Roger Jacobs

Dated this 22 day of March, 2015.

Footnote 62

Denver Carbon Rules Testimony

I am Mark Fix and I am a rancher and irrigator about 20 miles southwest of Miles City on the Tongue River. I am a past chair of the Northern Plains Resource Council (NPRC) and a member of the Western Organization of Resource Council (WORC). Northern Plains is a grassroots organization that was founded when coal strip mining came to Montana. Northern Plains was instrumental in pushing forward protections for landowners, such as landowner consent and reclamation of strip mined areas.

I am here to thank the Environmental Protection Agency (EPA) for promoting a rule that will help control carbon emissions that are affecting our lives and our planet.

We in agriculture are the first to be affected by climate change. In Montana in 2012 over 1.1 million acres were burned by the second largest wildfire in our state's history. Luckily I escaped that fire. The day the fire spread it was around 106 degrees and the wind increased to around 60 mph. Smoke was coming my direction and I thought I might see fire at any time, but luckily the winds were not headed my way. Many of my friends and neighbors were not so fortunate, and are still dealing with the incredible expense and workload of replacing fences, livestock, and even their homes. I know how hard this can be- I had a fire on my ranch 4 or 5 years earlier that burned about 3 sections of my property.

The next subjects I will mention I feel fit into the global weirding category. Last year we had an EF One tornado hit my ranch. The winds were in excess of 95 mph and took off half of my barn roof, about a quarter of my house roof and tipped over a new circle pivot that I had only used for about 2 weeks. The storm was about a half of a mile wide and also took down hundreds of cottonwood trees, which I am still struggling to clean up.

More recently there was an EF Three tornado that struck in SE Montana. One of the storm chasers said that he had never seen a tornado that strong in Montana. When I was a kid you never heard of a tornado in our area. Now it seems like there are warnings for possible tornados in almost every weather alert. And these are not the only type of extreme weather events, exacerbated by climate change that takes a serious toll on Montana landowners.

Cold weather and snow hit early last winter, causing many of my calves to be stressed and catch pneumonia. I lost about 10 percent of my heifer calves from sickness. The winter was long with lots of snow, and as a result, this spring we had lots of runoff and some of the worst ice jam flooding I have seen since we bought the ranch. The ice jammed for about a half of a mile and the river came out onto my irrigated ground and totally covered a 55-acre field. I had 50 head of heifers that were ready to have their first calf in a pasture that was in the path of the flood waters. The water came up very quickly and I did not have time to get the cattle out of the pasture. I saw the water and immediately thought that I had lost all fifty head of heifers. We looked a little closer and I could see some of them trapped on a high spot they had found. I had no way to get

to them for rescue. There was water 8 feet deep between the house and where the heifers were. It took me all night to get them to safety.

The flood waters took out close to a mile of fences on my ranch and I am still trying to get them fixed. My irrigated field was covered with floating trees and ice that I needed to clean up. The same field was littered with branches last year from that tornado. Climate change affects the weather and we in agriculture have to deal with the weather everyday. The weather can make or break us. If we want agriculture as we know it to continue to thrive, it is an economic and cultural imperative to deal with climate change.

As a rural electric cooperative member and ratepayer, I'd like to respond to those coops that have expressed concerns about the proposed rule. These coops, including my own, are living in the past and still think that the only viable source of power is coal. They are paying the price for it now. The supplier for our cooperative tried to build a coal plant that proved to be an enormous boondoggle. Our power supplier made bad decisions and is currently going through bankruptcy proceedings. Renewable power is cheaper, cleaner, and provides more jobs than coal fired power. We need renewables now.

We know that coal is a leading source of carbon dioxide in the atmosphere and we need to transition toward renewable sources of power. But there are reasons other than climate to shift our energy policy away from coal as well. My ranch is located on a potential path for a new railroad to develop a new coal mine about 50 miles away. My ranch would face condemnation were it to be built. In addition to condemning family farms and ranches, opening that mine would permanently tear up an important agricultural aquifer. We can and must do better.

Since the mine at Otter Creek has also been discussed as an export mine, I think it's important to note that no serious national effort to rein in CO₂ from coal is complete without addressing coal exports. It makes no sense to ship coal to Asia to have the prevailing winds bring back 2 tons of carbon dioxide for every ton of coal we ship to them.

One hundred miles away, they are developing an oil field at an amazing pace in the Bakken region of North Dakota and Montana. There is natural gas that is a byproduct and it is simply being flared and wasted. We should salvage all of the natural gas that is now being wasted. Methane emissions are a greenhouse gas that must be looked at in addition to carbon dioxide. It is critical that the BLM's proposals to limit flaring and venting of methane, and EPA methane pollution standards move forward. Otherwise switching from coal to natural gas could make climate change worse, not better.

Even with better controls on methane, though, promoting natural gas is not a good solution to climate change. Energy efficiency and renewable energy are much better. In Montana we have great potential for wind and solar power. Hydro power is still a good source of power as well, and we need to utilize the potential energy of the water stored in reservoirs – for example, the Tongue River Reservoir near me, which would be an excellent site for hydropower. Hydro,

wind, and solar are all clean, renewable sources of energy and need to be promoted. I fully support the new carbon rules and my hope is that they will help move renewable energy forward so that we can begin to combat climate change and build a new energy economy more consistent with the survival of family farms and ranches like mine.

Footnote 67



United States Department of Agriculture

Office of the Secretary
Washington, D.C. 20250

MAR - 6 2015

Mr. Jeremy Nichols
Climate and Energy Program Director
WildEarth Guardians
1536 Wynkoop Street, Suite 310
Denver, Colorado 80202

Dear Mr. Nichols:

Thank you for your letter of October 8, 2014, to U.S. Department of the Interior Secretary Sally Jewell and U.S. Department of Agriculture Secretary Thomas J. Vilsack, cosigned by representatives from numerous environmental organizations, requesting that the U.S. Department of Agriculture (USDA) and the U.S. Department of the Interior use the social cost of carbon accounting protocol in analyzing and disclosing the effects of alternatives for decisions under the National Environmental Policy Act. Secretary has asked me to respond. I apologize for the delayed response.

The court decision you referenced represents an opportunity to encourage the use of appropriate tools for measuring and disclosing the social and economic implications when developing impact analyses for leasing decisions. The social cost of carbon, an estimate of the economic cost of the greenhouse gas emissions permanently released into the atmosphere by fossil fuel combustion, is one such tool. Designed for estimating the cost of direct greenhouse gas emissions into the atmosphere, it is unclear how it might be used for other purposes such as fossil fuel production or non-fossil emissions where the long-term estimate of total emissions resident in the atmosphere over time may be complicated by leakage, regeneration/sequestration, and other considerations. Openness in the process is a key component of ensuring that USDA fulfills its mandate to make land-use decisions that balance competing demands, costs, and benefits.

USDA is a leader and key participant in developing tools and methods for measuring and managing greenhouse gas emissions and biogenic sequestration. With respect to public land-use management, USDA's Forest Service has developed widely-used and respected tools for estimating forest carbon and is currently engaged in a major initiative to strengthen knowledge throughout the agency about carbon stewardship. The Forest Service has produced new baseline assessments of forest stocks and trends for all of the National Forests, is adopting new forest carbon stewardship guiding principles, and has developed a climate change education program featuring carbon literacy. The Forest Service has also integrated carbon stewardship into its performance management system through its Climate Change Performance Scorecard and has interwoven a mandate to assess carbon stocks in its newly revised planning process. All of these efforts were designed to ensure better understanding of the carbon consequences of decisions made by the Forest Service and to more fully engage the public with reliable and useful information.

Mr. Jeremy Nichols
Page 2

USDA takes its responsibility seriously to both make and support wise land-use decisions that limit or mitigate climate change impacts. USDA recently announced three initiatives to promote more informed, transparent decision-making with respect to carbon costs and benefits. Regional Climate Hubs help farmers, ranchers, and forest landowners develop adaptation strategies by providing regionally-specific risk and vulnerability assessments. Two new online tools—Rapid Carbon Assessment and the Carbon Management Evaluation Tool (COMET)—permit calculations of agriculture's ability to sequester carbon in the soil. An interagency project was launched to establish guidelines for planting cover crops for carbon sequestration without losing eligibility for Farm Bill programs. In addition, USDA just published a new technical guide (Technical Bulletin 1939) for quantifying greenhouse gas emissions in agriculture and forestry. This will become the standard reference for producing estimates to which any evaluations of social and economic impacts will be applied.

Again, thank you for writing. USDA will continue to engage with other governmental agencies, conservation and environmental organizations, industry representatives, and members of the public in taking positive steps to address climate change. Please share this response with those listed in your letter.

Sincerely,

A handwritten signature in blue ink, appearing to read "Robert Bonnie", with a stylized flourish at the end.

Robert Bonnie
Under Secretary
Natural Resources and Environment

Footnote 73

FOR PUBLICATION
UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT

NORTHERN PLAINS RESOURCE
COUNCIL, INC., a Montana Non-
Profit Corporation,
Petitioner,

NATIVE ACTION INC., a Montana
Non-Profit Corporation,
Petitioner-Intervenor,

v.

THE SURFACE TRANSPORTATION
BOARD; UNITED STATES OF AMERICA,
Respondents,

TONGUE RIVER RAILROAD COMPANY,
Respondent-Intervenor.

No. 97-70037
TRAN No.
30186

NATIVE ACTION INC., a Montana
Non-Profit Corporation,
Petitioner,

v.

THE SURFACE TRANSPORTATION
BOARD; UNITED STATES OF
AMERICA,
Respondents.

No. 97-70099
TRAN No.
30186

21422 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

UNITED TRANSPORTATION UNION—
GENERAL COMMITTEE OF
ADJUSTMENT (GO-386); UNITED
TRANSPORTATION UNION—MONTANA
STATE LEGISLATIVE BOARD,
Petitioners,

v.

THE SURFACE TRANSPORTATION
BOARD; UNITED STATES OF
AMERICA,
Respondents,
TONGUE RIVER RAILROAD COMPANY,
Respondent-Intervenor.

No. 97-70217

TRAN
No. 30186

NORTHERN PLAINS RESOURCE
COUNCIL; CITY OF FORSYTH; UNITED
TRANSPORTATION UNION; GENERAL
COMMITTEE FOR ADJUSTMENT (GO-
386); UNITED TRANSPORTATION
UNION—MONTANA STATE
LEGISLATIVE BOARD; MARK FIX,
Petitioners,

NATIVE ACTION INC.,
Petitioner-Intervenor,

v.

THE SURFACE TRANSPORTATION
BOARD; UNITED STATES OF
AMERICA,
Respondents,
TONGUE RIVER RAILROAD COMPANY,
Respondent-Intervenor.

No. 07-74348

TRAN No.
30186
OPINION

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21423

On Petition for Review of Orders of the
Surface Transportation Board,
Department of Transportation

Argued and Submitted
July 11, 2011—Portland, Oregon

Filed December 29, 2011

Before: Alfred T. Goodwin, Harry Pregerson, and
Milan D. Smith, Jr., Circuit Judges.

Opinion by Judge Milan D. Smith, Jr.

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21429

COUNSEL

Jack R. Tuholske (argued), Tuholske Law Office PC, Missoula, Montana; John Meyer, Cottonwood Environmental Law Center, Bozeman, Montana, for the petitioner.

Virginia Strasser (argued), Raymond Atkins, Evelyn G. Kitay, and Theodore Hunt, Department of Transportation, Surface Transportation Board, Washington, D.C.; Joan M. Pepin, Department of Justice, Environmental & Natural Resources Division, Washington, D.C.; Robert B. Nicholson and John P. Fonte, Department of Justice, Antitrust Division, Washington, D.C., for the respondents.

Gordon P. MacDougall (argued), Washington, D.C.; Gary Ryder, Hysham, Montana; Joe A. Rodriguez, Lame Deer, Montana, for the petitioner-intervenor.

David Corburn (argued) and Betty Jo Christian, Steptoe & Johnson LLP, Washington, D.C.; Thomas Ebzery, Billings, Montana; John G. Crist, Crist, Krogh & Nord LLC, Billings, Montana, for the respondent-intervenor.

OPINION

M. SMITH, Circuit Judge:

This case arises out of three applications by the Tongue River Railroad Company, Inc. (TRRC) to build a 130-mile railroad line in Southeastern Montana to haul coal. The Surface Transportation Board (Board), or its predecessor, the Interstate Commerce Commission (ICC), approved each of the three applications (individually, TRRC I, II, and III). Northern Plains Resource Council, Inc. (NPRC), Mark Fix, the City of Forsyth, Native Action, Inc. (Native Action), and United Transportation Union-General Committee of Adjust-

21430 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

ment (UTU-GCA) (collectively, Petitioners) challenge TRRC II and III. Petitioners challenge the approval of TRRC II and III on a number of environmental and public convenience and necessity grounds.

We hold that the Board failed to take the requisite “hard look” at certain material environmental impacts inherent in TRRC II and III in the manner required by the National Environmental Policy Act (NEPA) prior to approving those applications. We further hold that the Board did not err in its public convenience and necessity analyses, except with respect to its reliance on the viability of TRRC II during the approval of TRRC III. Accordingly, we reverse and remand in part, and affirm in part.

BACKGROUND

I. Statutory Framework

A. NEPA Requirements

NEPA requires that federal agencies prepare “a detailed statement by the responsible official on . . . the environmental impact” of any federal actions “significantly affecting the quality of the human environment.” 42 U.S.C. § 4332(c); *Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1185 (9th Cir. 2008). NEPA’s purpose is twofold: (1) to ensure that agencies carefully consider information about significant environmental impacts and (2) to guarantee relevant information is available to the public. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989); *Ctr. for Biological Diversity*, 538 F.3d at 1185.

Regulations governing how NEPA is implemented have been promulgated by the Council of Environmental Quality, at 40 C.F.R. §§ 1505.1-1508.28. Regulations governing how NEPA applies to the constructions of railroads have also been promulgated by the Board, at 49 C.F.R. § 1105.1-1105.12. An

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21431

environmental impact statement (EIS) is normally prepared for new railroad construction projects by the Board's Section of Environmental Analysis (SEA). *See* 49 C.F.R. §§ 1105.2, 1105.6(a). An EIS must analyze the direct, indirect, and cumulative impacts from a proposed action. 40 C.F.R. § 1508.25(c). The SEA first invites public comment on the scope of the issues to be analyzed in the EIS. 49 C.F.R. § 1105.10(a)(2). After finalizing the scope of the issues to be considered, and completing consultations and site visits, the SEA issues a draft EIS (DEIS). *Id.* § 1105.10(a)(3). Public comments may be submitted to the SEA after the DEIS has been issued. *Id.* § 1105.10(a)(4). The SEA's final EIS (FEIS) discusses comments received, and any changes made to the DEIS in response to those comments. *Id.* The FEIS, and any comments and responses to the DEIS, are part of the record considered by the Board in deciding whether to grant an application. *Id.* § 1105.10(f).

B. Licensing of New Railroad Lines

Under 49 U.S.C. § 10901, the Board has exclusive licensing authority for the construction and operation of new railroad lines. A proceeding to grant authority begins when an application is filed with the Board. 49 U.S.C. § 10901(b). Under Section 10901(c), as amended by the Interstate Commerce Commission Termination Act (ICCTA) of 1995, the Board "shall issue a certificate authorizing activities for which such authority is requested in an application filed under subsection (b) unless the Board finds that such activities are inconsistent with the public convenience and necessity." 49 U.S.C. § 10901(c).¹

¹As further discussed in Section II.A, this post-ICCTA statute governs the issuance of TRRC III. At the time the TRRC II application was filed, Section 10901 provided that a rail carrier may construct an additional railroad line only if the ICC, the Board's predecessor, found that the "present or future public convenience and necessity require or permit the construction or acquisition (or both) and operation of the railroad line." 49 U.S.C. § 10901 (1980).

21432 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

II. Factual Background

The TRRC seeks to construct and operate a railroad line in the Tongue River Valley in southeastern Montana. *See* end-note 1, fig. 1-1. In 1983, the TRRC filed an application with the ICC² to construct an 89-mile railroad line between Miles City and Ashland, Montana. *See Tongue River R.R. Co.—Rail Construction and Operation—in Custer, Powder River and Rosebud Counties, MT*, Finance Docket No. 30186, 1986 ICC LEXIS 314, at *1 (ICC 1986). The purpose of the line was to serve new coal mines in the Ashland area. The plan was to connect the new line to the main line railroad at Miles City, presently owned by Burlington Northern Santa Fe Railroad (BNSF). *Id.* The ICC approved the TRRC I application on May 1, 1986. *Id.* The issuance of the TRRC I application is not before us in this litigation. We note, however, that to date the TRRC I line has not been constructed.

In 1989, the TRRC filed an application with the ICC to construct and operate an approximately 41-mile-long railroad line from Ashland to Decker, Montana. This line, TRRC II, was intended to connect with TRRC I to create a combined railroad line of approximately 130 miles. The purpose of TRRC II was to bring coal from Wyoming's Powder River Basin to the BNSF main line in Miles City, and then on to other destinations in the Midwest.

The ICC was concerned about potential environmental impacts that would be caused by the construction of TRRC II's "preferred route," as submitted in its application. As a result, the ICC also evaluated an alternate route called the "Four Mile Creek Alternative," which was approximately ten miles longer than the TRRC's preferred route requested in its TRRC II application. In April 1996, the Board issued its FEIS

²In 1995, Congress, through the ICCTA, amended the railroad statutes and the ICC was replaced by the Board. *See* Pub. L. No. 104-88, 109 Stat. 803 (1995).

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21433

for the TRRC II project. In October 1996, the Board issued its decision approving TRRC II, utilizing the Four Mile Creek Alternative with numerous mitigation conditions. The Board also required that the TRRC build the entire line from Ashland to Decker and the 89-mile line from Miles City to Ashland, approved in TRRC I, within three years of the date of its TRRC II decision.

Petitioners sought reconsideration of TRRC II, which the Board denied. Petitioners NPRC, UTU-GCA, and Native Action all filed appeals to our court.³ Subsequently, the TRRC (and BNSF through intervention) also petitioned for reconsideration of TRRC II, claiming that new studies showed the Four Mile Creek Alternative was not viable from an engineering and operational perspective, and, instead, proposed a new alternative, the 17.4-mile “Western Alignment.” The Board denied the TRRC petition for reconsideration in December 1997 on the grounds that its objections could have been raised earlier, but left open the possibility that the TRRC could file a new application for the Western Alignment. In 1998, Petitioners’ appeals in this matter were ordered held in abeyance pending the Board’s decision concerning TRRC III, discussed *infra*. In 1999, the Board revoked the condition that the entire line be built within three years of its TRRC II decision, and did not impose any future time limit on construction of the line.

In April 1998, the TRRC filed a new application to build the Western Alignment rather than the Four Mile Creek Alternative. That proceeding is called TRRC III in this appeal. Subsequently, the NEPA process was delayed for almost three years due to TRRC’s financial problems. In October 2004, the Board’s contractor issued a Draft Supplemental Environmental Impact Statement (DSEIS) for TRRC III. The Final Supplemental Environmental Impact Statement (FSEIS) was

³These three appeals—case numbers 97-70037, 97-70099, and 97-70217—are three of the four consolidated cases before us.

21434 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

completed in 2006 for TRRC III, and included updates to the environmental reviews in TRRC I and TRRC II. On October 5, 2007, the Board approved the construction and operation of the Western Alignment along with numerous mitigation measures. Petitioners timely appeal.

STANDARD OF REVIEW AND JURISDICTION

I. Review of NEPA Claims

Section 706 of the Administrative Procedure Act (APA) governs judicial review of agency decisions made pursuant to NEPA. 5 U.S.C. § 706; *City of Sausalito v. O'Neill*, 386 F.3d 1186, 1205-06 (9th Cir. 2004). An agency's action must be upheld unless it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A).

"Review under the arbitrary and capricious standard is narrow, and we do not substitute our judgment for that of the agency." *Lands Council v. McNair*, 537 F.3d 981, 987 (9th Cir. 2008) (en banc) (quoting *Earth Island Inst. v. U.S. Forest Serv.*, 442 F.3d 1147, 1156 (9th Cir. 2006), *abrogated on other grounds by Winter v. Natural Res. Def. Council, Inc.*, 555 U.S. 7 (2008)) (internal quotations marks and brackets omitted).

[W]e will reverse a decision as arbitrary and capricious only if the agency relied on factors Congress did not intend it to consider, entirely failed to consider an important aspect of the problem, or offered an explanation that runs counter to the evidence before the agency or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.

Id. at 987 (citations and internal quotation marks omitted). We look to the evidence the agency has provided to support

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21435

its conclusions, along with materials in the record, to make this determination. *Id.* at 993.

A court generally must be “at its most deferential” when reviewing scientific judgments and technical analyses within the agency’s expertise. *See Balt. Gas & Elec. Co. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87, 103 (1983). The court is not to “act as a panel of scientists that instructs the [agency] . . . , chooses among scientific studies . . . , and orders the agency to explain every possible scientific uncertainty.” *Lands Council*, 537 F.3d at 988. And “[w]hen specialists express conflicting views, an agency must have discretion to rely on the reasonable opinions of its own qualified experts even if, as an original matter, a court might find contrary views more persuasive.” *Id.* at 1000 (quoting *Marsh v. Or. Natural Res. Council*, 490 U.S. 360, 378 (1989)).

While we afford deference to the judgment and expertise of the agency, the agency must, at a minimum, support its conclusions with studies that the agency deems reliable. *Lands Council*, 537 F.3d at 994. The agency must “explain the conclusions it has drawn from its chosen methodology, and the reasons it considered the underlying evidence to be reliable.” *Id.* The agency will have acted arbitrarily and capriciously when “the record plainly demonstrates that [the agency] made a clear error in judgment in concluding that a project meets the requirements” of NEPA. *See id.*

NEPA imposes a procedural requirement on federal agencies to “take[] a ‘hard look’ at the potential environmental consequences of the proposed action.” *Or. Natural Res. Council v. Bureau of Land Mgmt.*, 470 F.3d 818, 820 (9th Cir. 2006) (quoting *Klamath-Siskiyou Wildlands Ctr. v. Bureau of Land Mgmt.*, 387 F.3d 989, 993 (9th Cir. 2004)). “Judicial review of agency decision-making under NEPA is limited to the question of whether the agency took a ‘hard look’ at the proposed action as required by a strict reading of NEPA’s procedural requirements.” *Bering Strait Citizens for Responsi-*

21436 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

ble Dev. v. U.S. Army Corps of Eng'rs, 524 F.3d 938, 947 (9th Cir. 2008) (citing *Churchill Cnty. v. Norton*, 276 F.3d 1060, 1072 (9th Cir. 2001)). Through these procedural requirements, NEPA seeks to make certain that agencies “will have available, and will carefully consider, detailed information concerning significant environmental impacts, and that the relevant information will be made available to the larger [public] audience.” *N. Idaho Cmty. Action Network v. U.S. Dep't of Transp.*, 545 F.3d 1147, 1153 (9th Cir. 2008) (citations and internal quotation marks omitted).

