New Mexico Wood Pellet Feasibility Study

Prepared for

San Miguel County

On behalf of

Johnson Timber, Inc.

Prepared by

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INTRODUCTION

SWCA Environmental Consultants (SWCA) has been selected to develop a feasibility study that analyzes the potential to support up to two wood pellet production facilities in New Mexico. Manufacturing the wood pellets requires a sufficient supply of wood fiber and plastic resins (#2 and #4). In order for a production facility to be economically and financially feasible, there needs to be at least 400,000 tons per year of raw, green wood fiber material and 38,000 tons per year of plastic resins available per processing facility. Assuming an average initial moisture content of 37%, this would entail 252,000 tons per year of oven-dry forest biomass per processing facility. Dry biomass is used throughout this report.

In order to determine if and where this raw material is available, SWCA has conducted a review of the available wood fiber supply in three different areas within the state that we believe would have sufficient supply to support the requirements. A geographic information system (GIS) database was developed to acquire, manage, analyze, and present the data for this preliminary assessment.

POTENTIAL SITES

Three potential locations were selected for analysis: Albuquerque, Alamogordo, and Las Vegas, New Mexico. For the purposes of analysis, three distances from each city (50, 100, and 150 miles) were analyzed for harvestable biomass. Harvestable biomass was determined by subtracting protected areas and areas of steep slopes from calculated values of total available biomass.

FEEDSTOCK SUPPLY

The feedstock supply of both wood fiber and plastic resins needed to support up to two wood pellet production facilities in New Mexico is analyzed below.

WOOD FIBER

BIOMASS AVAILABILITY

To determine the wood fiber availability for each site, a GIS database was created to analyze the biomass available from the 50-, 100-, 150-mile radius buffers (Figure 1). Area calculations were performed for each of the buffers and broken down by forest type, land ownership, and slope. Data sources used for this analysis included the U.S. Forest Service (USFS) Forest Inventory and Analysis (FIA) Program – National Forest Type Dataset, a current New Mexico land ownership database, and a statewide slope model derived from a 60-meter digital elevation model (DEM).

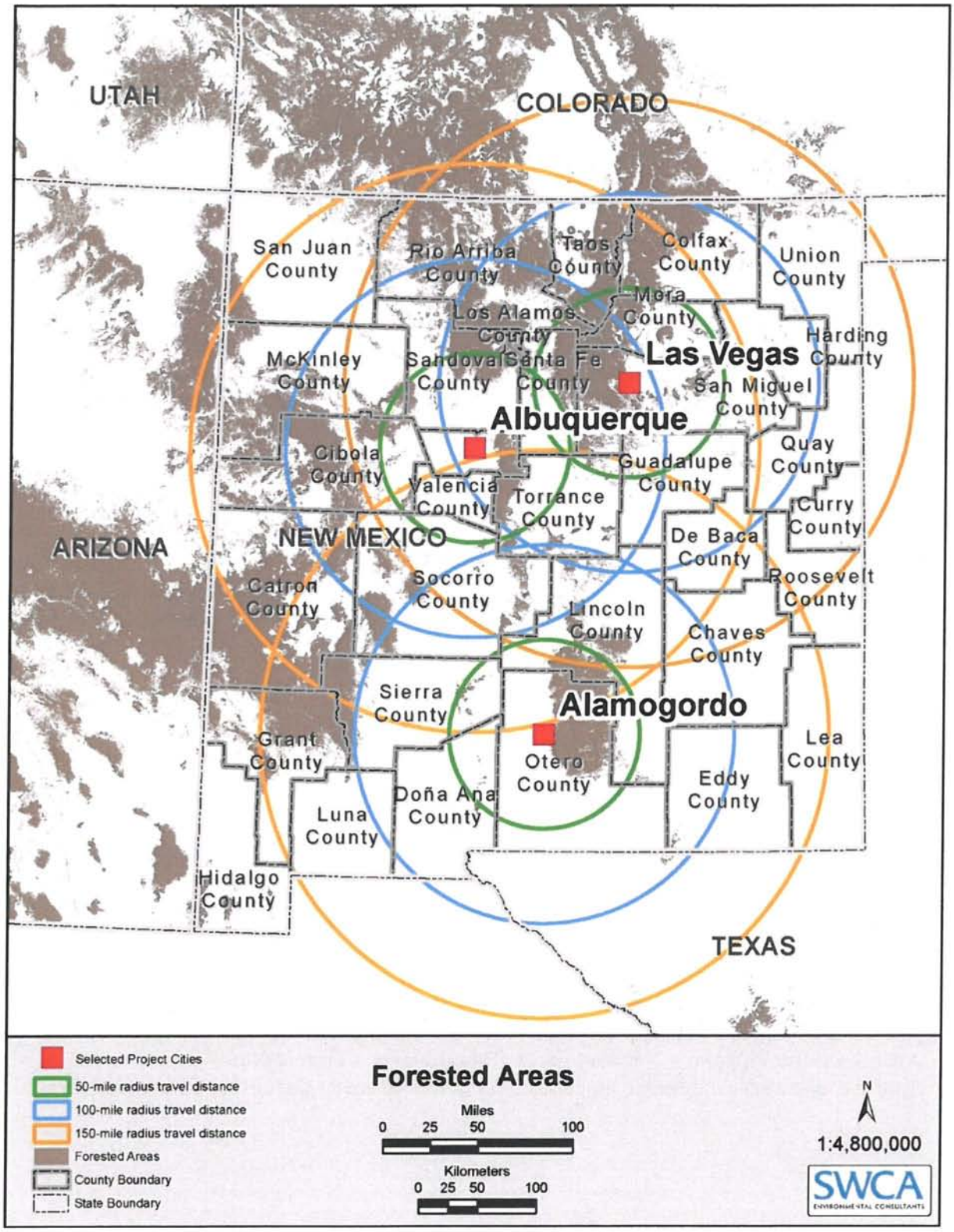

Figure 1. Map of selected cities (Albuquerque, Alamogordo, and Las Vegas), with forested areas identified within 50-, 100-, and 150-mile radius travel distances.

The FIA Program (USFS 2016a) samples spatially distributed forest biomass data across all forest types and landownership (private, state, federal, etc.) across the nation. The exact point data are not available, but averaged data can be queried for geographic areas of interest. This data source is the basic data used for all U.S. forest biomass studies.

FIA data were downloaded for the geographic areas of interest and included tons of biomass summarized by forest cover type (Figure 2). Forest cover types include Piñon-Juniper, Ponderosa Pine, Douglas-Fir, Oak Shrubland, Aspen, and Fir-Spruce. Data from the most recent collection (2014) was used. These data were downloaded using the Forest Inventory Data Online and EVALIDator web tools on the FIA