II. Review of the Railroad Application

“Our review of the construction given by an agency to a statute it administers is limited and deferential.” *Wash. State Dep't of Game v. I.C.C.*, 829 F.2d 877, 879 (9th Cir. 1987). We review the agency’s statutory construction under the analytical framework set out in *Chevron U.S.A., Inc. v. Natural Resources Defense Council*, 467 U.S. 837, 842-45 (1984). *DHX, Inc. v. Surface Transp. Bd.*, 501 F.3d 1080, 1086 (9th Cir. 2007). First, we inquire whether Congress has addressed directly the issue before the court. *Chevron*, 467 U.S. at 842. If Congress has clearly spoken on the issue, our inquiry ends and the agency “must give effect to the unambiguously expressed intent of Congress.” *Id.* at 842-43. We are compelled to overrule an agency’s interpretation if it is “contrary to clear congressional intent.” *Id.* at 843 n. 9. However, if the statute does not address the specific issue before us, or does so ambiguously, “the question for the court is whether the agency’s answer is based on a permissible construction of the statute.” *Id.* at 843. The agency’s construction must therefore only be “reasonable” and need not be the same as the construction the court itself would have embraced had it reviewed the statute de novo. *Id.* at 843-44. “[T]he court does not simply impose its own construction on the statute . . .” *Id.* at 843.

We review decisions by the Board on railroad application approvals under the APA, 5 U.S.C. § 706(2). *DHX*, 501 F.3d

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21437

at 1086. An agency's decision must be upheld unless it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). The Board's factual findings must be upheld if they are supported by substantial evidence. *In re Transcon Lines*, 89 F.3d 559, 564 (9th Cir. 1996).

III. Jurisdiction.

We have jurisdiction under 28 U.S.C. §§ 2321(a), 2342(5), and 2344.

DISCUSSION

I. Environmental Claims

A. Cumulative Impacts

"NEPA requires that where several actions have a cumulative . . . environmental effect, this consequence must be considered in an EIS." *Te-Moak Tribe of W. Shoshone of Nev. v. U.S. Dep't of Interior*, 608 F.3d 592, 602 (9th Cir. 2010) (citation and internal quotation marks omitted). The pertinent regulation defines cumulative impact as follows:

Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

40 C.F.R. § 1508.7.

A cumulative impact analysis "must be more than perfunctory; it must provide 'a useful analysis of the cumulative

21438 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

impacts of past, present, and future projects.’ ” *Kern v. U.S. Bureau of Land Mgmt.*, 284 F.3d 1062, 1075 (9th Cir. 2002) (quoting *Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 810 (9th Cir. 1999)). To be useful to decision makers and the public, the cumulative impact analysis must include “some quantified or detailed information; . . . general statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided.” *Ocean Advocates v. U.S. Army Corps of Eng’rs*, 402 F.3d 846, 868 (9th Cir. 2005) (quoting *Neighbors of Cuddy Mountain v. U.S. Forest Serv.*, 137 F.3d 1372, 1379-80 (9th Cir. 1998)). Federal agencies may “aggregate [] cumulative effects analysis” for NEPA purposes. *League of Wilderness Defenders-Blue Mountains Biodiversity Project v. U.S. Forest Serv.*, 549 F.3d 1211, 1217 (9th Cir. 2008) (“[A]gencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effects of all past actions combined.” (quoting Council on Environmental Quality Memorandum, “Guidance on Consideration of Past Actions in Cumulative Effects Analysis” (June 24, 2005))).

Petitioners contend that the Board’s cumulative impact analysis in TRRC III ignores the combined impacts of future coal bed methane⁴ (CBM) well development and coal mining projects that will also come into being in Southeastern Montana. Petitioners further contend that the Board failed to account for the combined effects of the referenced projects and the likely effects on air quality, wildlife, and water quality of the proposed construction and operation of the TRRC railroad. We agree with Petitioners’ contentions concerning the

⁴CBM is a natural gas. The gas is trapped in coal seams and held in place by water pressure in coal seam aquifers. To release the gas, developers build wells to drill underground into the aquifers and pump out the water contained in the aquifers. After the aquifer is depleted of all its water, the methane gas is released and can be piped to the surface.

cumulative foreseeable effects of CBM wells and the Otter Creek Coal Mine.

1. Coal Bed Methane

In 2003, the Bureau of Land Management (BLM) and the State of Montana finished a programmatic EIS (Methane EIS) that evaluated the future impacts of CBM development in the Powder River Basin. Bureau of Land Management, *Final Statewide Oil and Gas Envtl. Impact Statement* (Jan. 2003) (Methane EIS), available at http://www.blm.gov/mt/st/en/fo/miles_city_field_office/og_eis.html. The Methane EIS determined that a reasonably foreseeable development scenario in Montana over the next 20 years would involve drilling between 10,000 and 26,000 new CBM wells and 250 and 975 conventional oil and gas wells. *Id.* at 4-5. The Tongue River Valley is an area of concentration for such wells. *Id.* at Map 4-1. The Board incorporated the Methane EIS in its preparation of the FSEIS in TRRC III.

The Board also evaluated the cumulative impact of nine approved sites for CBM development near the TRRC sites. The BLM and the State of Montana had previously issued Environmental Assessments (EAs) for each of the projects and found that “no cumulative impacts are expected to occur” because adverse impacts were likely to occur only if there was simultaneous construction of the CBM wells and the TRRC railroad, and that project construction would not overlap. Notably, the Board found that “[t]he simultaneous construction of CBM gas wells could result in cumulative effects on land use.” Ultimately, however, the Board concluded that because “impacts of current CBM proposals would not occur within the same temporal parameters as construction of the Tongue River Railroad, no cumulative impacts would result.” As a result, the Board determined that there would be no cumulative impacts from the nine approved CBM projects.

21440 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

a. Five-Year Time Frame

Importantly, in order to reach its no cumulative impacts conclusion, the Board limited its analysis to projects that would be constructed within a five year period. Petitioners challenge this limitation. The Board defends its decision to use a five-year period to analyze cumulative effects because that period accounts for the time period necessary to construct the railroad (estimated to be three years) and to operate the railroad for two years thereafter. Further, the Board argues that it often uses a five-year period when examining environmental effects. Moreover, the Board maintains that any analysis focused on a time period after five years is wholly speculative because of likely changes in economic growth, industry growth, and shifts in energy transportation policies. Viewed in light of the facts presented by this case, we disagree with the Board.

Each project is different, and the agency is required to rationally explain its decision in the context of project-specific effects. *See* Council on Envtl. Quality, *Considering Cumulative Effects Under the National Environmental Policy Act*, Office of NEPA Policy and Compliance, 16 (Jan. 1997), available at http://energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-ConsidCumulEffects.pdf (“The time frame of the *project-specific* analysis should also be evaluated to determine its applicability to the cumulative effects analysis.”) (emphasis added); *see also Selkirk Conservation Alliance v. Forsgren*, 336 F.3d 944, 962 (9th Cir. 2003) (recognizing that the scope of the EIS is a “delicate choice” and should be entrusted to the agency but the agency must have “considered the relevant factors and articulated a rational connection between the facts found and the choice made”) (citation omitted).

[1] The Board partially justifies its use of a five-year limitation period because it has used a similar time framework in the past. However, in this case, the BLM and State of Mon-

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21441

tana's study projects a significant growth of CBM wells over the next 20 years. *Methane EIS* at 4-5. Thus, they anticipated that building CBM wells will continue well after the termination of a five-year time framework. The Board does not explain why its default five-year time frame should necessarily apply under these circumstances.

The Board also reasoned that five years was appropriate because it would allow for approximately three years of construction time, followed by two years of operation time. The Board's assumption that the railroad would be constructed and operational within five years of approval in 2007 is clearly flawed in light of the history of this railroad project, which has been under way for almost three decades, starting with TRRC I's approval in 1986. To date, construction has not begun on any section of the railroad. Accordingly, there is little reason to presume that the railroad would be constructed in five years, which—importantly for the Board's analysis—means that we can place little confidence in the Board's assumption that the project will not overlap with reasonably foreseeable CBM projects. Moreover, time restrictions for the construction of TRRC I and TRRC II were withdrawn, and TRRC III contains no construction time requirements. If we credit the 20-year BLM analysis and actual railroad construction is pushed out beyond five years, there may be overlapping CBM well construction. However, the Board's environmental analysis—which admits that cumulative impacts may result from simultaneous development—does not address this issue or account for this possibility.

In its decision, the Board worked around the Methane EIS by concluding that it would be too speculative to determine the effects from wells that are not already approved. In other words, because the Board does not know specific construction time lines or locations, it will await the development of site-specific EISs before including the known projects into its analysis. We acknowledge that the Board is not required to

21442 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

engage in speculative analysis. As we have explained, “[i]t is not appropriate to defer consideration of cumulative impacts to a future date when meaningful consideration can be given now, nor do we require the government to do the impractical, if not enough information is available to permit meaningful consideration.” *Envtl. Prot. Info. Ctr. v. U.S. Forest Serv.*, 451 F.3d 1005, 1014 (9th Cir. 2006) (internal quotation marks and citation omitted).

However, projects need not be finalized before they are reasonably foreseeable. “NEPA requires that an EIS engage in reasonable forecasting. Because speculation is . . . implicit in NEPA, [] we must reject any attempt by agencies to shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry.” *Selkirk*, 336 F.3d at 962 (internal quotation marks and citation omitted). As the Environmental Protection Agency (EPA) also has noted, “reasonably foreseeable future actions need to be considered even if they are not specific proposals.” EPA, *Consideration of Cumulative Impact Analysis in EPA Review of NEPA Documents*, Office of Federal Activities, 12-13 (May 1999), available at <http://www.epa.gov/compliance/resources/policies/nepa/cumulative.pdf>.

The TRRC is not operating in a vacuum. The route for the railroad is known, including the terrain and counties in which it would operate. Likewise, the Methane EIS has described in some detail the likely scope of CBM development in the future. Although the Methane EIS is a programmatic document, it is specific to the number of wells, field compressors, roads, and pipelines for each of the three counties that the TRRC railroad would cross. *Methane EIS*, Minerals Appendix at 17-22. For example, in Big Horn County (where Decker, Montana, the end of the railroad in TRRC III, is located), an estimated 2,500 to 7,000 CBM wells are reasonably foreseeable, and most of the wells would be located in the southeastern part of the county, where Decker is located. *Id.* at 17. The EIS also projected that 100 to 250 field compressors and

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21443

1,450 to 4,200 miles of gathering lines would be built in this area. *Id.* at 17. Similarly, in Rosebud County (where Ashland, Montana, the other end of the railroad in TRRC III is located), an estimated 1,000 to 2,800 CBM wells will be drilled, along with 40 to 100 field compressors and 600 to 1,650 miles of gathering lines. *Id.* at 19. The greatest concentration of CBM development is anticipated to occur in the Rosebud, Big Horn, and neighboring Powder River Counties, which is proximate to where the TRRC railroad will run. *Id.* at Map 4-1.

[2] In short, the BLM and the State of Montana have described a time frame and a reasonably foreseeable development plan for CBM development in areas that overlap with the TRRC railroad plans. Under the circumstances, the Board has not sufficiently explained why it cannot or should not incorporate this available data concerning likely future development into its environmental impact analysis. We do not ask the Board to peer into a crystal ball. *See Selkirk*, 336 F.3d at 962. The Methane EIS report contained actual numbers, broken down by counties, about development over the next 20 years. We conclude, therefore, that in this case, an adequate cumulative impact analysis necessarily requires that such information be included. Accordingly, we hold that the Board arbitrarily and capriciously relied on the five-year time frame, which resulted in a faulty analysis of the possible cumulative impacts from reasonably foreseeable CBM projects that could overlap construction of the railroad line.

b. Nine Approved CBM Sites

Petitioners also argue that the Board's EIS did not properly consider the effects of the nine already-approved CBM wells. These projects were either under consideration or had already been approved by the time the TRRC III environmental study and Plans of Development (PODs) for the projects were submitted to the Board for consideration. The Board concluded that any potentially significant cumulative impacts would be limited to the construction period, and that there would be no

21444 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

overlap between the well construction and the railroad construction activities. Petitioners contend that the Board failed to consider the significant long-term cumulative operational impact of the railroad and these wells.

[3] We conclude that this finding by the Board was not arbitrary and capricious. First, Petitioners do not present any evidence that the construction of the approved projects will overlap with TRRC construction. The Board concluded that the construction for the approved CBMs typically occur within two to sixth months after their approval and in some cases, construction had already begun at the time of the analysis. Thus, there would be no overlap with railroad construction, which would not occur until much later. We cannot overturn this finding without evidence to the contrary. Second, the Board did address both construction and operational impacts in many areas, including land use, biological resources, soil and geology, hydrology and water quality, cultural and paleontological resources, transportation and safety, air quality, noise and vibration, socioeconomics and environmental justice, recreation, aesthetics, and energy. Based on these considerations, the Board reasonably concluded that the TRRC projects would not result in cumulative effects with respect to the nine approved CBM sites. Petitioners argue that this conclusion is far-fetched and belied by the record, but again fail to present evidence that contradicts the findings of the Board.

c. Air Quality and Wildlife

[4] Beyond their attack on temporal limitation, see *supra*, Petitioners argue that the Board failed to consider the cumulative effect of the CBM wells and the railroad on air quality and wildlife. We disagree.

The Board analyzed air quality assuming an operational railroad and concluded that such effects would be minor, particularly when mitigation measures are applied. The Board

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21445

considered two types of emissions that would affect air quality—fugitive dust emissions and combustion emissions. Fugitive dust emissions include wind-blown dust which could result from exposed soils from devegetation along the railroad right of way. The SEA estimated that 10% of the right of way would have exposed soils and estimated the emissions based on EPA emission factors. Fugitive dust emissions also include coal dust from traveling coal cars. Combustion emissions from the operation of the railroad locomotives were also considered using emission standards released by the EPA. The Board is afforded deference in choosing its scientific method for modeling data, and it chose to limit the scope to the Air Quality Control Region in Eastern Montana. *See Lands Council*, 537 F.3d at 988 (explaining that the court is not to impose its own scientific judgment on the agency); *id.* at 1000 (“When specialists express conflicting views, an agency must have discretion to rely on the reasonable opinions of its own qualified experts even if, as an original matter, a court might find contrary views more persuasive.”) (citation and quotation marks omitted). Thus, Petitioners do not demonstrate how the Board here failed to take a “hard look,” even if they did not include the air quality model preferred by Petitioners or air quality data from Wyoming.

[5] Additionally, the Board analyzed effects of construction and operation of the railroad and the CBM wells on wildlife and reasonably concluded that most of the effects were likely to occur during construction, rather than during operation of the railroad. For example, the Board found that most of the effects, including removal of vegetation and habitat, increased sedimentation, and loss of flood plain, are localized and temporary in nature. The EIS addresses these impacts and creates mitigation measures. Additionally, Petitioners do not cite any specific deficiencies in this analysis, but instead point to generalized wildlife cumulative impacts addressed in the Methane EIS for the entire state. Therefore, there is no basis

21446 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

for finding this particular Board decision irrational, and it is entitled to deference.⁵

2. Other Coal Mines

Petitioners further argue that the Board failed to address any cumulative impacts of the railroad with existing coal mines—in particular, the Ashland and Otter Creek Mines.

a. Ashland Coal Mines

[6] Petitioners contend that the Board also erred by relying on the analysis of the Ashland Mines from TRRC I when doing its analysis for TRRC II and III. Petitioners are correct that the TRRC I data was incorporated. Wholesale adoption of TRRC I's data into TRRC II and III could conceivably raise some questions because TRRC I pre-dated the other projects by many years, and the data could have changed in the meantime. However, the Board evaluated whether there would be any increases in coal production in the Ashland area mines for TRRC II and TRRC III. The Board concluded that no material changes are predicted, beyond those already analyzed in TRRC I. Accordingly, because coal production has remained stable, as noted in the TRRC I study, and was reevaluated for the two subsequent projects, the Board did not unreasonably continue to rely on the Ashland mines coal production conclusions in TRRC I in doing its analysis for TRRC II and TRRC III.

⁵This conclusion, however, is subject to the caveat that the Board lacks the requisite updated and baseline data as to wildlife. See *infra* Section I.B-C. Therefore, to the extent that the operations analysis overlaps with the lack of requisite data, the Board's no operation impact finding is arbitrary and capricious. Without the requisite data, the Board cannot come to the conclusion that the operations will not affect wildlife.

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21447

b. Otter Creek Coal Mines

However, we do not reach the same conclusion as to the Otter Creek mines. Petitioners argue that the Board failed to address any impacts from the Otter Creek mines, notwithstanding the fact that the financial justification for the entire line included hauling Otter Creek coal. The Board first responds that Petitioners have waived this argument because Petitioner Mark Fix agreed in comments sent to the Board that the Otter Creek development was unforeseeable. Second, the Board claims that mining development in Otter Creek was not reasonably foreseeable when the Supplemental EIS in TRRC III was completed. We disagree with both the Board's contentions.

Parties must alert an agency to their position and contentions. *Vermont Yankee Nuclear Power Corp. v. Natural Res. Def. Council, Inc.*, 435 U.S. 519, 553 (1978). A party waives arguments that are not raised during the administrative process. *See Dep't of Transp. v. Public Citizen*, 541 U.S. 752, 764-65 (2004). Here, however, Petitioner NPRC specifically commented that development of the Otter Creek coal mines must be addressed. Specifically, on December 6, 2004, NPRC stated that the DSEIS was deficient because:

[i]n its preliminary determination that the TRR is in the public need, the [Board] relies, at least in part, on the development of coal tracts along Otter Creek and the development of coal-fired power plants near Ashland, Montana. The [Board] contends that the TRR is needed to provide a means of hauling coal from yet-to-be leased much less permitted coal tracts. Yet in the SDEIS, the [Board] concludes that the proposed coal mines and power plants are too speculative to be considered reasonably foreseeable future actions. Consequently, the [Board] failed to evaluate the potential cumulative impacts of this development on the human environment. This

21448 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

[Board] decision is disingenuous, implausible, and a textbook example of arbitrary and capricious decision-making.

Earlier, on November 16, 2004, Petitioner Mark Fix told the Board that he did not see Otter Creek as foreseeable. However, in this case, the subsequent comment by Petitioner NPRC brought the issue to the Board's attention. The Board had notice of the concern and was afforded the opportunity to bring its expertise to bear. Thus, the argument is not waived.

[7] Moreover, the Board's own explanation that the Otter Creek mines were not foreseeable is arbitrary and capricious. The Board knew that in 2002 the federal government transferred the land to the State of Montana for coal development, and the DSEIS included a map with the sites of future coal mines. Even more significantly, the Board relied on the coal mine development in Otter Creek to justify the financial soundness of the proposal, since it included the tonnage forecasts in its 2007 final decision. We therefore hold that, because the Otter Creek mine was reasonably foreseeable at the time of TRRC III, the FSEIS violated NEPA by failing to address the mine's impacts.

3. Water Quality

Petitioners' last cumulative effect argument is that the FSEIS does not analyze the combined effects of the railroad, CBM, and coal mines as to water quality. The Board responds that, because there is really no impact from CBM development (because construction will not occur simultaneously) and there are virtually no impacts from coal mine development (as mitigated), there are no effects to add to the virtually non-existent impact on water quality from the railroad.

We agree with the Board that where a proposed project has "virtually no effect" on water quality, the agency is not required to examine cumulative impacts from other projects

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21449

because it would not provide an informed analysis. *See Nw. Env'tl. Advocates v. Nat'l Marine Fisheries Serv.*, 460 F.3d 1125, 1140 (9th Cir. 2006). However, we disagree with the Board's analysis in this instance because it is largely based on the reasoning that the railroad construction will not occur simultaneously with the construction of the CBM wells. This argument does not address the concern expressed above, see *supra* Section I.A.1.a, that there may well be simultaneous construction. Construction of the railroad is estimated to increase sediment loading in the Tongue River. Thus, were simultaneous construction to occur, the Board must address this water quality issue. The Board also fails to address the cumulative effects of railroad construction combined with the water quality degradation from operational CBM wells, which are estimated to be substantial.

The Board's position is more persuasive as it relates to operation of the railroad, since the railroad is not expected to discharge water during operation. Mitigation measures such as revegetation are estimated to reduce the sediment delivery during operations to "near zero."

[8] Accordingly, we hold that the Board's FSEIS in TRRC III is deficient as to its water quality analysis related to construction, but sufficient as to operations. Furthermore, because the Board failed to account for the Otter Creek coal mines, the Board should perform cumulative water quality analysis, taking this reasonably foreseeable project into account on remand.

B. Adequacy of the Baseline Data

[9] Petitioners also contend that the TRRC II and III EIS documents do not provide adequate baseline data to assess the impacts of the railroad.⁶ Petitioners take issue with the

⁶While Petitioners' brief argues that TRRC II's baseline data is insufficient, Petitioners specific arguments do not refer to the TRRC II EIS.

21450 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

Board's analysis concerning the pallid sturgeon, sage grouse, fish and aquatic resources, other wildlife, and sensitive plants. Because the TRRC III FSEIS does not provide baseline data for many of the species, and instead plans to conduct surveys and studies as part of its post-approval mitigation measures, we hold that the Board did not take a sufficiently "hard look" to fulfill its NEPA-imposed obligations at the impacts as to these species prior to issuing its decision.

NEPA requires that the agency provide the data on which it bases its environmental analysis. *See Lands Council*, 537 F.3d at 994 (holding that an agency must support its conclusions with studies that the agency deems reliable). Such analyses must occur before the proposed action is approved, not afterward. *See LaFlamme v. F.E.R.C.*, 852 F.2d 389, 400 (9th Cir. 1988) ("[T]he very purpose of NEPA's requirement that an EIS be prepared for all actions that may significantly affect the environment is to obviate the need for speculation by insuring that available data is gathered and analyzed prior to the implementation of the proposed action.") (internal citation and quotation marks omitted). "[O]nce a project begins, the 'pre-project environment' becomes a thing of the past" and evaluation of the project's effect becomes "simply impossible." *Id.*

Petitioners cite the pallid sturgeon as an example of a wildlife resource with insufficient baseline data. The pallid sturgeon was listed in 1990 as being endangered throughout its range by the U.S. Fish and Wildlife Service (FWS). During the EIS process for TRRC III, the FWS submitted comments to the Board indicating that the Board failed to determine

Instead, all specific arguments regarding the various species missing baseline data refer us to the TRRC III EIS process. Accordingly, our discussion and conclusion is largely limited to the TRRC III EIS process. However, to the extent that the data presented in TRRC III is a wholesale adoption of the data from the TRRC II EIS, the discussion and conclusion applies to that portion of the TRRC II EIS as well.

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21451

whether vibrations and noise from the railroad would be harmful to the fish at a nearby hatchery. The TRRC had hired an engineering firm, Womack & Associates, Inc. (Womack) in 1998 to study the effects of the railroad at the Miles City Fish Hatchery, with supplemental reports being prepared in 2004 and 2006. The FWS, however, disagreed with the analysis by Womack and expressed interest in doing its own studies as needed to assure that there would be no impacts from the construction and operation of the TRRC railroad.

As the TRRC III decision itself recognized:

As set out in the SEIS, the parties also have had a number of discussions on the potential vibration issues. [FWP] has asked the applicant to conduct additional baseline studies to more fully understand the potential long-term effects that vibration may have on the fish. *TRRC is concerned that long-term studies of the sort [FWP] has sought could significantly delay its construction schedule.* However, in April 2006, the railroad agreed to implement a work plan (included as Appendix G to the Final SEIS) for additional vibration monitoring at the hatchery.

The work plan, implemented as a mitigation measure, was developed by Womack and the noise and vibration program would include measurements and analysis to “[m]easure baseline conditions at the [Miles City Fish Hatchery],” to “[p]redict and assess future sound pressure levels from construction and operation of the TRR near the [Miles City Fish Hatchery] and compare to baseline conditions,” and to “[m]easure actual noise and vibration during the construction and operation of the TRR to compare actual levels to predicted levels.”

Similarly, as to sage grouse, the only data the Board collected was the number of acres of potential sage grouse habitat within the 200-foot railroad right of way. The BLM

21452 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

submitted comments to the Board indicating that there was insufficient information as to the sage grouse:

With the increasing importance of sage grouse, more discussion on sage grouse is needed, including discussion on wintering areas and impacts of West Nile virus on sage grouse. Need to check statewide data base for more information on sage grouse strutting grounds which have been found in the past few years. . . . Sage grouse inventories need to be conducted at least two miles from any proposed disturbance.

In response, the Board agreed to conduct sage grouse surveys at least two miles from the proposed disturbance as a mitigation measure and that “pre-construction surveys would be conducted to determine the extent of sage grouse habitats and activity in the project area.” Further, the Board acknowledged that “[l]ocations of leks [communal grounds used by the grouse for courtship, breeding, and wintering] from Birney to the terminus of the proposed Western Alignment at the Spring Creek spur are not well known, so potential impacts on grouse in this portion of the line are difficult to determine.” However, in response to the BLM’s comments, the Board did not collect this data before approval of the railroad application and instead instituted mitigation measure 26 to conduct surveys on sage grouse at a later date.

Finally, as to fish and aquatic resources, other wildlife, and sensitive plants, Petitioners also contend that baseline data is only being gathered as part of mitigation measures. For fish, mitigation measure 34 purports to “conduct a three-part study plan to identify aquatic resources” by conducting a fish and fish habitat survey to “estimate population and to monitor potential mortality or emigration due to construction impacts.” For other wildlife, other mitigation measures call for data reconnaissance to “locate habitat areas and nesting sites” for several species of animals for the entire rail line. For

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21453

plants, the SEA was unable to conduct ground-level surveys to identify which state and federally protected plant species existed along the railroad's right of way. Thus, the Board prepared a mitigation measure to conduct a field search to "identify plant species of concern (Federal and state) and to implement appropriate mitigation measures during construction activities if such species are found."

[10] We recognize the Board's extensive mitigation efforts. However, such mitigation measures, while necessary, are not alone sufficient to meet the Board's NEPA obligations to determine the projected extent of the environmental harm to enumerated resources *before* a project is approved. Mitigation measures may help alleviate impact *after* construction, but do not help to evaluate and understand the impact before construction. In a way, reliance on mitigation measures presupposes approval. It assumes that—regardless of what effects construction may have on resources—there are mitigation measures that might counteract the effect without first understanding the extent of the problem.

This is inconsistent with what NEPA requires. NEPA aims (1) to ensure that agencies carefully consider information about significant environmental impacts and (2) to guarantee relevant information is available to the public. *Robertson*, 490 U.S. at 349; *N. Idaho Cmty. Action Network*, 545 F.3d at 1153. The use of mitigation measures as a proxy for baseline data does not further either purpose. First, without this data, an agency cannot carefully consider information about significant environment impacts. Thus, the agency "fail[s] to consider an important aspect of the problem," resulting in an arbitrary and capricious decision. *See Lands Council*, 537 F.3d at 987 (citation omitted). Second, even if the mitigation measures may guarantee that the data will be collected some time in the future, the data is not available during the EIS process and is not available to the public for comment. Significantly, in such a situation, the EIS process cannot serve its larger informational role, and the public is deprived of their

21454 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

opportunity to play a role in the decision-making process. *See Robertson*, 490 U.S. at 349. While the Board must prepare a detailed statement on “any adverse environmental effects which cannot be avoided should the proposal be implemented,” 42 U.S.C. § 4332(C)(ii), this requirement does not contravene the Board’s other obligation to ensure that data exists *before approval* so that the Board can understand the adverse environment effects *ab initio*.

The Board responds that it was unable to conduct some of the surveys due to the rough terrain in the area, and that it was unable to access some portions of the land in order to conduct the surveys because the access points were on private property. We are unpersuaded that these excuses can relieve the Board of its requirement under NEPA to gather information before it can make an informed decision. The Board presented no evidence indicating that it even attempted to contact any private land owners about gaining access to their land to conduct the surveys. As to rugged terrain, the Board does not explain how waiting until post-approval mitigation to conduct the survey alleviates this issue.

[11] Had the Board attempted to obtain the baseline data for these plants and wildlife through some scientific study or methodology that its experts deemed reliable, we would evaluate the situation from a different perspective. After all, we do not “act as a panel of scientists that instructs the [agency] . . . , chooses among scientific studies . . . , and orders the agency to explain every possible scientific uncertainty.” *Lands Council*, 537 F.3d at 988. The problem here, however, is that the Board did not collect this data in the first place, and was therefore unable to consider it during the EIS process. We hold that the Board violated NEPA by not taking a sufficiently “hard look” when it deferred gathering baseline data discussed in this Section I B.

C. Stale Data

Petitioners also contend that the Board relied on stale data in making its TRRC III environmental impacts analysis.

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21455

Board admits that it was unable to conduct on-the-ground surveys as part of the EIS process. The Board cites the rough terrain, rural location, and limited access due to private property as the reasons that it was unable to conduct on-the-ground surveys. The Board instead relied on aerial surveys and photography, along with data from TRRC I and TRRC II. We agree with Petitioners that the Board's reliance on this data does not constitute a "hard look" under NEPA.

[12] Many of the aerial surveys relied upon were conducted many years ago—in 1985 for TRRC 1, in 1992 for TRRC II, and in 1997 for TRRC III. At the time of the 2007 decision in TRRC III, even the most recent aerial survey was ten years old. Reliance on data that is too stale to carry the weight assigned to it may be arbitrary and capricious. See *Lands Council v. Powell*, 395 F.3d 1019, 1031 (9th Cir. 2005) (finding that six-year-old data, without updated habitat surveys, was too stale). For the reasons *infra*, we find the Board's reliance on stale aerial surveys was arbitrary and capricious under the circumstances in this case.

The Board contends that it is entitled to rely on this outdated data because "the physical environment of the area at issue here is substantially the same." However, the Board does not cite any scientific studies or testimony in the record that supports this conclusion. See *Lands Council*, 537 F.3d at 994. Moreover, even assuming this was true, we fail to understand how this necessarily and logically leads to the conclusion that the information regarding habitat and populations of numerous species remains the same as well.

The Board also did not adequately update the aerial surveys with more recent data. The Board's 2004 helicopter surveys were limited to black-tailed prairie dog colonies and bald eagle wintering and nesting sites. The Board also contends that it conducted site visits, including one in 2003. However, these site visits were conducted from the local public roads. The Board has acknowledged that much of the TRRC railroad

21456 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

line would traverse private property that is not near public roads. The Board fails to explain how its surveys from the public roads allowed it to adequately update the resource data when it admits that much of the prospective railroad land is not even accessible from public roads.

[13] Given the dearth of other data in this case, the Board fails to show that its reliance on several-years-old aerial photographs can support its conclusions. The Board's decision, citing *Mid States Coalition for Progress v. Surface Transportation Board*, 345 F.3d 520 (8th Cir. 2003), contends that environmental surveys often use aerial photography and aerial surveys. In *Mid States Coalition*, the Board used aerial photographs to identify noise-sensitive receptors—which was defined as any residence. 345 F.3d at 538. The objection raised was that a single building that could be identified via the aerial photograph could in fact contain multiple residences. *Id.* The Eighth Circuit held that the agency is not required to maximize precision at all costs and the method used was a reasonable way to approximate the number of affected receptors. *Id.* The use of the aerial photographs in *Mid States Coalition* stands in stark contrast with its use by the Board in TRRC III. Here, the Board purported to use aerial photographs and surveys to identify habitats and populations of fish, plants, and other wildlife. The Board fails to cite to any explanation in the record of what reliable methodology allowed it to determine the population of fish in rivers or identify sensitive plant species from these aerial surveys. We do not conclude that an agency cannot rely on aerial surveys in certain situations for studying habitats and populations. However, in this case, we find it inherently illogical to credit the evidence the Board has submitted to support its conclusion that the aerial surveys conducted were sufficient to establish the habitat and population for the numerous plants and wildlife potentially at risk.

[14] In summary, the Board relied on stale data during the environment impact analysis process of TRRC III and failed

to properly update the data with additional studies and surveys. We hold that such faulty reliance does not constitute the “hard look” required under NEPA.

D. Geographic Scope

Petitioners also argue that the Board improperly limited the geographic scope of the Board’s direct impacts analysis and focused only on the railroad’s right of way (ROW). “The task of selecting the geographic boundaries of an EIS requires a complicated analysis of several factors, such as the scope of the project considered, the features of the land, and the types of species in the area.” *Selkirk*, 336 F.3d at 958. The determination of the geographic boundary where environmental impacts may occur is often “a task assigned to the special competency of the appropriate agencies.” *Kleppe v. Sierra Club*, 427 U.S. 390, 414 (1976).

[15] The Board did not arbitrarily limit the geographic scope to the railroad’s ROW. The impact analysis was limited to the area surrounding the ROW for the study of land use, noise and vibration, and cultural resources because these disturbances are limited and not expected to travel far. For each resource, the Board determined the scope of its impact analysis—for example, 300 meters on each side of the center of the ROW for soil surveys and 1,500 feet on each side of the center of the ROW for cultural resources. For other resources such as fish and wildlife, however, the Board did not limit the scope to the area surrounding the ROW. Some studies the Board reviewed covered a 6,000-square-mile area for mammals and birds and another covered a 7,500-square-mile area for birds. Further, for water and air quality analysis, the Board’s review was not limited to the ROW and covered much more of the neighboring area. We hold that the Board did not err in limiting the scope of the studies.

E. Single EIS

Petitioners also claim that the Board erred by not creating a single comprehensive EIS to cover the various TRRC appli-

21458 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

cations. Petitioners contend that a single EIS is required because the TRRC applications were closely related, and under the regulations, should be discussed under a single impact statement. See 40 C.F.R. § 1508.25(a)(1) (“Connected actions . . . should be discussed in the same impact statement.”).

Actions are “connected” if they “[c]annot or will not proceed unless other actions are taken previously or simultaneously.” 40 C.F.R. § 1508.25(a)(1)(ii). We have explained that “[p]roposals or parts of proposals which are related to each other closely enough to be, in effect, a single course of action shall be evaluated in a single impact statement.” *Klamath-Siskiyou Wildlands Ctr.*, 387 F.3d at 998 (citing 40 C.F.R. § 1502.4(a)). “The purpose of this requirement is to prevent an agency from dividing a project into multiple actions, each of which individually has an insignificant environmental impact, but which collectively have a substantial impact.” *Great Basin Mine Watch v. Hankins*, 456 F.3d 955, 969 (9th Cir. 2006) (citation and quotation marks omitted). In determining whether there is a connection between projects, this circuit employs an “independent utility” test. *Wetlands Action Network v. U.S. Army Corps of Eng’rs*, 222 F.3d 1105, 1118 (9th Cir. 2000), *abrogated on other grounds by Wilderness Soc. v. U.S. Forest Serv.*, 630 F.3d 1173 (9th Cir. 2011). The test asks whether “each of two projects would have taken place with or without the other.” *Id.* (citation omitted). If the answer is yes, then the projects have “independent utility” and do not require the same EIS. *Id.* “To prevail, plaintiffs must show that [the agency] was arbitrary and capricious in failing to prepare one comprehensive environmental statement.” *Native Ecosystems Council v. Dombeck*, 304 F.3d 886, 894 (9th Cir. 2002) (citing *Kleppe*, 427 U.S. at 412).

Petitioners argue that all the projects lack independent utility. In particular, because TRRC II and TRRC III connect to TRRC I on one end, neither railroad would lead anywhere without TRRC I. Conversely, the Board argues that the proj-

ects should not be considered as one single project, because TRRC II and TRRC III were additions and modifications to the TRRC I project. The Board contends that it had no way of knowing, at the time of TRRC I, that TRRC II or TRRC III would be later proposed. Thus, the Board contends that it did what was required of it, and supplemented the EISs for TRRC II and TRRC III to consider the impact of the entire railroad line.

[16] Both parties make thought-provoking arguments. However, the timing of the TRRC applications precluded them from being filed as a single EIS. The railroad approved in TRRC I had independent utility in and of itself. The TRRC II and TRRC III applications do not have much utility outside of TRRC I. Nevertheless, when the Board approved TRRC II and TRRC III, it did incorporate the findings of the previous EISs and looked at the total environmental impact of the entire 130-mile railroad line even though it did not prepare one single comprehensive EIS. While we hold that the Board's EIS preparation is arbitrary and capricious in other ways, see *supra* Section I.A-C, we do not find that its incorporation of the previous EISs is *per se* in error for reasons already discussed. In other words, we believe that the Board's method of incorporating the EISs—which considered the entire railroad line—may have been appropriate had it cured the other deficiencies cited *supra* in Section I.A-C.

F. Tiering

[17] Petitioners' final argument is that the Board violated NEPA when it tiered its EIS to five other site-specific EISs. Tiering is the process of incorporating by reference coverage of general matters in broader environmental impact statements, such as national program or policy statements, into subsequent narrower environmental analysis, such as site-specific statements. 40 C.F.R. § 1508.28. Tiering under NEPA is permitted in two circumstances: (1) "a program, plan, or policy impact statement" may be tiered to "a pro-

21460 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

gram, plan, or policy statement or analysis of lesser scope or to a site-specific statement or analysis,” and (2) “an environmental impact statement on a specific action at an early stage” may be tiered “to a supplement . . . or a subsequent statement or analysis at a later stage.” *Id.* § 1508.28(a), (b). Only documents that have undergone NEPA analysis may be tiered. *Kern*, 284 F.3d at 1073.

[18] The Board contends that it did not impermissibly tier any other site-specific EISs but relied on the EISs only for general background information. We agree. In the TRRC III FSEIS, the Board stated:

Additionally, the Tongue River region has been studied extensively, not only by SEA in conducting the environmental analysis for Tongue River I and Tongue River II, but also by BLM and MT DNRC in the preparation of EISs for Powder River I, Montco Mine, CX Ranch, and the Tongue River Reservoir Dam reconstruction, as well as the analysis of coal-bed-methane-production wells. Where appropriate, SEA has relied on these other environmental analyses.

The Powder River I, Montco Mine, CX Ranch, Tongue River Reservoir Dam, and coal-bed-methane production wells EISs are site-specific EISs that do not fall into either situation where tiering is permitted. However, Petitioners fail to explain what aspect of the TRRC environmental analysis directly relies on the incorporation of these other EISs. Thus, we reject Petitioners’ contention that the Board engaged in illegal tiering.

To summarize our holdings in Section I, we reverse and remand on (1) the Board’s cumulative impact analysis in TRRC III as to the reasonably foreseeable coal bed methane projects, the Otter Creek Coal Mine, and water quality analysis; (2) the adequacy of the baseline data in TRRC III as to

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21461

the pallid sturgeon, sage grouse, fish and aquatic life, other wildlife, and sensitive plants; and (3) the Board's reliance on stale data, consistent with the analysis outlined above in Section I. We affirm the Board as to Petitioners' other environmental claims.

II. Railroad Claims

A. The 49 U.S.C. § 10901 Standard

Petitioners contend that the Board did not apply the correct statutory standard when it granted permission to construct the rail lines in TRRC II and TRRC III. We disagree.

[19] 49 U.S.C. § 10901 governs when the Board may authorize the construction and operation of railroad lines. As the statute existed prior to 1980, the Board could authorize construction of a rail line only if it found that “the present or future public convenience and necessity *require or will be enhanced by* the construction or acquisition (or both) and operation of the railroad line.” 49 U.S.C. § 10901 (1976) (emphasis added). The Staggers Act of 1980 changed the language to authorize construction of a rail line if the Board finds that “the present or future public convenience and necessity *require or permit* the construction or acquisition (or both) and operation of the railroad line.” 49 U.S.C. § 10901 (1980) (emphasis added).

1. TRRC II

TRRC II was submitted to the Board in 1989. In its decision approving the construction, the Board reasoned that the Staggers Act amended Section 10901 to relax the burden on railroad companies because construction could be granted as long as public convenience and necessity “permit” the construction, whereas public convenience and necessity must have “required” or “be enhanced” by the construction prior to 1980. Petitioners argue that this interpretation was erroneous.

21462 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

They contend that the Staggers Act amendment aimed only to “harmonize” the standard between Section 10901 governing construction of railroads with Section 10903 governing abandonment of railroads.

To the extent Petitioners argue that the Staggers Act worked to “harmonize”—i.e., to bring into agreement—the language for when a railroad can be abandoned and when a railroad can be constructed, we agree. However, we fail to see why this harmonization necessarily forecloses Congress’s intent to lower the standard for railroad construction to match the standard for railroad abandonment.

Nothing in the history of textual changes to the statute compels the conclusion that the standards for construction and abandonment were historically ever in sync, at least until the passage of the Staggers Act. When Congress passed the Transportation Act of 1920—giving the ICC authority over railroad construction and abandonment—the statute called for construction of railroads when “present or future public convenience and necessity *require or will require*” the construction and abandonment when “present or future public convenience and necessity *permit*” the abandonment. Transportation Act of 1920, 41 Stat. 477-78, Section 402, ¶ 1(18). The Railroad Revitalization and Regulatory Reform Act of 1976 separated the two standards into different sections of the Code, and called for construction when “present or future public convenience and necessity *require or will be enhanced by*” the construction and abandonment when “present or future public convenience and necessity *require or permit*” the abandonment. 49 U.S.C. §§ 1(18)(a), 1a(1) (1976). These two sections were not harmonized until the 1980 Staggers Act, which called for construction or abandonment when “the present or future public convenience and necessity *require or permit*” the construction or abandonment. 49 U.S.C. §§ 10901, 10903 (1980).

Petitioners have a different view of what it means to “harmonize” the standards. Instead of construing the change in

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21463

language as bringing the two standards into agreement, they argue that the Staggers Act aimed to restore the traditional standards which were in place prior to 1976. Neither the plain language of the statute nor the legislative history supports this assertion.

[20] The change in language in Section 10901 from allowing construction if the public convenience and necessity “require or *will be enhanced by*” the proposed construction to allowing construction when public convenience and necessity “require *or permit*” the proposed construction signals that Congress intended to relax the policy concerning railroad construction. Indeed, the Eighth Circuit also has concluded as much:

As first enacted, § 10901 directed the [Board] to approve a project only if public convenience and necessity ‘require or will be enhanced by’ the construction. Congress subsequently relaxed this restrictive policy by providing that the [Board] need only find that public convenience and necessity ‘permit’ the proposed construction.

Mid States Coalition, 345 F.3d at 552 (8th Cir. 2003) (internal citations omitted). Furthermore, this relaxed standard is consistent with the legislative history of the Act. Specifically, the conference report states that:

The Senate Bill changes existing law to *permit easier entry*, consistent with the policy of this Act to encourage greater reliance on marketplace forces than on government regulation. Under present law, the Commission may authorize the construction of a railroad only if it finds that the public convenience and necessity ‘require or will be enhanced’ by the construction. *This is a more stringent test than that applied to either the abandonment of rail lines or mergers. There does not appear to be any reason*

21464 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

why the Commission should apply a more difficult standard for the construction of new facilities than for the abandonment of old facilities. The Senate Bill changes the test applied by the Commission from ‘require or will be enhanced’ to ‘require or permit’.

H.R. Conf. Rep. 96-1430, P.L. 96-448, Staggers Rail Act of 1980, 115 (1980) (emphasis added). Thus, we conclude that the Board did not misinterpret the standard under § 10901 in rendering its decision on TRRC II.

2. TRRC III

In 1995, Congress further amended 49 U.S.C. § 10901 with the passage of the ICCTA, to read as follows:

The Board *shall* issue a certificate authorizing activities for which such authority is requested in an application filed under subsection (b) *unless* the Board finds that such activities are *inconsistent with* the public convenience and necessity.

49 U.S.C. § 10901 (1996) (emphasis added). The TRRC filed an application for the 17.4-mile Western Alignment known as TRRC III in 1998.

[21] Petitioners contend that the pre-1996 § 10901 should apply to TRRC III even though it was filed in 1998, due to the ICCTA’s savings clause. The savings provision of the ICCTA states that any proceeding or application that is pending before the ICCTA’s effective date (generally, January 1, 1996) shall be continued and unaffected and review shall be taken as if the ICCTA was never enacted. ICCTA, Pub. L. No. 104-88, § 204, 109 Stat. 803, 941 (1995) (codified at 49 U.S.C. § 701 Note). Petitioners argue that TRRC III should be covered by the savings provision because the TRRC originally tried to reopen TRRC II for the 17.4-mile Western Alignment alternative. Petitioners also argue that the Board

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21465

considered TRRC III supplemental to TRRC II from an environmental standpoint. We disagree with both contentions.

[22] TRRC II and TRRC III were separate proceedings. TRRC III was filed in 1989 and clearly was not “pending” before the ICCTA took effect on January 1, 1996. Further, Petitioners fail to show how the Board may have abused its discretion in treating the TRRC’s application for the Western Alignment as a new application. A final agency decision in TRRC II had already been issued on October 28, 1996.⁷ Rather than reopen those proceedings, the Board asked TRRC to file a new proceeding and the Board correctly applied the version of Section 10901 that was in place at that time.

Second, Petitioners argue that even if the post-ICCTA version of Section 10901 was applicable, the Board impermissibly read into the standard a presumption that construction should be approved. Petitioners argue that this presumption was not the intent of Congress, and that the Board cannot read it into the statute.

[23] Review of the Board’s decision in TRRC III does not indicate that an impermissible presumption was read into the statute. We start with the plain language of the statute. *See Pension Benefit Guar. v. Carter & Tillery Enters.*, 133 F.3d 1183, 1185-86 (9th Cir. 1998). The plain language of the post-ICCTA Section 10901 states that applications “shall” be approved “unless the Board finds that such activities are inconsistent with the public convenience and necessity.” This language loosens the prior standard, which allowed approval only when public convenience and necessity “required or per-

⁷We note that TRRC II was also decided after the January 1, 1996 effective date of the ICCTA. However, TRRC II does fall within the ICCTA savings clause, discussed *supra*, because it was filed in 1989 and was pending when the ICCTA was enacted. Thus, the law that applies to the TRRC II application is the law in effect prior to the enactment of the ICCTA. *See* ICCTA, Pub. L. No. 104-88, § 204, 109 Stat. 803, 941 (1995) (codified at 49 U.S.C. § 701 Note).

21466 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

mitted” the construction. The Board’s construction of this statute is reasonable and consistent with the Eighth Circuit’s interpretation:

Congress’s latest iteration of the statute relaxes the standard even further, directing that the Board “shall issue” construction licenses, “unless the Board finds that such activities are *inconsistent* with the public convenience and necessity.” 49 U.S.C. § 10901(c) (emphasis added). When read in conjunction with Congress’s broad policy directives to promote “effective competition among rail carriers” and to “reduce regulatory barriers to entry into . . . the industry,” 49 U.S.C. § 10101, we believe that the Board correctly maintains that there is a statutory presumption that rail construction is to be approved.

Mid States Coalition, 345 F.3d at 552. We agree with the Eighth Circuit and the Board’s interpretation, and find the Board did not improperly apply a presumption for construction in TRRC III.

B. The Board’s Public Convenience and Necessity Findings

Petitioners also challenge the Board’s findings regarding public convenience and necessity and whether the findings are supported by the record.

1. The Public Convenience and Necessity Test

Petitioners first challenge the test that the Board applied to evaluate “public convenience and necessity.” In TRRC II, the Board formulated the following test for public convenience and necessity:

The transportation issues that are raised in rail entry cases include: (1) whether the applicant is fit, finan-

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21467

cially and otherwise, to undertake the construction and provide rail service; (2) whether there is a public demand or need for the service; and (3) whether the competition would be harmful to existing carriers.

While Petitioners acknowledge that the test includes three factors and that the Board's use of the word "include" in the test indicates that other factors may be considered, they contend that the Board only considered the three factors in subsequent cases. In any event, Petitioners claim that the test described varies from the test for public convenience and necessity that has been used traditionally.

The parties agree that Congress did not define public convenience and necessity. *See I.C.C. v. Parker*, 326 U.S. 60, 65 (1945). Citing *Public Convenience Application of Utah Terminal Ry.*, 72 ICC 89, 93-94 (1922), Petitioners argue that the Board has previously defined the term as a "strong or urgent public need." However, since then, it appears that the Board historically has "draw[n] its conclusion from the infinite variety of circumstances which may occur in specific instances." *N.M. Navajo Ranchers Ass'n v. I.C.C.*, 702 F.2d 227, 232 (D.C. Cir. 1983) (quoting *Parker*, 326 U.S. at 65).

We are not persuaded that the Board erred in considering the factors it did in making its TRRC II decision. Petitioners fail to explain how the test—under these specific circumstances—was unreasonable. In particular, Petitioners do not cite any additional factors the Board should have considered that would affect public convenience and necessity. Further, the Board has traditionally looked to a "variety of circumstances," and the Supreme Court has confirmed that the Board has discretion to do so. *See Parker*, 326 U.S. at 65 ("The Commission has assumed, as its duty under these earlier subsections, the finding of facts and the exercise of its judgment to determine public convenience and necessity. This Court approved this construction.").

21468 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

The Petitioners also fail to show that the Board erred in considering the factors it did in making the TRRC III decision. In that decision, the Board applied the following test:

[T]he agency has traditionally looked at whether: (1) the applicant is financially able to undertake the project and provide rail service; (2) there is a public demand or need for the proposed service; and (3) the proposal is in the public interest and will not unduly harm existing services. The agency accords the interests of existing shippers substantial importance in assessing the [public convenience and necessity] in railroad construction proceedings.

Petitioners argue that the inclusion of the “public interest” in this test somehow lessened the public convenience and necessity standard. We disagree. The public interest was one of many factors the Board considered and analyzed that, taken together, constituted their consideration of public convenience and necessity for the construction of the railroad.

[24] We conclude that the Board did not err in considering the factors it did in analyzing the public convenience and necessity standard of Section 10901.

2. TRRC’s Financial Fitness

Petitioners’ next argument is that, assuming that the factors the Board considered were correct, the Board’s conclusion as to each factor was not supported by the record. Petitioners first contend that the Board did not properly consider TRRC’s financial fitness. The Supreme Court has elaborated on the purpose behind this factor:

Congress undertook to develop and maintain, for the people of the United States, an adequate railway system. It recognized that preservation of the earning capacity, and conservation of the financial resources,

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21469

of individual carriers, is a matter of national concern; that the property employed must be permitted to earn a reasonable return; that the building of unnecessary lines involves a waste of resources, and that the burden of this waste may fall upon the public; that competition between carriers may result in harm to the public, as well as in benefit; and that, when a railroad inflicts injury upon its rival, it may be the public which ultimately bears the loss.

Texas & P. Ry. Co. v. Gulf, C. & S.F. Ry. Co., 270 U.S. 266, 277 (1926). Petitioners claim that the Board must consider the effect on the public and carriers as part of this test.

[25] While we agree with Petitioners that the Board should consider the protection of the public, the carriers, and existing shippers, we conclude that the Board adequately weighed these issues. Petitioners argue that the Board's decision focused only on protecting service for existing shippers and not on protecting the TRRC and its investors. The Board first noted that the effect on existing shippers would be small because there were no current TRRC shippers and any shippers TRRC may service in the future are at liberty to return to using the longer BNSF route if necessary. The Board next evaluated the financial fitness of the TRRC. Based on a review of data submitted, the Board concluded that the TRRC was financially fit and able to construct the line and sustain operations and service. Petitioners submitted no evidence to refute this finding.

[26] Similarly, as to TRRC III, the Board performed a detailed financial analysis, taking into account construction costs, financing, and operating revenues. The Board considered the objections raised by Petitioners at that time, and performed a reasoned analysis. Petitioners argue that the Board evaluated the TRRC's financial fitness under too liberal a standard, but they do not contest any specific Board calculations, nor do they explain why the analysis fails under their

21470 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

perceived more-stringent standard. We affirm the Board's findings concerning the financial fitness of both TRRC II and TRRC III.

3. Clear Public Need or Demand

[27] Petitioners also argue that the Board misapplied the public need or demand factor in both TRRC II and TRRC III. Petitioners assert that the Board did not consider whether the need could be adequately met by the existing BNSF road, and complain that no existing shippers currently using BNSF wrote to support TRRC's application. However, in both its TRRC II and TRRC III decisions, the Board cited support for the project from a variety of sources, including coal producers, public utilities, and dairy farmers, who favored the project for its reduced transportation costs, as well as several Montana state officials, who favored the project because of increased employment and development and a broadened tax base. Petitioners do not cite to any authority, or explain why the public demand and needs of these parties are not properly considered over the needs of existing shippers. We hold that the Board did not err in concluding that there is a clear public need or demand for the railroad.

4. Harm to Existing Carriers

Finally, Petitioners argue that the Board misapplied the harm to existing carriers factor in granting both TRRC II and TRRC III. Petitioners contend that the Board should have not only considered direct harms to the TRRC's competitors—BNSF as to TRRC II and Dakota, Minnesota & Eastern Railroad Corporation (DM&E) as to TRRC III—but also should have considered possible harm to the communities that rely on the operation of the competitors. As an initial matter, Petitioners do not cite any authority supporting their claim that the Board must consider harmful effects other than those to direct competitors under this factor. *See, e.g., Indiana & Ohio Ry. Co.—Construction and Operation*, 9 I.C.C. 2d 783, 794

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21471

(1993). Furthermore, the Board addressed some of these concerns in its public interest section, which we will discuss *infra*, in Section II.B.5.

[28] In TRRC II, the Board concluded that BNSF's direct interests would not be harmed significantly because its railroad's only overlap with the TRRC railroad constitutes a small segment of the total haul. In TRRC III, the Board concluded that DM&E's direct interests would not be significantly harmed here because the DM&E and TRRC lines would serve different customers and transport different types of coal. Because BNSF actively supported TRRC in its TRRC III application, we do not find that the Board erred in failing to address the competitive harm to BNSF in TRRC III. Accordingly, the Board was not arbitrary and capricious in its harm to competitors findings.

5. Public Interest

In addition to the factors addressed *supra*, the Board also considered the public interest in its public convenience and necessity analysis. In particular, the Board considered (1) the loss of railroad jobs, (2) loss of mining jobs, (3) harm to ranchers, and (4) Native American interests. After examining each factor, the Board found that TRRC III would be in the public interest. The Board concluded that any lost jobs would be offset by new jobs created by the construction and operation of the new rail line, that the construction would foster the development of new mines and increase mining jobs, that ranchers would be adequately compensated for their lands, and that the TRRC will adhere to a Programmatic Agreement developed with the Native American interests in mind.

Petitioners object to this public interest analysis on procedural grounds. Indeed, Petitioners do not contest the Board's actual findings regarding the public interest. Instead, Petitioners argue that the Board primarily relied on environment documents in making its determination, and that the environment

21472 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

proceedings are conducted in a different manner from those where a public convenience and necessity determination is made.

[29] When conducting a public convenience and necessity test, the Board may “draw its conclusion from the infinite variety of circumstances which may occur in specific instances.” *N.M. Navajo Ranchers*, 702 F.2d at 232 (quoting *Parker*, 326 U.S. at 65). Thus, consideration of the public interest is permissible under this test. While Petitioners object to the evidence that the Board considered in its analysis, Petitioners fail to identify how they are prejudiced by the way the Board conducted its analysis. Moreover, they do not claim that they were barred from submitting the testimony of any witnesses or reports for the consideration of the Board. Based on the record before us, we conclude that the Board did not act arbitrarily or capriciously in addressing this issue.

C. Transportation and Environmental Division

In TRRC II, after the Board made its public convenience and necessity determination, the Board balanced the transportation concerns with environmental concerns. Petitioners argue that the Board’s balancing analysis violated 49 U.S.C. § 10901 because some factors considered “environmental” should have actually been considered under the traditional public convenience and necessity analysis. In particular, Petitioners contend that the railroad employee concerns and Native American issues should have been handled under traditional public convenience and necessity analysis.

As an initial matter, we note that Petitioners’ argument contradicts its position in TRRC III that these factors are not properly considered under the public convenience and necessity test. *See supra* Section II.B.5. As we previously noted, we agree with Petitioners’ position that these factors may fit more into a traditional public convenience and necessity analysis. However, as applied to TRRC II, Petitioners fail to show that

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21473

the Board's treatment of these factors under its environmental label led to an arbitrary or capricious finding.

As to railroad employees, the Board found that, at most, 57 BNSF railroad employees would be displaced by TRRC II. The Board found that TRRC would have to hire 64 employees to operate the new railroad. Thus, the Board concluded that the construction and operation of TRRC II would result in a net employment gain for railroad employees.

The Board addressed the Native American issues extensively during the development of the EIS. In its Notice of Availability of Draft Environmental Impact Statement, the Board dedicated over 20 pages evaluating the project's impacts to the Northern Cheyenne Indian Reservation and the Crow Indian Reservation. The Board's evaluation included socio-economic effects, as well as impact on tribal cultural values and religious practices.

[30] Petitioners fail to explain how the Board's treatment of these issues is insufficient simply because the analysis was conducted as part of the Board's environmental analysis. Petitioners cite no contradictory evidence in the record disputing the Board's findings, nor do the Petitioners articulate why the Board's decision regarding the public convenience and necessity analysis would have been different if the Board had used different procedural approaches. Thus, we conclude that the Board's treatment of these factors was not arbitrary and capricious.

D. Lack of an ALJ decision

Petitioners argue that the Board's decision in TRRC II should be set aside because the Board should have permitted an administrative law judge (ALJ) to issue the initial decision. After an ALJ conducted the hearings in TRCII, the Board's predecessor, the ICC, set the application for hearing pursuant to 49 C.F.R. § 1150.10(g).

21474 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

49 U.S.C. § 10327 sets the time line for “a division, individual Commissioner, employee board, or employee designated under Section 10305 of this title to make an initial decision.” 49 U.S.C. § 10327(b) (1994).⁸ This requirement for initial decision under Section 10327 may be voided, however, by the Board “on a finding that the matter involves a question of Commission policy, a new or novel issue of law, or an issue of general transportation importance, or that it is required for the timely execution of its functions.” *Id.* § 10327(c).

The Board reserves for itself consideration and disposition of “[a]ll investigations and other proceedings instituted by the Board, except as may be ordered in individual situations.” 49 C.F.R. § 1011.2. 49 U.S.C. § 10305 permits the ICC to “delegate to a division, an individual Commissioner, an employee board, or an employee appointed under Section 3105 of title 5, a matter before the Commission for action.” 49 U.S.C. § 10305(a) (1994).

Petitioners contend that the Board’s assignment of the case for hearing before the ALJ effectively delegated the case. Petitioners argue that, therefore, the Board could forgo having the ALJ issue the initial decision only if it finds that doing so would enable timely execution of the agency’s functions.

[31] Here, however, the Board never explicitly delegated authority to the ALJ to issue a decision pursuant to 49 U.S.C. § 10305. In particular, the Board notes that the ALJ’s only express grant of authority was “to conduct an oral hearing in Montana or Wyoming and to certify the transcript of the hearing to us to assist us in deciding the case.” “[U]pon completion of the record and consideration of the environmental impact, we will issue a decision.” Thus, under 49 U.S.C. § 10327, the ALJ was not required to issue the initial deci-

⁸Neither Section 10327 or Section 10305 was preserved following the enactment of the ICCTA in 1995.

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21475

sion. Furthermore, the Board went on to state that the case was already protracted, and given the importance of the case, the Board decided that it was better on balance to have the Board issue the initial decision directly. We agree with the Board, and conclude that Petitioners fail to show that the Board's decision was not within its statutory authority.

E. Labor Finding under 49 U.S.C. § 10901(e)

As to TRRC II, Petitioners also argue that the Board's decision must be set aside because it failed to address labor protection for railroad employees. Petitioners seek protection for BNSF employees. The Board responds that it is not required to provide employee protection for non-applicant employees—including the BNSF employees.

When TRRC II was filed, Section 10901(e) provided that:

The Commission *may* require *any rail carrier* proposing both to construct and operate a new railroad line pursuant to this section to provide a fair and equitable arrangement for the protection of the interests of railroad employees who may be affected thereby *no less protective of and beneficial to the interests of such employees than those established pursuant to section 11347 of this title.*

49 U.S.C. § 10901(e) (emphasis added) (1994).⁹ The plain language of the statute indicates that the Board has discretion whether to impose protections. *See Ry. Labor Execs.' Ass'n v. I.C.C.*, 914 F.2d 276, 278 (D.C. Cir. 1990) ("Thus, for transactions under section 11343, employee protection is mandatory, while under section 10901, it is discretionary."), cert. denied, 499 U.S. 959 (1991). Moreover, the Board gen-

⁹Even though TRRC II was decided post-January 1, 1996 on October 28, 1996, the ICCTA's revocation of Section 10901(e) does not apply to TRRC II due to the ICCTA's savings provision. *See supra* note 7.

21476 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

erally does not impose labor protections unless “exceptional circumstances are shown.” *Id.*

The Board also has consistently interpreted Section 11347’s employee protection to apply only to the applicant railroad’s employee—in this case, TRRC employees—and not to non-applicant railroads’ employees, such as BNSF workers. *See id.* at 280 (“[T]he Commission’s view that section 11347 does not require labor protection for employees of nonapplicant carriers like CNW is firmly supported by previous decisions in this and other circuits.”); *see also Crounse Corp. v. I.C.C.*, 781 F.2d 1176, 1192-93 (6th Cir. 1986) (“Every court of appeals that has considered the question has concluded that section 11347 does not apply to employees not directly involved in the transaction.”), cert. denied, 479 U.S. 890 (1986); *Missouri-Kansas-Texas R.R. Co. v. U.S.*, 632 F.2d 392, 411-12 (5th Cir. 1980), cert denied, 451 U.S. 1017 (1981).

[32] Here, Petitioners requested employee protection only for non-applicant BNSF employees. And, as previously noted, courts have consistently found that the protections of 49 U.S.C. § 11347 apply only to applicant employees. In light of Section 10109(e)’s explicit reference to the interests of the employees that would be established pursuant to Section 11347, we see no reason to read the two sections inconsistently.¹⁰ Thus, we conclude that Section 10901(e)’s employee protections do not apply to non-applicant employees, such as the BNSF employees in this case. In addition, even if the provi-

¹⁰Petitioners cite *Railway Labor Executives Association v. I.C.C.*, 784 F.2d 959 (9th Cir. 1986), to argue that the Ninth Circuit has provided for protection for affected non-applicant employees. However, in that case, Northwestern Pacific Railroad Company (NWP) wanted to abandon its railroad line and sold the interests in the line to two acquiring companies. *Id.* at 960. The primary issue presented was whether labor conditions should be imposed on the vendor NWP and the two acquiring companies. *Id.* at 969. The opinion is not apposite because it does not address any difference between applicant versus non-applicant employees.

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21477

sion did apply, Petitioners have not shown that they could meet the “exceptional circumstances” standard.

F. Viability of TRRC II

Finally, Petitioners contend that we should set aside the Board’s decision in TRRC II because even TRRC concedes that it is no longer viable from an operational and engineering standpoint. In TRRC II, the Board considered two alternative routes—the TRRC’s “preferred route” and the Four Mile Creek Alternative. The TRRC offered the Four Mile Creek alternative at the request of the Board’s SEA. The Board approved TRRC II, adopting the Four Mile Creek Alternative.

After the Board rendered its decision on October 28, 1996, TRRC filed a petition seeking to reopen the application on the basis that the Four Mile Creek Alternative presented serious operational issues, and was not viable. BNSF sought to intervene in the proceedings and supported TRRC’s argument. The Board denied the motion to reopen TRRC II because it found that the TRRC could have presented evidence of any defects during the review period.

At the time it decided TRRC II, the Board’s decision was not arbitrary and capricious. In responding to the Board’s decision respecting the Four Mile Creek Alternative, TRRC argued that it was concerned about the 2.31 percent grade for loaded unit trains on the Four Mile Creek Alternative, and that the route is 10 miles longer than its preferred route. The Board acknowledged TRRC’s concerns, but relied on the findings of the SEA that there were design and operating options that the TRRC could use to mitigate potential safety problems. The SEA also consulted with the Federal Railroad Administration (FRA), which concurred that the Four Mile Creek Alternative could be safely operated. Furthermore, the TRRC acknowledged that the line could operate, but that it would be faced with increased construction and operating costs. In a June 7, 1994 letter, the TRRC stated that it had

21478 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

undertaken an exhaustive review of possible routings, and that its engineering consultants, who had studied the routings, concluded that the TRRC's preferred alignment and the Four Mile Creek Alternative were the only feasible options.

[33] Thus, the evidence in the record shows that prior to October 1996, when the Board issued its decision in TRRC II, the Board properly considered the evidence presented and concluded that even the TRRC agreed at that time that the Four Mile Creek Alternative could be safely operated, albeit at an increased cost. Any new evidence that the TRRC and BNSF put forth regarding the new safety concerns was not before the Board when it issued its TRRC II decision, and we do not consider such evidence in our review. *See, e.g., Humane Soc. of the United States v. Locke*, 626 F.3d 1040, 1058 (9th Cir. 2010) ("As a general matter, judicial review of agency decisions is limited to the record considered by the agency in making its decision." (citing *Camp v. Pitts*, 411 U.S. 138, 142 (1973))). Thus, we hold that the Board did not act arbitrarily and capriciously in finding that the Four Mile Creek Alternative was viable when it rendered its decision in TRRC II.

[34] However, as Petitioners observe, the current viability of TRRC II may be important to the extent that the approval of the TRRC III application relied on the Board's TRRC II application as its "no-build" alternative. And unlike in TRRC II, by the time of the TRRC III application in 1998, the Board was aware of the safety, operational, and viability concerns that both the TRRC and BNSF had about the Four Mile Creek Alternative.

When the TRRC and BNSF raised new safety concerns, instead of investigating these concerns and reopening TRRC II, the Board denied the motion to reopen and suggested that if the TRRC desired to propose an alternative, it could do so by submitting a new application—TRRC III. In denying the motion to reopen, the Board rejected TRRC's "new" evidence

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21479

because it was not new. The Board stated that “[e]ither the concerns [the TRRC] addresses have already been extensively considered and disposed of by SEA or the Board or the evidence, relating to a construction project first proposed 5 years before SEA issued its FEIS, could have and should have been developed and presented earlier.” As for the evidence in the “new” studies conducted by the TRRC’s contractor, Mission Engineering, and studies conducted by BNSF, the Board stated that “[t]his evidence, although newly introduced, is not new because it also could have been presented earlier, but was not.” Thus, the record indicates that the Board may not have evaluated the TRRC and BNSF’s new evidence of safety concerns on the merits, but instead rejected the motion to reopen on the grounds that the evidence should have been presented earlier.

However, in evaluating the new TRRC III application, the Board still did not review the new evidence of operational and safety concerns, and instead considered the Four Mile Creek Alternative as “currently authorized,” and the “no-build” alternative considered in TRRC III. By the time the Board prepared the DSEIS in October 2004, the Board was well aware of the concerns that the TRRC and BNSF had raised about the viability of the Four Mile Creek Alternative from a safety and operational perspective. Moreover, in 2004, the Board was aware that the TRRC had asked to suspend proceedings due to financial problems in 2000, after which review was suspended for almost three years. The Board also did not revisit the financial viability of the Four Mile Creek Alternative when it considered it the “no-build” alternative in TRRC III in light of the changed financial circumstances. Thus, we conclude that the Board’s decision in TRRC III was arbitrary and capricious in light of the evidence it had before it regarding the TRRC and BNSF’s safety concerns that arose subsequent to the Board’s approval of TRRC II.

[35] To summarize our holdings for Section II, we find that the Board’s decision not to review new evidence of oper-

21480 NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR

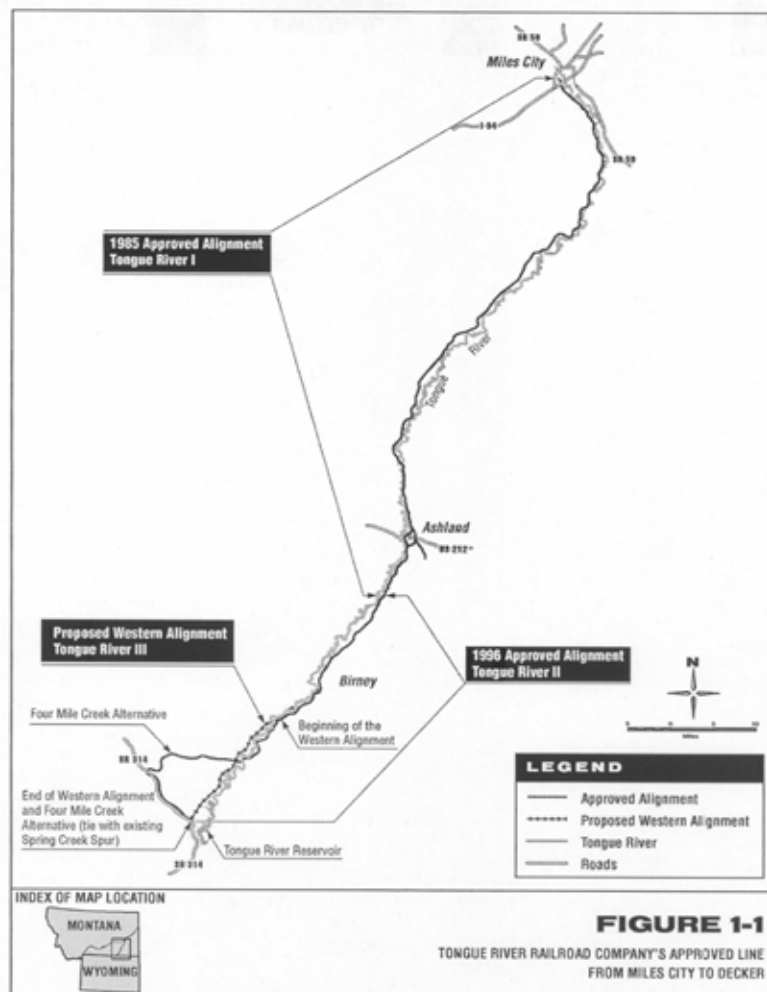
ational and safety concerns for the Four Mile Creek Alternative in TRRC III to be arbitrary and capricious, and we reverse and remand on that ground. We affirm the Board on Petitioners' other railroad claims.

CONCLUSION

For the foregoing reasons, we **AFFIRM** in part and **REVERSE and REMAND** in part. Each party shall bear its own costs on appeal.

NORTHERN PLAINS RESOURCE v. TONGUE RIVER RR 21481

APPENDIX



Footnote 74



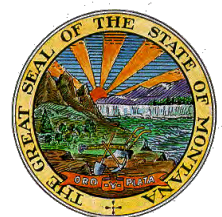
A Review of the Rationale for EC and SAR Standards

FINAL

August 5, 2011

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TABLE OF CONTENTS

Acronyms	iii
1.0 Background	1
2.0 Need for standards	1
2.1 Electrical Conductivity.....	2
2.2 Sodium Adsorption Ratio	3
3.0 Derivation of EC standards.....	3
3.1 Leaching fractions	4
3.2 Precipitation Correction Factor.....	6
3.3 The tributaries.....	8
3.4 Derivation of EC standard for non-irrigation season	9
3.5 Maximum EC standards	9
4.0 Derivation of SAR standards	10
4.1 The Rainfall Effect	11
4.2 SAR during the non-irrigation season	13
4.3 Maximum SAR standards	14
5.0 Decline in produced water quality between discharge and ultimate use	14
6.0 Standards Exceeded by Existing Water Quality	15
7.0 Nondegradation	15
8.0 Flow Based Permitting	16
9.0 Severability.....	16
10.0 Recommendation.....	16
11.0 References Cited	17
Appendix 1 - Calculation Of Electrical Conductivity Standards For Long-Term Irrigation On The Tongue/Powder/Rosebud Tributaries	21
References Cited in Appendix 1	24
Appendix 2 - Public Comment Categories Received, and Department Responses	27
Comments on Scientific & Technical Basis.....	27
Comments Addressing Legal Issues	30
Comments Addressing Administrative and Implementation Issues.....	31
Appendix 3 - Studies Not Cited In The Rationale	1

LIST OF TABLES

Table 1. Threshold of salinity (as electrical conductivity, EC) impacts to the growth of plants commonly grown in the Powder and Tongue River Basins, from Maas & Grattan (1999).	4
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LIST OF FIGURES

Figure 1. Assessing the maintenance leaching fraction under conventional irrigation methods.	5
Figure 2. Relationship between EC and SAR and the effect on infiltration of water into the soil (Hanson, et al., 1999)	12
Figure A-1. Precipitation Recurrence Frequency at Broadus, MT	22

ACRONYMS

Acronym	Definition
7Q10	Lowest flow occurring for a 7 day period every 10 years
ARM	Administrative Rules of Montana
CBM	Coalbed Methane
CBNG	Coalbed Natural Gas
CWA	Clean Water Act
DEQ	Department of Environmental Quality (Montana)
EC	Electrical Conductance or Electrical Conductivity
EC _E	Soil Water Salinity Threshold
EC _W	Irrigation Water Salinity Threshold
EPA	Environmental Protection Agency (US)
ESP	Exchangeable Sodium Percentage
ET	Evapotranspiration
MCA	Montana Codes Annotated
MPDES	Montana Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
S _{AC}	Final soil electrical conductivity
SAR	Sodium Absorption Ratio
S _{SW}	Initial salt present in soil water
TMDL	Total Maximum Daily Load
TY	Tongue-Yellowstone
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WET	Whole Effluent Toxicity
W _{SP}	Depth of total water in soil profile, inches

1.0 BACKGROUND

On April 15, 2010, the Board of Environmental Review (Board) gave notice of its intent to review Montana's water quality standards through the triennial review process, as required by the federal Clean Water Act, 33 U.S.C. § 1313 (c). Included in this review was a solicitation for public input on the standards for Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) in the Tongue and Powder River basins of Montana. This document provides an analysis of new information obtained during the Department of Environmental Quality's (Department) triennial review process relating to the standards for EC and SAR.

In 2003, the Board of Environmental Review adopted new rules to establish numeric water quality standards for EC and SAR for the Tongue River, Rosebud Creek, Powder River, and Little Powder River watersheds. The Board determined that rules were necessary to ensure that the designated uses of these waters for agricultural purposes would be protected during the development of coalbed methane (CBM). Environmental Protection Agency (EPA) approved the new rules later in 2003.

In 2006, the Board adopted numeric nondegradation criteria by designating EC and SAR as harmful parameters. This designation resulted in treatment of EC and SAR for purposes of nondegradation review in the same manner as all other constituents for which there are numeric standards.

The Board also made several other administrative and implementation changes to the rules. After several Wyoming gas producers sued the Department and the Board in state district court, claiming that there was insufficient scientific basis for the standards. EPA approved the changes in February of 2008. The State prevailed in that litigation, a decision which was later upheld by the Montana Supreme Court.

The Wyoming producers also sued EPA for approving Montana's standards in federal district court in Wyoming. That court found for the plaintiffs, and the standards were remanded to EPA for reconsideration. During EPA's reconsideration of the standards on remand, the Board initiated a triennial review of Montana's water quality standards. In the public notice initiating the review, the Board specifically requested comment on the standards and nondegradation requirements for EC and SAR. The Board also requested that, if any suggestions for revisions to those standards and nondegradation requirements were made, the technical basis for the request should be provided. To facilitate public input on this issue, the Department compiled about 40 new studies and research efforts that had been conducted since the Board's original rulemaking in 2003. These studies were made available to the public online, and a 60 day public comment period was held to solicit input from interested persons.

2.0 NEED FOR STANDARDS

- Water produced during CBM development has an average EC value of 2,200 $\mu\text{S}/\text{cm}$ and a SAR value often greater than 40. These values, especially the SAR values, are well above almost all of the ambient water quality values of the rivers and streams in CBM country. In addition, the SAR value of CBM water is well above the value that will adversely impact irrigated agriculture (Ayers and Westcot, 1985; Oster, 1994).

- The numeric standards chosen by the Board in 2003 were based on the analysis and recommendations of the Department, the available scientific data, and public comments received during rulemaking. The Department also hired Dr. James Oster, Extension Soil and Water Specialist (Emeritus) at the University of California at Riverside, to assist its technical staff during rulemaking.
- Studies conducted since the Board's adoption of numeric standards have confirmed the need for and value of Montana's regulatory approach.
- Paige and Munn (2010), found that salinity and sodicity issues with CBM produced water, in addition to issues of volume and flow, remain unresolved on the Wyoming side of the Powder River basin as development enters a second decade.
- There are identified needs to develop effective standards and management strategies to put the CBM product water to beneficial use and minimize impacts to soil, vegetation and water resources.
- Different approaches to regulate and dispose of the produced water have been developed by the four states along the Front Range; Wyoming, Montana, Colorado and New Mexico.
- Attempts by the Wyoming Department of Environmental Quality to develop an Agricultural Protection Policy based on end of pipe water quality standards remain controversial, and have been unsuccessful to date.
- Milligan, Reddy, and Legg (2010), found that in the Powder and Tongue River watersheds, produced water SAR exceeded the limit for irrigation water.
- Several public comments stressed the need for protective numeric standards. The EC & SAR standards are intended to protect riparian plants and crops that are irrigated with water from the rivers and streams and their tributaries. EC directly affects a plant's ability to uptake water while the SAR affects the soils in which the plants grow.

2.1 ELECTRICAL CONDUCTIVITY

Electrical Conductivity (EC) is a measure of the amount of dissolved solids (salts) in water and is generally expressed as microsiemens per centimeter ($\mu\text{S}/\text{cm}$), or decisiemens per meter (dS/m). For example, 2000 $\mu\text{S}/\text{cm}$ equals 2.0 dS/m . As the EC in the soil water increases, a threshold is reached where further increases in EC cause decreases in plant growth. The EC in the soil water is directly affected by the EC of the irrigation water, and it is important to distinguish between the two.

The EC of the soil water may be higher than the EC of the irrigation water because plants and evaporation remove water from the soil but do not remove salts. Unless salts are removed or leached from the soil by excess water, the concentration of salts in the soil will build up as irrigation water is added over time.

The water in excess of the plant and evaporative needs applied to a given area of soil is termed the leaching fraction. This excess water may be supplied by irrigation and by precipitation. However, that

portion of the water that is used by plants or which evaporates does not directly add to the leaching fraction. Precipitation or irrigation that occurs when the soils are saturated with water or that is stored in the soil when excess water is applied, does directly add to the leaching fraction.

2.2 SODIUM ADSORPTION RATIO

The sodium adsorption ratio (SAR) is a measure of the abundance of sodium relative to the abundance of calcium and magnesium in water. It is directly related to the amount of sodium that is absorbed by soils. A high SAR in irrigation water has the potential to impair soil structure and thus, the permeability of the soil leading to a lack of soil moisture. This is particularly so when the EC of the soil water or applied water is insufficient to counteract the negative effects of adsorbed sodium on soil structure. The SAR of irrigated soils equilibrates with the SAR and the EC of the applied irrigation water over time. That is, if the average SAR of the irrigation water is 5 and the EC is 1500 $\mu\text{S}/\text{cm}$, the SAR and EC of the soils at and near the soil surface will also be about 5 and 1500 $\mu\text{S}/\text{cm}$ within a few years.

3.0 DERIVATION OF EC STANDARDS

The Board adopted numeric standards for EC that are applicable during the irrigation season when the protection of water quality for agricultural use is a concern, and during the late fall and winter months when irrigation is not a concern. The time period between March 1 and October 31 was chosen for the irrigation season standards, because that is the time that irrigation in the affected area normally occurs.

Several comments suggested a detailed explanation of the scientific basis for the numeric standards. In order to derive standards for EC during the irrigation season, the Board considered the type of plants being irrigated in the affected area, the sensitivity of those plants to EC, the leaching fractions that are occurring, the correction factors that should be applied due to precipitation, and an adjustment for the rainfall effect.

The plants being irrigated in the affected area are summarized in **Table 1**. The list of crop types in the table was compiled by the Department in 2001 after receiving more than 200 responses to several surveys asking the agricultural community what type of plants they cultivate each year¹. Column 2 of the table lists the soil water salinity thresholds (as EC_e) for each of these plants from Maas and Grattan (1999), for example, 1000 $\mu\text{S}/\text{cm}$ for common beans. Another source, Ayers & Westcot (1985), contains these same values. When these thresholds are exceeded plant or crop yields begin to decrease. The standards for irrigation water EC_w are intended to protect the most salinity sensitive plants listed in **Table 1** that are produced in the affected area.

The most salinity sensitive crops irrigated with water from the Tongue River are strawberry, common beans, and carrots, with an EC_w threshold of 1000 $\mu\text{S}/\text{cm}$. The most salinity sensitive crops being irrigated with water from the Powder River are corn and alfalfa, with an EC_w threshold of 1700 and 2000 $\mu\text{S}/\text{cm}$, respectively. While alfalfa is the dominant crop on both the Tongue and Powder rivers, the naturally high quality of Tongue River water allows for the more sensitive crops to be grown, and the Board wanted to preserve that opportunity for farmers to continue growing sensitive crops even though alfalfa might tolerate higher concentrations of EC_w . There were about 325 acres of beans grown on the Tongue in 2009 (United States Department of Agriculture, National Agricultural Statistics Service, 2011),

¹ Unpublished Results from 2001 Grower Surveys, DEQ Files, and Federal Litigation Administrative Record

and about 275 of these acres were irrigated (United States Department of Agriculture Farm Service Agency, National Agricultural Imagery Program, 2009).

The marginal quality of Powder River water limits the opportunity to irrigate these more sensitive crops, so alfalfa (the dominant crop) was chosen as the target crop. There were about 16,800 acres of alfalfa on the Powder in 2009 (United States Department of Agriculture, National Agricultural Statistics Service, 2011), and about 4,300 acres were irrigated (United States Department of Agriculture Farm Service Agency, National Agricultural Imagery Program, 2009). In comparison, there were less than 100 acres of beans grown on the Powder in 2009 (United States Department of Agriculture, National Agricultural Statistics Service, 2011), and only 13 acres of irrigated beans were identified (United States Department of Agriculture Farm Service Agency, National Agricultural Imagery Program, 2009).

Table 1. Threshold of salinity (as electrical conductivity, EC) impacts to the growth of plants commonly grown in the Powder and Tongue River Basins, from Maas & Grattan (1999).

Assumed leaching fractions associated with each cultivation practice are shown. For each plant and leaching fraction, an increase in irrigation water salinity beyond the table value will cause plant yield decreases.

Name of Plant or crop		Irrigation water EC _w (μS/cm) : Threshold for no-impact to growth			
		Rosebud Creek [#]	Tongue River [#]	Powder & Little Powder Rivers ^c	Tributaries
		(Conventional Flood Irrigation)	(Conv. Flood & Sprinkler)	(Flood Irrigation)	(Water Spreader)
EC _E Threshold	15% Leaching Fraction	15% L.F.	30% L.F.	0% L.F.	
Strawberry	1000	(667) 1000	(667) 1000	1000	
Common Beans	1000	(667) 1000	(667) 1000	1000	
Carrots	1000	(667) 1000	(667) 1000	1000	
Radish	1200	(795) 1193	(795) 1193	1155	
Onions, Bulb	1200	(795) 1193	(795) 1193	1155	
Lettuce	1300	(860) 1290	(860) 1290	1250	
Clover (all types)	1500	(990) 1485	(990) 1485	1445	500
Orchard Grass	1500	(990) 1485	(990) 1485	1445	500
Corn & Sweet Corn	1700	(1126) 1689	(1126) 1689	1640	
Alfalfa	2000	(1330) 2000	(1330) 2000	2000	500

[#] On the Tongue River and Rosebud Creek, precipitation correction factor of 1.5 has been applied to values in the right hand, unbracketed column. Left hand column values in parentheses are uncorrected.

^c On the Powder and Little Powder Rivers, no precipitation correction factor has been applied.

See text for details of how these EC standards were developed.

3.1 LEACHING FRACTIONS

The standards for irrigation season also vary depending upon the type of irrigation used in the various watersheds and the differing leaching fractions that occur as a result of these irrigation practices. For the Tongue River, a leaching fraction of 15% is assumed as a basis for the EC standards. This is assumed because a leaching fraction of 15% is typical of conventional sprinkler and flood irrigation, which is used in the basin (Oster, J.D., personal communications 6/2/2002). There has been a progressive shift, in many areas, from flood irrigation practices to sprinkler irrigation (Wyoming Water Development Office, 2002). The Board assumed a 30% leaching fraction for the Powder River standards, because the work of deMooy and Franklin (1977) identifies the actual leach rate at the four to five foot root depth for alfalfa as 31% in the Powder River Valley. Finally, the Board also used a leaching fraction to derive EC standards

for Rosebud Creek because there is some conventional flood irrigation in the lower reaches (McRae, Clint, personal communications 6/21/2002).

The leaching fractions discussed above are averages and it is assumed that leaching is uniform throughout a field. In practice the leaching fraction is not uniform throughout a field and local impacts due to salinity can occur.

AGRICULTURAL SALINITY AND DRAINAGE

Maintenance Leaching

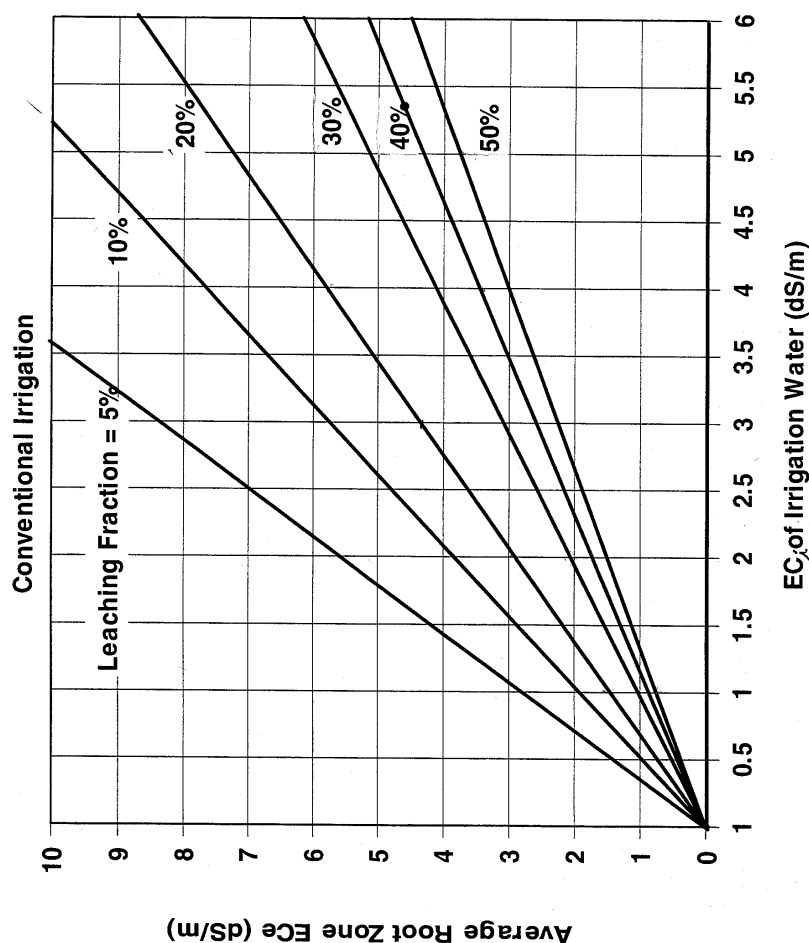


Figure 1. Assessing the maintenance leaching fraction under conventional irrigation methods.

Figure 1. Assessing the maintenance leaching fraction under conventional irrigation methods.

(United States Department of the Interior, Bureau of Reclamation, 2008). No net evaporation occurs outside the irrigation season (Western Regional Climate Center, 2010). At a leaching fraction of 15 Relationships between leaching fractions, irrigation water and soil water ECs (from Hanson, Grattan, and Fulton (1999))

Figure 1 illustrates the permissible value of EC in the irrigation water based upon a maximum permissible level of EC in the soil water and a leaching fraction. The figure is originally from Ayers &

Westcott (1985). At 15% leaching fraction, the relationship between soil water EC_E and irrigation water EC_w is defined by **equation 1** from that source:

$$EC_w = EC_E / 1.5 \quad (\text{eq. 1})$$

Thus, the 1000 $\mu\text{S}/\text{cm}$ soil water requirement for full yield for common beans, one of the most sensitive crops grown on the Tongue, equates to an irrigation water EC_w of 667 $\mu\text{S}/\text{cm}$.

Hanson, Grattan and Fulton (1999), the more recent study from which **Figure 1** is drawn, is described by Dr. James Bauder, one of the leading Montana experts in the field, as the authoritative source for salinity and drainage calculations (Bauder, James W., personal communications 8/25/10).

3.2 PRECIPITATION CORRECTION FACTOR

Equation 1 was used to calculate the "uncorrected" EC values given in parentheses for each leaching fraction listed in **Table 1**. These values represent the values of EC in the irrigation water that will cause no decrease in yield for sensitive crops that are grown in the Tongue and Powder River basins if precipitation is ignored. These values differ for the various leaching fractions.

In the Tongue River basin, where there is sufficient available water to fully support the needs of a crop, the diluting effect of precipitation must also be considered in order to correctly calculate EC values for irrigation water that will protect irrigated plants.

The average annual total precipitation at Brandenburg, Montana, chosen for its central location in the Tongue River basin, for the period from 5/1/1956 to 12/31/2009 is 14.44 inches. This value is within the range of the numbers reported for other stations in the Tongue and Powder River valleys for which there is data for the same time period. Average annual precipitation at these stations range from 15.51 inches at Lame Deer and 15.06 inches at Colstrip, to 14.38 inches at Forsythe and 13.34 inches at the Miles City Airport. (Western Regional Climate Center, 2011)

The diluting effect of this precipitation is dependent on the amount of irrigation water that is applied. According to deMooy and Franklin, the effective infiltration of precipitation in the region is about 80% (DeMooy and Franklin, 1977). That is, some of the precipitation simply runs overland to the nearest drainage without soaking into the soil. This is especially true during thunderstorms, which are common in the region. An effective precipitation of about 11.5 inches ($0.80 \times 14.44 = 11.55$) is a reasonable value for calculating the correction factor.

In the Tongue and Powder River basins, plant growth and evaporation require about 31 inches of water per growing season. No net evaporation occurs outside the irrigation season (Western Regional Climate Center, 2010). Sprinkler and conventional flood irrigation throughout the valley is generally applied in amounts that result in leaching fractions of about 15%. At a leaching fraction of 15% an additional 4.65 inches (15% of 31 inches) is needed during the growing season for a total of 35.6 inches. Of this, about 11.55 inches is normally supplied by effective precipitation, which has no salts. The remaining 24 inches of crop agronomic need is assumed to be met by the application of irrigation water. One operator on the Tongue confirms that he applies about two feet of water to his crop served by sprinklers (Fix, Mark, personal communication 9/29/2010).

Using the following formula, the salt content of about 24 inches of irrigation water is diluted by 11.5 inches of precipitation to calculate a correction factor of 1.5. For these reasons, the Board used a precipitation factor of 1.5 to derive the EC standards for the Tongue River basin.

$$\text{Correction Factor} = (\text{Depth}_{(\text{precipitation})} + \text{Depth}_{(\text{Irrigation water})}) / \text{Depth}_{(\text{Irrigation water})}$$

The correction factors are applied to the “uncorrected” threshold values (in parenthesis) for EC in the irrigation water to calculate the corrected threshold values. For example **Table 1** lists the irrigation water EC thresholds as 1000 $\mu\text{S}/\text{cm}$ ($667 \times 1.5 = 1000$) for no impact on the yield of strawberry, common beans (a commercial crop in the area) and carrots at a leaching fraction of 15%.

The standards for irrigation water EC for the Tongue River are also applied to Rosebud Creek due to the conventional flood irrigation in the lower reaches of Rosebud Creek, and to the Tongue River Reservoir because it stores Tongue River flows.

On the Powder River, water quality is highly variable. Irrigators on the Powder exercise selective use of water when it is of adequate quality. The challenge on the Powder is to protect the use of better water quality when that use is exercised.

Flood irrigation with a leaching fraction of 30% was assumed based on deMooy & Franklin’s (1977) study of irrigation of Powder River soils. Alfalfa is the commonly grown most sensitive crop and requires that soil water EC_e be maintained below 2,000 $\mu\text{S}/\text{cm}$. Some silage corn is also grown and it requires an EC_e below 1700 $\mu\text{S}/\text{cm}$ to avoid adverse effect on production. Because alfalfa dominates crop acreage on the Powder, and because more sensitive crops cannot be successfully grown due to variable water quality, it was used as the target crop.

The irrigation water EC_w for alfalfa on the Powder is 2000 $\mu\text{S}/\text{cm}$, based on a soil water EC_e of 2000 $\mu\text{S}/\text{cm}$, because at a leaching fraction of 30%, the relationship between soil water EC_e and irrigation water EC_w is one to one (**Figure 1**).

This value compares favorably to the reported threshold used by Powder River irrigators when applying water to their heavier soils. One farmer easily measures real-time EC with a salinity meter and uses this value as an indication of elevated SAR and generally will not divert water for irrigating these soils when EC exceeds about 2000 $\mu\text{S}/\text{cm}$ (Griffin, Bill, personal communication 8/24/2010). The USGS uses this same approach to report real-time SAR, using a regression equation that correlates EC and SAR at a number of water quality monitoring stations (Clark and Mason, 2007; 2006). Another irrigator reports that he goes by the USGS real-time data at Morehead, and doesn’t apply water that exceeds about 1500 $\mu\text{S}/\text{cm}$ on a new alfalfa crop (Gay, Glenn, personal communication 8/31/2010).

Calculation of a valid correction factor on the Tongue River and Rosebud Creek was possible because sufficient irrigation water is available to fully meet the agronomic need of the crop. The Powder and Little Powder Rivers are only marginally supportive of agricultural uses (Montana Department of Environmental Quality, 2008). There is not sufficient irrigation water of acceptable quality available to fully meet this need. The opportunistic use of Powder River water for irrigation generally doesn’t support full yields, and salts are more likely to accumulate in the soil. For these reasons, the 31 inch value for seasonal agronomic water uptake on the Tongue is not applicable to the Powder.

When water quality is adequate, the beneficial use of river water for irrigation is exercised. When water quality is not adequate, it is not exercised. The calculated EC_w of 2000 $\mu\text{S}/\text{cm}$ is the appropriate standard, and a valid correction factor cannot be applied.

3.3 THE TRIBUTARIES

Two comments addressed the need for standards protective of irrigation use on the tributary streams of the basin. EC levels in runoff events on tributaries have a high level of variability and can be elevated for extended periods of time (Sanders, Frank, personal communication 2011).

The methodology for arriving at the EC standard on the tributaries is contained in the Department's July 2002 Technical Basis (Montana Department of Environmental Quality, 2002). The approach has not changed, but is restated here, along with the calculations, documentation, and cites to the authoritative literature.

Irrigation on the tributaries consists largely of gates and canals on lower mainstems, and spreader dike systems on ephemeral tributaries. A leaching fraction of 30% is not reasonable for these systems (Oster, J.D., personal communication 6/2/2002). Leaching will occur only under wet spring conditions when the total infiltrated water from rain, snowmelt, and operation of the system exceed evapotranspiration by about 14 inches. This occurs about once out of every 8 to 10 years. In the intervening years salts, in the water applied accumulate in the upper 3 feet of soil increasing the salinity of the soil water.

One irrigator on Hanging Woman Creek, a tributary to the Tongue, reports that he normally only gets a single seasonal opportunity of a few days duration to access good water; some years this happens twice (Punt, Terry, personal communication 4/28/2009). The most common month for this better quality water to be available is February, when he often turns the water out on frozen fields.

The tributary EC standard was calculated using a basic soil water-salt mass balance calculation to calculate water quality necessary to protect against crop loss. Expected increase in salinity associated with water quality was calculated based on the following assumptions:

- 1) Alfalfa is the major crop grown with these systems.
- 2) The rate of water addition to the soil water is 6 inches per year.
- 3) The average initial soil water salinity is 0.25 dS/m (250 $\mu\text{S}/\text{cm}$.)
- 4) The water holding capacity of the soil is 2 inches per foot (United States Department of Agriculture Farm Service Agency, National Agricultural Imagery Program, 2009).
- 5) The salinity is measured on water extracts obtained on saturated soil pastes that have a water content that is two times higher than that of the soil.
- 6) Leaching only occurs once every 8 to 10 years, with no leaching during intermediate years.
- 7) No significant removal of salt in the harvested alfalfa.

The full calculations and citations to the literature are included in **Appendix 1**. The EC of the applied water should not exceed 500 $\mu\text{S}/\text{cm}$ in order to prevent salt accumulation in 8 years to 2.3 dS/m (2300 $\mu\text{S}/\text{cm}$) and in 10 years to 2.8 dS/m (2800 $\mu\text{S}/\text{cm}$). These levels can reduce the yield of alfalfa by 2.2 and 5.9% respectively. If the average EC of the applied water was 600 $\mu\text{S}/\text{cm}$, the average root-zone salinity could reach levels in 8 to 10 years that range from 2.6 – 3.2 dS/m (2600 – 3200 $\mu\text{S}/\text{cm}$). For alfalfa these salinities correspond to yield declines that range from 4.8 to 9.3%. Thus, 500 $\mu\text{S}/\text{cm}$ was selected as a monthly average value protective of target crop production.

Discharges of CBM produced water into ephemeral tributaries may result in perennialization of the stream bed. This is a concern unique to the tributaries, particularly in view of recent findings. Hendrickx and Buchanan (2009), found that perennialization of ephemeral tributaries causes elevated water tables, waterlogging, and elevated salinity in the root zones of vegetation and crops along the tributaries.

3.4 DERIVATION OF EC STANDARD FOR NON-IRRIGATION SEASON

The Tongue River Reservoir stores water all year round. Storage of non-irrigation season flows are released at the beginning of the irrigation season and are available for beneficial use. For this reason, the irrigation season limits apply year round in the Reservoir. The same rationale used to determine irrigation season standards for the Tongue River and Rosebud Creek apply to the standards set for the Tongue River Reservoir.

One comment questioned the need for a non-irrigation season standard. Non-irrigation season limits are adopted to protect riparian vegetation. Montana's narrative water quality standards prohibit concentrations of substances that are harmful to plant life (ARM 17.30.637 (1) (d)).

Water moving through the alluvium provides water for plant growth in the riparian zone. The riparian zone is continually exposed to water. In addition, in some places the water in the alluvium will tend to "wick" to the surface and evaporate leaving the salts at or near the soil surface. An increase in the salinity of the water may result in an increase in the accumulation of salt. Such an increased accumulation could impact the riparian plant communities.

Warrence, Bauder, and Pearson (2004) found that common riparian species such as service berry, dogwood, gooseberry, chokecherry, and aspen are sensitive to salinity, and vulnerable to effects at ECs greater than 2000 $\mu\text{S}/\text{cm}$. One of the main effects of salinity is the delay of germination and seedling development. This means that roots of emerging seedlings are exposed to a greater degree of stress than indicated by usual salinity measurements which are usually averaged from soil samples taken throughout the soil profile. Plant loss during this seedling stage can reduce the plant population density to below optimal levels and significantly reduce yields. Montana DEQ (Tetra Tech, Inc., 2003c) identifies chokecherry and dogwood as common riparian species on the Tongue, so a monthly average EC value of 1500 $\mu\text{S}/\text{cm}$ will provide non-irrigation season protection for Tongue River and Rosebud Creek. Other common riparian species such as snowberry, horsetail, watercress, willow, cattail, and cottonwood were found to be moderately sensitive, and susceptible to impacts at ECs greater than 4000 $\mu\text{S}/\text{cm}$ (Warrence, et al., 2004). Montana DEQ (Tetra Tech, Inc., 2003a) identifies snowberry and willow as common riparian species on the Powder, so a monthly average EC value of 2500 $\mu\text{S}/\text{cm}$ will provide non-irrigation season protection for the Powder and Little Powder Rivers.

The tributary EC value of 500 $\mu\text{S}/\text{cm}$ reflects the fact that soil salinity and crop yield on the tributaries is a product of an eight to ten year water cycle. Much of the water input that drives the tributary standard calculations occurs during the non-irrigation season.

3.5 MAXIMUM EC STANDARDS

Instantaneous maximum standards are generally adopted for those criteria for which there are numeric standards. Maximum values for irrigation season EC criteria were set at 150% of the average monthly value, up to a maximum of 2500 $\mu\text{S}/\text{cm}$. Two EPA guidance documents for the establishment of acute to chronic ratios for aquatic life support suggest that 150% of the chronic, average value is an appropriate

maximum (United States Environmental Protection Agency, 1991; 1994). While the EC and SAR standards address agricultural protection rather than aquatic life, the Department believes that a similar approach to the designation of maximum values is appropriate. It is not necessary for any maximum value to exceed 2500 $\mu\text{S}/\text{cm}$. CBM produced water generally does not exceed an EC of 2000-2300 $\mu\text{S}/\text{cm}$.

The tributary EC maximum value of 500 $\mu\text{S}/\text{cm}$ reflects the fact that soil salinity and crop yield on the tributaries is a product of an eight to ten year water cycle. The tributary EC calculation is based on a consistent quality of water input during this cycle, and cannot accommodate a temporary influx of poorer quality water.

4.0 DERIVATION OF SAR STANDARDS

A high SAR in irrigation water has the potential to impair soil structure and thus the permeability of the soil. One comment pointed out that three-fourths of the Tongue-Yellowstone (TY) irrigation district is on the Yellowstone River drainage, which contains a higher proportion of clay soils.

Soils in the Tongue and Powder River drainages are generally loams and silty clay loams (Bauder, 2008). The higher the clay content, the greater the soil's vulnerability to dispersion. Soils in the Yellowstone River floodplain irrigated by the TY Irrigation District are some of the most sensitive soils in the region. These soils are dominated by Yamacall loam and Kobase silty clay loam, but contain widely distributed Harlake and Lallie silty clays, which are probably the soils most susceptible to the effects of elevated SAR.

Montana DEQ, TetraTech, and EPA 2003 (Tetra Tech, Inc., 2003a; 2003b; 2003c) found clay dominated soils widespread in the Tongue, Powder, and Rosebud drainages, containing clay fractions up to 70%. However, The Tongue River Information Program (Agricultural Monitoring and Protection Program) study conducted by Fidelity E & P and the MT Oil & Gas Conservation Division found that clay soils are rare in the Tongue River drainage (Schafer, et al., 2007).

Suarez, Wood, and Lesch (2006), found that for bare clay soil an increase from SAR 2 to SAR 4 resulted in a significant decrease in infiltration rate. For loam soil the increase in infiltration time was significant at the SAR 6 level, and that for cropped soil the increases in infiltration time were statistically significant at SAR 6. In 2008 the researchers found reductions in water infiltration in both clay & loam soils at SAR above 2, and found that the reductions become more severe with increasing SAR. (Suarez, et al.,)

Some studies suggested that laboratory soil study protocols may yield inconsistent results. Harvey (2009) suggested that crushing, drying and sieving soil samples destroyed natural soils structure, although the Tongue River AMPP Study, (Schafer, et al., 2007), in which he participated, prepared soil samples for laboratory study in a similar fashion.

Suarez, Wood & Lesch (2008) found that hydraulic conductivity measurements taken from undisturbed cores at the end of the experiment were highly variable, suggesting that in-situ infiltration measurements may be preferred when evaluating SAR effects. The researchers noted that existing irrigation water quality criteria related to sodium and salinity are based primarily on short-term laboratory column studies (Suarez, et al., 2008). These earlier studies measured infiltration or hydraulic conductivity of disturbed soil under continuously saturated conditions. They suggested that application

of these standards to field conditions is uncertain, as it does not account for wetting and drying conditions, formation of crusts and impact of rain events, etc. Finally, the investigators concluded that the study results show a greater sensitivity to SAR than indicated by laboratory column studies and existing water quality criteria.

Schafer, Fehring, Brown (2007) found no statistically significant changes in EC & SAR in study soils irrigated with Tongue River water, which they described as loam soils with a maximum clay content of about 40%. This study found that there has been no apparent damage from irrigation with Tongue River water on less sensitive soils. Suarez, Wood, and Lesch (2006) examined soils with a clay content of 54% in arriving at their conclusions that reductions in infiltration occurred at SAR's as low as 4.

Bauder (2008) examined soils that varied in clay content from a low of about 28% for loam soils, up to 62% for clay soils on a lower Tongue River Valley farm. He found that dispersion/soil structure loss was specific to areas where soil was more than 30% smectite-clay, had higher cation exchange capacity values, and higher exchangeable sodium percentage values (ESP). This study examined the apparent collapse of a newly planted alfalfa crop following irrigation and then significant rainfall on very sensitive soil.

Other studies have investigated the application of CBM produced water directly to soils through land application/disposal and managed irrigation projects. While different from the application of river water containing produced water, they shed light on the effects of elevated SAR on soil structure.

Ganjugunte, Vance, and King (2005), found that EC and SAR of soil saturated paste extracts were significantly higher than control sites for five areas experiencing land application of CBM water, and that there was a significant buildup of sodium in irrigated soils as well as sodium mobilization within the soil profiles. They concluded that irrigation with CBM produced water significantly impacts certain soil properties. They state that applications of CBM water significantly increased soil EC, SAR, and ESP values (up to 21, 74, and 24 times, respectively) compared with non-irrigated soils. They observed that differences in soil chemical properties between an irrigated and non-irrigated coarse-textured soil were less than that of fine-textured soils, emphasizing texture as an important factor for salinity buildup. They found that pretreatment of CBM water using a sulfur burner and application of gypsum and elemental soil amendments reduced soil pH but did not prevent the build-up of salts and sodium. Finally, the researchers suggested that current CBM water management strategies are not as effective as projected.

Johnston, Vance and Ganjugunte (2008), reported that CBM water with no amendments significantly increased sodium concentration within the soil profile. Finally, they observed that in all treatment combinations, both EC and SAR increased significantly in the top two sampling depths.

4.1 THE RAINFALL EFFECT

The effects of elevated sodium adsorption ratios increase as the salinity of the water decreases (Hanson, et al., 1999). This relationship is shown in **Figure 2**.

Leaching of salts with excess irrigation water or from precipitation will lower the EC of the soil solution while its SAR will remain about the same. SAR of the soil water is controlled by the composition of the exchangeable ions (calcium, magnesium, sodium and potassium) adsorbed on the soil. The number of adsorbed ions is from 10 to 30 times greater than the number of ions dissolved in the soil water. Further, the total number of adsorbed ions does not change as a result of leaching. Consequently the

reduction in EC as a result of leaching can only have a small impact on the composition of the adsorbed ions and the SAR of the soil solution. It requires only a very small fraction of adsorbed sodium to be replaced by calcium, magnesium and potassium to maintain the SAR level in the soil water that was present before leaching occurred. In other words, the exchangeable ion composition buffers the composition of the soil water with the result that while leaching will reduce the EC of the soil water, the reduction in SAR will be far smaller. As a result, leaching as a result of a rainstorm can cause SAR problems in the surface soil because the stabilizing effects of salinity on aggregate stability is lost when the EC is reduced (Oster, J.D., personal communication 6/2/2002).

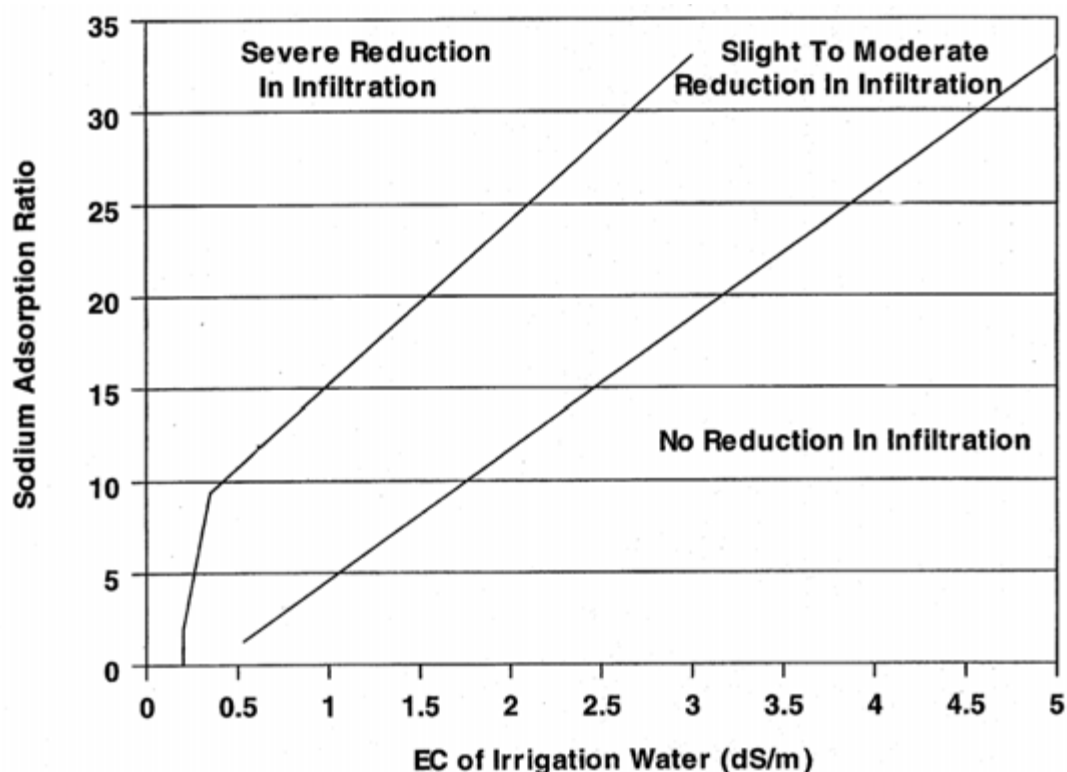


Figure 2. Relationship between EC and SAR and the effect on infiltration of water into the soil (Hanson, et al., 1999)

The lower line and the area below it reflect conditions of EC and SAR for which there will be no reduction in infiltration under normal field conditions. This line can be mathematically expressed as $SAR = (EC \times 0.0071) - 2.475$ (Shaffer, et al., 2001). Several commenters suggested using this formula to establish the applicable SAR standard. However, at an EC of 350 $\mu S/cm$ or less the formula would indicate that the allowable SAR would be less than zero. At ECs above 1000 $\mu S/cm$ a SAR limit would be greater than 5. A maximum of 5 is justified to consider the effects of rainfall on the EC and the SAR. When rainfall reduces the salinity in a soil irrigated with water with a SAR greater than 5, there is a risk that infiltration rates will be reduced.

On the Tongue and Rosebud, from **Figure 2**, a soil irrigated with water at 1000 $\mu S/cm$, could experience a decrease in EC down to 700 $\mu S/cm$, a 30% reduction. At an SAR of 3, no resulting decrease in infiltration would occur. Above an SAR of 3, a rainfall-induced reduction in EC to 1000 $\mu S/cm$ would result in a decrease in infiltration. Therefore, a rainfall effect-adjusted monthly average SAR of 3.0 was chosen for the Tongue and Rosebud, to correspond to the EC standard of 1000 $\mu S/cm$. The SAR

standards for the Tongue River are also applied to the Tongue River Reservoir because it stores Tongue River flows.

For the Powder and Little Powder, a rainfall event could reduce EC in soil irrigated with water at the 2000 $\mu\text{S}/\text{cm}$ standard to 1000 $\mu\text{S}/\text{cm}$, a 50% reduction. A rainfall effect-adjusted monthly average SAR of 5.0 was chosen to protect soils from this possible occurrence. The rainfall-effect adjustment for the Powder is greater than that for the Tongue, reflecting the higher EC's and SAR's, the lower availability of irrigation water, and the resulting greater ratio of precipitation to irrigation water applied.

Suarez, Wood, and Lesch (2008) reported that salinity and SAR criteria in earlier literature had been developed for conditions where irrigation was the only water source. The investigators found that these criteria may not be applicable where there is a combination of rain AND irrigation during the growing season.

Bauder, Hershberger and Browning (2008) found that decreases in EC upon leaching with distilled water were of greater magnitude than corresponding decreases in SAR, reinforcing supposition of sodium induced dispersion of fine textured soils as a consequence of rainfall following irrigation with water having salinity and sodicity levels equal to previously published irrigation guidelines.

For irrigation systems on tributary streams, infiltration of rainfall and snowmelt is crucial to maintaining soil salinity levels that have little or no impact on crops, particularly alfalfa. The EC of rainfall is near zero. Thus during a wet spring, the salinity of the soil surface can be low due to leaching by rain during times when there is no water of acceptable quality available for irrigation. The SAR of the captured runoff water should not result in adsorbed levels of sodium in the soil that will impede the infiltration of rain.

Schaefer, et al cites Ayers and Westcott (1985), and Hanson et al. (1999) in stating that for irrigation water with low salinity (EC between 200 and 700 $\mu\text{S}/\text{cm}$) the lowest SAR required to protect soil permeability is 3.0. For these reasons, a monthly average SAR of 3.0 during the irrigation season was adopted for tributary streams, to correspond with the EC standard of 500 $\mu\text{S}/\text{cm}$.

4.2 SAR DURING THE NON-IRRIGATION SEASON

Warrance, Bauder, and Pearson (2004) report that the two main risks of high sodium levels in soil water are toxic effects and impacts on plant growth from changes in soil structure. Excess sodium present in soil water can cause soil dispersal, especially in soils with high clay contents. Soil dispersal causes loss of soil structure and surface crusting. Surface crusting leads to reduced hydraulic conductivity, reduced water infiltration, and increased water runoff. These conditions can make seedling establishment very difficult, if not impossible. Decreased drainage from sodium-induced soil dispersal can also increase the sodicity in the root zone. If water containing salts is not allowed to drain below the root zone, the salt concentration of soil water will increase as plants take up water by transpiration and as evaporation occurs.

The authors found that sensitive and moderately sensitive riparian species require an SAR between 1.6 and 8 to protect against adverse impact from waterlogging and anaerobic conditions in riparian soils. Monthly average SAR limits of 5.0 on the Tongue and Rosebud Creek, where sensitive riparian species were inventoried were chosen to protect these riparian species during the non-irrigation season. Monthly average SAR limits of 6.5 on the Powder and Little Powder, where moderately sensitive species

were recorded were chosen. On the tributaries, a non-irrigation season SAR standard of 5 was retained, for consistency with other lower EC waters like the Tongue River.

4.3 MAXIMUM SAR STANDARDS

Short-time period, maximum (acute) standards are generally adopted in addition to longer duration (chronic) standards for those pollutants for which there are numeric standards. Maximum values for SAR criteria were set at 150% of the average monthly value. Two EPA guidance documents for the establishment of acute to chronic ratios for aquatic life support suggest that 150% of the chronic, average value is an appropriate maximum (United States Environmental Protection Agency, 1991; 1994). While the EC and SAR standards address agricultural protection rather than aquatic life, the Department believes that a similar approach to the designation of maximum values is appropriate.

5.0 DECLINE IN PRODUCED WATER QUALITY BETWEEN DISCHARGE AND ULTIMATE USE

CBM produced water may decline in quality between the point and time it is discharged, and where it ultimately winds up and may affect beneficial use. A number of studies since 2003 investigate this decline in quality. The decline makes protective standards even more important.

Jackson and Reddy (2007) reported that outfalls are chemically different from corresponding discharge ponds. They found that sodium, alkalinity, and pH all tend to increase, possibly due to environmental factors such as evaporation, while calcium decreased due to calcite precipitation. Most discharge ponds within individual watersheds tended to increase in sodium and SAR from 2003 to 2005.

Brink, Drever and Frost (2008) report that the interaction of CBM produced waters with semiarid Powder River basin soils can mobilize accumulated salts, which, through infiltration, can then reach the water table, potentially affecting the quality of the groundwater. They found that the mobilization of the soil based salts may render the composition of the water recharging the near surface groundwater very different from the initial chemical composition of the CBM produced water. The researchers went on to say that prolonged exposure to CBM produced water can cause the salinization and sodification of soils surrounding CBM produced water ponds and streams. They concluded that the high SAR of CBM produced water requires careful management to prevent sodification of irrigated soils when it is used as an irrigation source.

Patz, Reddy, and Skinner (2004) found that the dissolved calcium concentration of produced water decreased significantly in the downstream channel water, and SAR increased from 32.9 to 45.5 in downstream channels after the confluence of Sue Draw with Burger Draw in Wyoming.

They concluded that significant increase in SAR values of CBM discharge water in tributaries suggest a careful monitoring of salinity and sodicity is needed if CBM discharge water is used for irrigation in semiarid environments.

McBeth, Reddy, and Skinner (2003) found that mean EC of CBM produced water increased from 1.93 to 2.09 dS/m (1930 to 2090 $\mu\text{S}/\text{cm}$), between discharge point and pond waters in the Little Powder watershed. They concluded that release of CBM product water onto the rangelands of the Little Powder

may precipitate calcium carbonate (CaCO_3) in soils, which in turn may decrease infiltration and increase runoff and erosion.

6.0 STANDARDS EXCEEDED BY EXISTING WATER QUALITY

One public comment received by the Department noted that some recorded values in streams have values that exceed the proposed standards due to natural fluctuations of EC in the water throughout the year. When the natural EC values exceed the proposed EC standards, the provisions of 75-5-306, MCA would apply. This section of the Montana Water Quality Act allows for natural exceedances of standards by providing that: "It is not necessary that wastes be treated to a purer condition than the natural condition of the receiving stream as long as the minimum treatment requirements established under this chapter are met". Thus, if the standard is $1000\ \mu\text{S}/\text{cm}$ and the natural condition of the receiving water is $1500\ \mu\text{S}/\text{cm}$, a discharge could occur as long as the discharge did not raise the instream concentration above $1500\ \mu\text{S}/\text{cm}$. The Department will determine the natural condition of the stream at any given point in time through monitoring, interpretation of historic data, and modeling to ensure that water quality is not diminished under the guise of ambient conditions

7.0 NONDEGRADATION

Two commenters questioned why EC & SAR were found to be harmful parameters. The previous nondegradation criterion was based upon a narrative standard that provided that changes in existing surface and groundwater quality were non-significant if the changes would not have measureable effect on any existing or anticipated use, or cause changes in aquatic life or ecological integrity. All other DEQ-7 parameters for which there are numeric standards have numeric antidegradation criteria. Applying this policy to the numeric EC & SAR standards is necessary to protect the existing water quality of the Tongue River from degradation from CBM discharges. Designation of EC & SAR as harmful parameters merely applies numeric nondegradation thresholds, and makes the handling of the parameters consistent with all other constituents in DEQ-7.

The Montana Supreme Court has deferred to the Department's decision to treat harmful parameters with numeric standards in a consistent fashion, and rejected industry's proposal that the 2006 treatment of EC and SAR was novel. (*Pennaco Energy Inc. v. Bd. of Environmental Review*, 2008)

Since salinity and sodium as measured by EC & SAR are harmful to plants and soils, the appropriate nondegradation category for them is harmful. For harmful parameters changes in existing water quality are considered nonsignificant if the change is less than ten percent of the numeric standards and the ambient water quality of the receiving stream is less than 40% of the standard.

The Department does not consider the Powder and Little Powder Rivers to be High Quality Waters for salinity and subject to anti-degradation policy. These rivers exceed some of the numeric standards as much as 40% of the time. The Department also found that these waterbodies are impaired for salinity in the 2008 Water Quality Integrated Report (Montana Department of Environmental Quality, 2008).

8.0 FLOW BASED PERMITTING

One commenter suggested using flow-based permitting in implementing the numeric standards. In 2006, the Board adopted the section of the proposed rule that deleted the requirement to use flow based dilution when calculating MPDES permit discharge limits. The Board also rejected the proposal to require the DEQ to use the 7Q10 low flow value to calculate permits. These decisions give the DEQ the discretion to use either method or combination of the two and will make the analysis of CBM produced water permit applications consistent with other types of discharge permits.

9.0 SEVERABILITY

The nonseverability requirement was originally recommended by DEQ and adopted by the Board at the CBM industry's request. The intent was to prevent a situation in which narrative nondegradation criteria were struck down in court, leaving only the numeric standards in effect. Since the Board approved the replacement of the narrative nondegradation criteria with a conventional numeric approach, the nonseverability provision was no longer necessary.

10.0 RECOMMENDATION

The Department finds that the great majority of the literature published since 2003 supports the need for protective numeric standards, the manner in which they were developed, and the ultimate values that the Board adopted. The Department has considered all of the studies identified in its public notice dated April 10, 2010, as well as all public comments received, and determines that the rules adopted in 2003 and 2006 are adequate to protect beneficial uses and do not require any amendment. The Department has not identified any basis through these recent studies, nor through the public comments received, that argue re-visitation of the general approach, the numbers themselves, or the manner in which they are implemented.

In Montana water quality standards are adopted as rules by the Board of Environmental Review (Board). The Department summarized and presented the preceding information to the Board at their regularly scheduled May 13, 2011 meeting. Based on this information the Board determined that the existing standards are necessary to protect water quality and soils, and the Board declined to initiate rulemaking to modify the standards.

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APPENDIX 1 - CALCULATION OF ELECTRICAL CONDUCTIVITY STANDARDS FOR LONG-TERM IRRIGATION ON THE TONGUE/POWDER/ROSEBUD TRIBUTARIES

In southeastern Montana, the consumptive use of water on the tributaries is very different than the mainstem rivers. Irrigation consists largely of gates and canals on the mainstems, and spreader dike systems on the tributaries (Punt, Terry, personal communication 4/28/2009). Water is in short supply on the tributaries, application is very opportunistic, and limited to snow melt and rain driven events. The Department of Environmental Quality (DEQ) calculated water quality standards for tributaries to protect the long term irrigation use in these systems.

DEQ took a three step approach to calculate a protective electrical conductivity (EC) limit on the tributaries:

- Estimate the frequency of conditions resulting in leaching of the soil-profile
- Calculate the amount of salt accumulated between leaching events
- Determine the amount of salt accumulation possible without any significant crop loss.

Leaching of the majority of salts will occur only under wet conditions when the total infiltrated water from rain, snowmelt, and operation of the spreader dike system exceeds evapotranspiration (ET) by about 14 inches (American Society of Agronomy, 1999).

To determine the target crop to determine ET, information from the 2001 grower surveys was used. DEQ received more than 200 responses to several surveys asking the agricultural community what type of plants they cultivate each year. One of the surveys was targeted at tributary water use, and 15 of 16 respondents grew alfalfa². Actual evapotranspiration for alfalfa was calculated at 5.17 inches (DeMooy and Franklin, 1977) from the start of the growing season (April 1) through May 15th.

Total precipitation was estimated from data from National Oceanic and Atmospheric Administration National Climatological Data Center (National Oceanic and Atmospheric Administration, National Climatological Data Center, 2011). Data from the Broadus, MT station was used from 1920-2010. A conservative assumption was made that when mean monthly temperatures were at or below freezing, snow buildup occurred (November through March). The water content from this snow was added to rain through May to estimate the total available water for infiltration in the spring.

Water contribution from the spreader dike systems was estimated to be 6 inches per year. This assumption was based on an infiltration rate study in the Powder River drainage presented in deMooy and Franklin (DeMooy and Franklin, 1977). The average infiltration rate across 6 sites was 1.6 inches per hour. Assuming the duration of 4 hours of flooding for one event per year, approximately 6 inches of water would infiltrate into the soil profile.

Leaching events are promoted when 14 inches of water is available in excess of the 5 inches to meet ET (that is 19 inches of total water). This is achieved with the combined water contributions from the following sources: 6 inches from spreader dike irrigation systems, 6 inches held in the 3 foot soil profile (2 inches/foot) (Montana Testing Labs and Yellowstone-Tongue APO, 1978), and 7 inches precipitation in

² Responses to Grower Surveys Distributed by Montana Department of Environmental Quality, 2001

the form of snow melt and rain. A recurrence frequency was calculated for the total available water from precipitation at Broadus (Figure A-1).

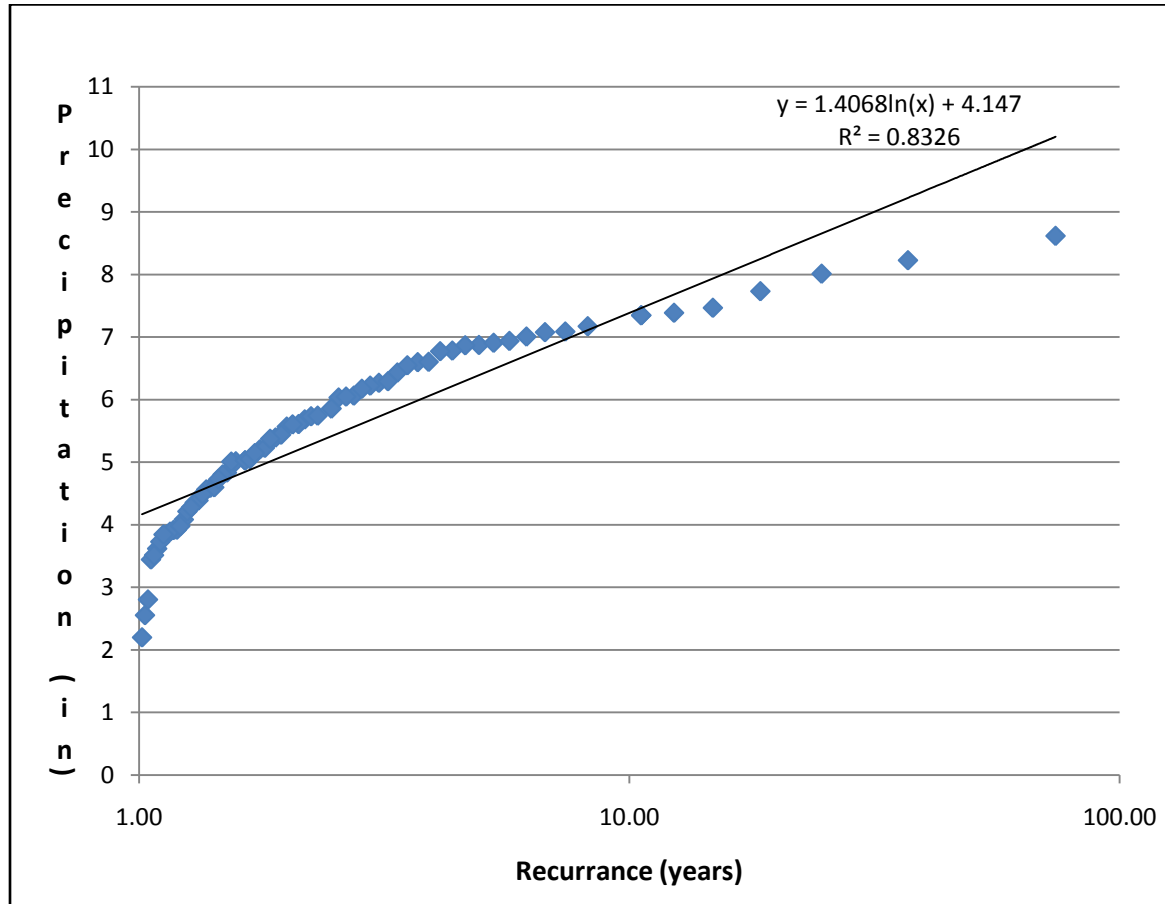


Figure A-1. Precipitation Recurrence Frequency at Broadus, MT

Sufficient water to drive the leaching events occurs once every 8 to 10 years. In the intervening years, when leaching does not occur, salts in the water applied with the spreader dike system accumulate in the upper 3 feet of soil.

A water-salt mass balance calculation (*eq. 1*) was used to determine the total salt accumulating from applied irrigation water between leaching events. This approach accounts for the initial salt present in the soil, plus salt added with irrigation water.

$$\left[\frac{S_{SW} + I_s * D}{W_{SP}} \right] = S_{AC} \quad (eq. 1)$$

where:

- S_{SW} = Initial salt present in soil water, [dS*inches]/m
- I_s = Salt water added annually through irrigation, [dS*inches]/m
- D = Duration between leaching events
- W_{SP} = Depth of total water in soil profile, inches

S_{AC} = Final soil electrical conductivity, dS/m

The mathematical steps to apply the equation are as follows:

- Salt accumulates in the upper 3 feet of soil
- Water holding capacity is 2" water/foot soil
- Therefore, total water in the soil is:
- 3' soil * 2"/foot = 6" total water

The average initial soil salinity was assumed to be 0.25 dS/m (250 μ S/cm) as measured on extracts from saturated soil pastes that have a water content two times higher than that of the soil. To correct the dilution factor, the initial soil quality was multiplied by 2.

Therefore:

$$0.25 \text{ dS/m} * 2 = 0.5 \text{ dS/m}$$

The initial soil salinity was multiplied by the total depth of soil water to quantify the total initial salt present in the 3 foot soil profile:

$$S_{SW} = 0.5 \text{ dS/m} * 6" \text{ total soil water} = 3 \text{ [dS*inches]/m}$$

500 μ S/cm (or 0.5 dS/m) was used as a surrogate water quality. The following calculation derives the amount of water and salt added annually through the application of irrigation water:

$$I_s = 0.5 \text{ dS/m} * 6" = 3 \text{ [dS*inches]/m added annually}$$

Leaching occurs at a frequency of once every 8 to 10 years (D).

Therefore ($I_s * D$):

$$3 \text{ [dS*inches]/m} * 8 \text{ years} = 24 \text{ [dS*inches]/m increase over 8 years}$$

$$3 \text{ [dS*inches]/m} * 10 \text{ years} = 30 \text{ [dS*inches]/m increase over 10 years}$$

The EC increase over 8 and 10 years of irrigation plus the initial soil EC ($[(I_s * D) + S_{SW}]$):

$$8 \text{ years: } 24 \text{ [dS*inches]/m} + 3 \text{ [dS*inches]/m} = 27 \text{ [dS*inches]/m}$$

$$10 \text{ years: } 30 \text{ [dS*inches]/m} + 3 \text{ [dS*inches]/m} = 33 \text{ [dS*inches]/m}$$

The calculated EC increase is contained in the 6 inches of water that is distributed throughout the 3 foot soil profile so we divided by 6 to determine the average condition of the soil profile.

$$S_{AC} = 8 \text{ years: } 27 \text{ [dS*inches]/m} / 6" \text{ water} = 4.5 \text{ dS/m}$$

$$S_{AC} = 10 \text{ years: } 33 \text{ [dS*inches]/m} / 6" \text{ water} = 5.5 \text{ dS/m}$$

The EC of the soil was converted back to EC of soil water extract by dividing by a dilution factor of 2:

$$8 \text{ years: } (4.5 \text{ dS/m}) / 2 = 2.3 \text{ dS/m}$$

$$10 \text{ years: } (5.5 \text{ dS/m}) / 2 = 2.8 \text{ dS/m}$$

After 8 to 10 years of irrigation with 500 μ S/cm (0.5 dS/cm) water, EC of soil water extract would range from 2.3 -2.8 dS/m.

The approach (**eq. 2**) used by Ayers (1975) and Ayers and Westcot (1976) was used to relate soil water extract quality to potential crop yield loss.

$$Y = 100 - b(EC_e - a) \quad (eq. 2)$$

where:

- Y = relative crop yield in %
- EC_e = salinity of the soil saturation extract (mmhos/cm)
- a = threshold value for the crop representing the maximum EC_e at which 100% yield can be obtained (mmhos/cm)
- b = yield decrement per unit of salinity, or percent yield loss per unit of salinity (EC_e) between the threshold value (a) and the EC_e value representing the 100% yield decrement

The following yield threshold values for alfalfa taken from Ayers and Westcot (1976) were used (1 mmhos/cm is equivalent to 1 dS/m):

100% yield for alfalfa: 2.0 dS/m EC_e

0% yield for alfalfa: 15.5 dS/m EC_e

The following method to calculate b was used:

0% yield – 100% yield = range of EC_es

Range of EC_es / 100 = EC_e per 1% loss

b * EC_e per 1% loss = 1dS/m

15.5 dS/m – 2.0 dS/m = 13.5 dS/m

13.5 / 100 = 0.135 dS/m per 1% loss

b * 0.135 dS/m = 1dS/m (solve for unknown)

7.4% loss per dS/m = b

The calculated relative crop loss (Y) range from 2.2% to 5.9% when applying 500 µS/cm water for 8 to 10 years. If 600 µS/cm was used as a surrogate quality of the irrigation, the range of crop loss would increase to 4.8% to 9.3%.

To protect the agricultural water supply designated use, a tributary electrical conductivity standard of 500 µS/cm is warranted.

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APPENDIX 2 - PUBLIC COMMENT CATEGORIES RECEIVED, AND DEPARTMENT RESPONSES

COMMENTS ON SCIENTIFIC & TECHNICAL BASIS

1. The standards cannot be met, because historic water quality sometimes exceeds them.

When the natural EC values exceed the proposed EC standards, the provisions of 75-5-306, MCA would apply. This section of the Montana Water Quality Act allows for natural exceedances of standards by providing that: "It is not necessary that wastes be treated to a purer condition than the natural condition of the receiving stream as long as the minimum treatment requirements established under this chapter are met". Thus, if the standard is 1000 $\mu\text{S}/\text{cm}$ and the natural condition of the receiving water is 1500 $\mu\text{S}/\text{cm}$, a discharge could occur as long as the discharge did not raise the instream concentration above 1500 $\mu\text{S}/\text{cm}$.

2. Montana has only established standards for the waters of CBM country. It seems they would be needed for all waterbodies in the state that support irrigation.

Narrative standards are in effect for salinity and sodium in all state waters. Numeric standards were adopted for the Powder River basin because there is a risk to beneficial uses from a significant volume of discharge of water with elevated salinity and sodium.

The use of the standards by the Department may result in their application on other waterbodies that have narrative standards. The Department would likely use the same approach used here in permit specific narrative standard translation.

3. What crop, soil, and irrigation methods were used to justify the standards? We do not believe MT has provided adequate scientific justification for the selected standards.

The original 2003 Technical Basis included an in depth analysis of crop tolerances, irrigation methods, leaching fractions, and rainfall effects. The updated rationale revisits this analysis with additional findings from recent literature and scientific studies, and response to public comment. The analysis provides a sound basis for the identification of appropriate numeric standards, and the manner in which they are implemented.

4. We see no scientific justification for the determination that EC & SAR are harmful parameters and thus subject to non-degradation criteria.

The existing literature and recent studies affirm that elevated salinity adversely affects plant's ability to draw water from the soil. Elevated SAR causes dispersal and reduction in infiltration in sensitive soils. All water quality parameters that have numeric standards are also subject to numeric nondegradation criteria, and EC & SAR should be no exception.

5. We question the need for non-irrigation season limits on the Powder and Little Powder. With no impoundments, this water will not be used for irrigation.

Non-irrigation season limits are adopted to protect riparian vegetation. Montana's narrative water quality standards prohibit concentrations of materials that are harmful to plant life (ARM 17.30.637 (1) (d)).

The updated Rationale includes recent studies that identify typical riparian species in each of the Tongue and Powder River basins, and the salinity levels that adversely affect their propagation and growth.

7. Montana should return to the narrative standards that serve almost all other states for beneficial use protection.

All states use a combination of narrative and numeric standards to protect beneficial uses and Montana is no exception. With respect to the EC & SAR standards, numeric standards provide more consistency and greater predictability in agency permitting.

8. If MT persists in using numeric values, it should adopt "sliding" or flow based values, which recognize that lower flows naturally result in higher EC and SAR.

The Department can and does use flow based permit limits in some situations. For instances when the natural water quality exceeds the standards, see the response to Comment No. 1.

9. If MT persists in using numeric values, it should adopt the Hanson formula to determine the SAR limit based on the existing EC.

The Board used a range of alternative methods, and relied on established literature, to identify the appropriate SAR for given ranges of ECs, including the Hanson formula for mid-range ECs. As identified in both the original 2003 technical basis and the updated Rationale, the Hanson formula is not effective in identifying meaningful SAR levels at very low ECs, when the existing authoritative literature identifies an SAR of 3 as the appropriate level. The formula is also ineffective at high ECs, when the indicated SAR level would leave soils vulnerable to the rainfall effect. In these cases, a maximum SAR level of 5 insures that a rainfall induced reduction in EC won't result in dispersal of sensitive soils.

10. Dawson Powder study concludes no change in Water Quality between '69 & '04; no studies on Tongue or Little Powder yet.

The Dawson Powder study found small changes in the quality of river flow when pre-1990 data were not included. 1990 is about the time that the Salt Creek oil fields in Wyoming ceased discharging poor quality produced water. Montana maintains that it is not appropriate to include this data, which was affected by human caused discharges which have ceased and will not occur again. Dr. Dawson also conducted a Tongue River analysis; see Comment No. 12.

11. Department has failed to explain why it changed its 2003 decision on numeric nondeg.

The comment responses in the 2006 Montana Administrative Rules rule adoption notice include an explanation of the decision to adopt numeric nondegradation criteria by designation EC & SAR as harmful parameters. The reasons for this decision include the Board's 2003 direction to the Department to come up with an alternative to the narrative nondegradation approach approved at

that time. The narrative nondegradation approach also left EC and SAR as the only two parameters, out of hundreds of parameters in DEQ-7, that had numeric standards and narrative nondegradation criteria. Finally, the Department concluded that the high quality water of the Tongue River required protection through the numeric nondegradation approach. This protection was lacking under the narrative nondegradation approach

12. The Dawson Tongue report concludes that there is no statistically significant difference in pre- and post-CBM EC at Stateline. The report notes a post-CBM increase in SAR, but states that there is insufficient monitoring information to determine whether the post-CBM development increase in SAR in the Tongue River at Stateline station is due to:

- direct discharges to the river from CBM development in Montana,
- discharge from Prairie Dog Creek (which has had CBM development in Wyoming and is characterized by higher SAR than the main stem)
- or a characteristic of the lower flows observed during the post-CBM development time period

The Department agrees with this interpretation of the Dawson Tongue report.

13. Irrigation water from the Tongue has damaged clay soils in the TY irrigation district.

The Department agrees with the conclusions of the study, Rainfall induced dispersion and hydraulic conductivity reduction under low SAR x EC combinations in smectite-dominated soils of eastern Montana by Dr. James W. Bauder. Among his conclusions are that the observed adverse effects were not necessarily linked to CBM discharges. He found, however, that application of even low SAR water can cause dispersion on very sensitive soils in combination with other events, such as significant precipitation.

14. Numeric standards that protect the broad range of soils in the Tongue and Yellowstone valleys are critical.

The Department agrees. The updated Rationale includes information on specific soil types found in the Powder River basin.

15. The science to date supports Montana's numeric standards and the designation of EC & SAR as harmful parameters.

The Department agrees.

16. Produced water accumulates in the Tongue River Reservoir; if there is insufficient spring runoff, it contributes to standards exceedances at gauging stations downstream.

The Board adopted year round standards for the reservoir so that higher non-irrigation season standards could not contribute to downstream exceedances when the stored water is released.

17. Three-fourths of the TY irrigation district is on the Yellowstone River drainage, which contains a high proportion of clay soils. These soils do not have adequate ability to disperse the level of sodium in CBM produced water.

The Department agrees, although the study referenced in the response to Comment No. 13 concludes that soils effects can occur even with low EC's under certain circumstances.

18. USGS grab sample SAR levels have increased by 27% pre- and post development.

The USGS has two trend analysis studies ongoing, one in each state. No results have been published yet. When they are, these study efforts will aid the identification of any water quality trends. State agencies, including the Department, also track water quality. If significant trends are identified, actions can be taken to mitigate them.

19. DEQ's hired expert during standards development concluded there is insufficient diluting flow in the tributaries; hence the EC standard of 500 dS/cm.

DEQ assumes the Tongue River tributary standard for EC of 500 μ S/cm is intended in this comment. It was necessary because in most years there is insufficient water to allow for leaching fraction on tributaries which renders the comparatively straight forward approach used for other waterbodies with leaching fractions inappropriate.

The Department has restated the analysis in the updated Rationale, with greater detail, documentation, and cites to the authoritative literature.

20. More acreage is being converted from flood to sprinkler irrigation; this fact supports the use of the 30% leaching fraction in arriving at the standards. In some cases, the 30% leaching fraction may be insufficient to flush salts from soils.

The Department agrees that the Tongue River drainage has experienced this conversion; it is described in the updated Rationale. However, a 15% leaching fraction was used for sprinkler irrigation, which is more efficient than flood irrigation. The numeric standards represent water quality levels for which sufficient leaching is available to flush salts from the root zone. That is, application of irrigation water meeting the numeric standards will result in sustainable agricultural practices.

21. The tribs are a source of high quality irrigation water. Maintaining the current standards will help prevent perennialization and preserve their value for supporting this beneficial use.

The updated Rationale includes cites from Hendrickx and Buchanan, 2009, which describe the adverse effects of perennialization of ephemeral drainages. The Department recognizes that changes in flow regimes can alter ecosystems and water quality.

COMMENTS ADDRESSING LEGAL ISSUES

Because these issues were raised in litigation, the Department does not feel it is appropriate to respond.

1. EPA conditioning of permits based on downstream state Water Quality Standards applies only to federal permits, not state-issued permits. Section 1342 (b) of the CWA does not require Wyoming to comply with Montana's water quality standards at the border.

2. Section 510 of the CWA explicitly preserves a state's jurisdiction over its own waters. This fact prevents Montana from directing Wyoming producers to meet limits more restrictive than those provided in the CWA.
3. As written, the rules impermissibly discriminate against Wyoming, contrary to the Commerce Clause.
4. Construing the CWA to allow Montana's water quality standards would intrude upon Wyoming's sovereignty.
5. The federal district court ruling does not void Montana's EC & SAR standards; they remain in effect.
6. The court did not rule on Wyoming & industry's argument that the standards violate Wyoming's sovereignty.
7. Wyoming & industry misconstrue the purpose of the Triennial Review when they reargue the points raised in their Pennaco briefs. EPA has not determined that Montana's standards are inconsistent with the CWA.
8. No changes should be made to the EC & SAR standards. EPA cannot approve the standards until it has reviewed the entire admin record, and even then approval is dependent upon Montana's review and upon the state's preparation of the requisite admin record.

COMMENTS ADDRESSING ADMINISTRATIVE AND IMPLEMENTATION ISSUES

1. EPA approval is also inappropriate at this time because the agency is conducting its own review of CBM produced water through its Effluent Guidelines Program.

Federal promulgation of ELGs, if it occurs, is likely a number of years away. Water quality based standards are necessary and appropriate at the present time. Ultimately, when both technology-based and water quality based standards exist, the more stringent of the two will be used in permitting decisions.

2. Will MT use average historic data or instantaneous data to determine background water quality in compliance determinations?

The Department would consider all data that is readily available to determine background.

3. The fact that CBM discharges in Montana actually control water quality at Stateline suggests that setting Montana standards for use in Wyoming's discharge permits is unwarranted.

We disagree that Montana discharges control salinity at the stateline USGS gaging station. MT DEQ's 2010 mass balance analysis on the Tongue River indicates that MT authorized discharges comprised about two to three percent of the salinity load at Stateline station under spring base flow conditions, and less at higher flows. Since this analysis, untreated discharges to the Tongue have ceased in Montana. Prairie Dog Creek in Wyoming, where there is extensive CBM development, contributes between 10 and 15% of the load in its surface flow, and probably more than that in subsurface flows through alluvial soils.

4. Discharges in Wyoming are degrading Montana waters. Montana needs to uphold their standards and promote federal compliance support.

The Department intends to resubmit the water quality standards for EPA review and re-approval.

5. The recent Montana Supreme Court decision appears to impose treatment requirements on produced water. Standards changes should not occur until agencies can determine the best method to comply with the Court's decision.

Montana's standards are still in effect in-state, and permits are being rewritten to accommodate the Supreme Court's decision on treatment.

6. The numeric standards in place for EC & SAR are protective of existing uses and in many cases overly protective given that the ambient water quality in tributaries exceeds these standards.

*Please see the response to **Scientific Basis comment No. 1**.*

7. The SAR standards should apply in the receiving waters, not at the end of the pipe. Addition of calcium salts to meet end of pipe criteria unnecessarily raises the EC of the receiving water.

Water quality standards and nondegradation criteria always apply to the receiving water. Water quality based effluent limitations always apply to the quality of the effluent prior to dilution in the receiving water (end of pipe) and are based on meeting the applicable water quality standard in the receiving water after giving consideration for any allowable dilution. If no dilution or mixing zone is granted, the water quality standards and effluent limits are equivalent.

8. In the absence of a proposed revision to an existing rule, it is not possible to offer specific comments.

Any changes proposed to the standards will include a separate rulemaking process including public comment on the proposed revision.

9. DEQ should provide an explanation of the relevance of each of the CBM studies listed on the agency's site, and how it supports the standards so that the public can comment on the Department's rationale.

In the updated Rationale, the Department has included references to and interpretations of the studies that relate directly to the technical issues addressed. The Department has also summarized the findings of each study which was reviewed for relevance to this effort, and posted online to support the public involvement process.

10. Existing discharge permits must apply nondegradation provisions when renewed.

The Department conducts a non-significance determination in accordance with ARM 17.30.705(2) and 706(2) based on the criteria adopted by the Board at the time the application is received. Water quality based effluent limitations based on nondegradation criteria may be imposed in the permit or approval, to insure that changes in water quality do not exceed the applicable non-significance

criteria. These limitations are maintained in subsequent permit renewals. New or revised nondegradation criteria adopted by the Board may be considered in subsequent permit renewals if the facility proposes to modify or increase the volume or nature of the discharge such that another non-significance determination is necessary.

11. The recent Supreme Court decision requires all produced water to be treated before discharge. If nondegradation and treatment are required, the produced water will no longer fail WET testing.

The Department agrees that treatment will likely reduce toxicity to levels that will routinely pass whole effluent toxicity tests. Once treatment is in place for CBM discharges, the WET testing protocols will serve the function of assuring that no acute or chronic toxicity remains after treatment.

12. Access points are necessary for the monitoring of water quality in the Tongue. Enforcement of the standards is impossible otherwise.

75-5-603, MCA authorizes the Department to enter upon any public or private property to investigate conditions relating to pollution of state waters, inspect any monitoring equipment, and sample any effluents.

13. Nondegradation requires that discharges that add more than 15% of the flow be deemed significant.

The Department agrees. However, ARM 17.30.715 (3) allows the Department to find these increases are nonsignificant based on the criteria of 75-5-301 (5) (c). These include the discharge's potential for harm, its quality and strength, its duration, and the character of the pollutant.

14. The standards should not be flow-based. At low flows, discharges are not curtailed, resulting in the majority of the flow in the river being produced water.

ARM 17.30.623 (2) (j) and 635 (1) (e) require that permit be issued based on the design flow or 7-day, 10-year low flow. Water quality based effluent limits must be based on this design condition to ensure compliance with water quality standards. When in-stream flow is below this level, the discharge is to be governed by the permit conditions developed and implemented in the permit.

15. When TMDL's are completed, it may be necessary to revisit the standards.

TMDL's represent the highest level of pollutants that a waterbody can experience and still meet standards and support its beneficial uses. The TMDL does not generally affect the standards, rather it is driven by them.

16. Montana permits have not taken into consideration the standards proposed by the Northern Cheyenne tribe; these standards need to be considered in drafting permits.

The Northern Cheyenne Tribe is presently revising its proposed standards and they have not yet been approved. When they are, the Department will insure that state issued permits comply with them.

17. The existing standards cannot be protective until MT DEQ and EPA enforce them.

Water quality standards serve as a basis for permit limits and are enforceable as permit limitations. Other provisions of state and federal statutes prohibit the discharge of pollutants without a permit. Water discharges and instream water quality are monitored for compliance by a number of methods, including field sampling, real time reporting, and industry self monitoring and reporting of discharge quality and volume.

18. MT should formally reopen the numeric standards.

The Department advertised the current review as open to any and all technical and public input. If changes to the standards are proposed, a separate rulemaking will be undertaken, which will include another call for public comment.

19. The inquiry of the Triennial Review is whether there is additional scientific or technical data that requires revision of the existing rules.

The Department agrees. Studies conducted between 2003 and 2010 were reviewed and analyzed in the Rationale.

20. The EC & SAR standards should not be part of the Triennial Review constituents proposed for EPA approval. A comprehensive rulemaking should be conducted, taking into account public comment and all scientifically sound data.

As elements of the State's water quality standards, the EC & SAR criteria are part of the Triennial Review. A rulemaking will be conducted if the Board determines that new information and data requires it. The Department's recommendation is that no rulemaking is necessary at this time.

APPENDIX 3 - STUDIES NOT CITED IN THE RATIONALE

The following studies posted to support public review were not cited in the Rationale, for the reasons provided:

- Bauder, James. 2007. Comments regarding *Potential Impacts of Coal Bed Methane Development to the Buffalo Rapids Project: Draft Agreement Between Montana and Wyoming*

Dr Bauder provides observations on other studies cited in the Rationale. These studies themselves are cited.

- Clearwater, Susan, Brady Morris & Joseph Meyer. 2002. *A Comparison of Coalbed Methane Product Water Quality Versus Surface Water Quality in the Powder River Basin of Wyoming, and An Assessment of the Use of Standard Aquatic Toxicity Testing Organisms for Evaluating the Potential Effects of Coalbed Methane Product Waters*

Dr. Clearwater's conclusions on the variability in quality of CBM produced water and the manner in which discharge might impact surface waters are valid and informative, but are not necessary to expand the Rationale's discussion of the numeric standards required to protect beneficial uses.

- Bauder, T.A., R.M. Waskom, and J.G. Davis. 2004. *Irrigation Water Quality Criteria*, Crop Series: Irrigation No. 0.506. Colorado State University Cooperative Extension.

Dr. Bauder's observations are cited in the Rationale from his other works.

- Suarezk, Donald L., James D. Wood, and Scott M. Lesch. 2006. *Effect of SAR on Water Infiltration Under a Sequential Rain-Irrigation Management System*. Agricultural Water Management Vol. 86.

Dr. Suarez's observations are cited in the Rationale from his original study.

- Steg, Ron, with technical support provided by TetraTech, Inc. April 6, 2007. *Tongue River Modeling Approach and Results*. U.S. Environmental Protection Agency, Region 8 Montana Operations Office.

At the time this report was published, the initial modeling results and analysis did not bear on the development of numeric standards to protect beneficial uses.

- Cannon, M.R., David A. Nimick, Thomas E. Cleasby, Stacy M. Kinsey, and John H. Lambing. 2007. *Measured and Estimated Sodium-Adsorption Ratios for Tongue River and its Tributaries, Montana and Wyoming 2004 – 2006*. USGS Scientific Investigations Report 2007-5072

This USGS study describes the regression method used to estimate SAR levels from the real-time EC readings. It is an important tool in the reporting of real-time data, but does not reflect on the development of numeric standards required to protect beneficial uses.

- Dawson, Helen E. 2007. *Pre- and Post-Coal Bed Natural Gas Development Surface Water Quality Characteristics of Agricultural Concern in the Upper Tongue River Watershed*. U.S. EPA, Region 8, Denver, CO

- Dawson, Helen. March 2007. *Powder River Watershed Stream Water Quality Pre- and Post-CBM Development*. US EPA Region 8.

Dr Dawson's conclusions about whether or not CBM development to date has had any measurable effect on the quality of surface waters in the Powder River basin do not bear on the development of numeric standards required to protect beneficial uses.

- Wang, Xixi, Assefa M. Melesse, Michael E. McClain and Wanhong Yang. December 2007. *Water Quality Changes as a Result of Coalbed Methane Development in a Rocky Mountain Watershed*. Journal of the American Water Resources Association Vol. 43, No. 6.

Although Dr. Wang's work provides valuable information on the measured effects of upstream CBM produced water management, the results do not bear on the development of numeric standards to protect beneficial uses.

- Healy, Richard W., Cynthia A. Rice, Timothy T. Bartos, and Michael P. McKinley. 2008. *Infiltration from an impoundment for coal-bed natural gas, Powder River Basin, Wyoming: Evolution of water and sediment chemistry*. Water Resources Research, Vol. 44.

Dr Healy's conclusions on the impacts of water infiltrating from CBM ponds are certainly cause for concern, but do not directly bear on the development of numeric standards required to protect beneficial uses in surface waters.

- Frost, Carol, Elizabeth Brink, Jason Mailloux, Shaun Carter, and Shikka Sharma. 2009. *Environmental Tracers Applied to Quantifying Causes in Water Quality Along the Powder River, Wyoming*.

Sharma, S. and C.D. Frost. March-April 2008. *Tracing Coalbed Natural Gas-Coproduced Water Using Stable Isotopes of Carbon*. Ground Water, Vol. 46, No. 2,

Campbell, Catherine E., Benjamin N. Pearson and Carol D. Frost. 2008. *Strontium isotopes as indicators of aquifer communication in an area of coal-bed natural gas production, Powder River basin, Wyoming and Montana*. Rocky Mountain Geology, Vol. 43, No. 2.

Dr Frost's isotope tracer studies are innovative and informative, but the amount of CBM produced water in the Powder River does not directly bear on the development of numeric standards required to protect beneficial uses in the Powder. Dr Frost's study on the geochemical evolution of produced water in the environment was cited in the Rationale.

- Gajegunte, Girisha K., Lyle A. King, and George F. Vance. 2008. *Cumulative Soil Chemistry Changes from Land Application of Saline-Sodic Waters*. Journal of Environmental Quality Vol. 37.

Dr. Ganjegunte's and Dr. King's observations from their 2005 study are cited in the Rationale.

- Patz, M.J., K.J. Reddy, and Q.D. Skinner. 2006. *Trace Elements in Coalbed Methane Produced Water Interacting with Semi-arid Epemeral Stream Channels*. Water, Air and Soil Pollution, Vol. 170.

Jackson, Richard E. and K.J. Reddy. 2007. *Trace Element Chemistry of Coal Bed Natural Gas Produced Water in the Powder River Basin, Wyoming*. Environmental Science and Technology, Vol. 41, No. 17.

Dr.s Patz, Reddy, and Jackson's observations are cited in other studies and journal articles referenced in the Rationale.

- Wang, Xixi and Wanhong Yang. 2008. *Modeling potential Impacts of Coalbed Methane Development on Stream Water Quality in an American Watershed*. Hydrological Processes, Vol. 22, No. 1.

Dr Wang's predictive modeling work does not directly bear on the development of numeric standards required to protect beneficial uses in surface waters. Dr. Wang's JAWRA study was cited in the Rationale.

- Milligan, C., K.J. Reddy, K.J. and D. Legg. 2010. *Monitoring Geochemistry of CBNG Produced Water Outfalls, Disposal Ponds, and Sediments in the Powder river Basin, Wyoming*. Chapter 8. Coalbed Methane: Energy and Environment. Nova Science Publishers, New York.

Recommendations for the monitoring of produced water do not directly bear on the development of numeric standards required to protect beneficial uses. Two other studies conducted by Dr. Reddy were cited in the Rationale.

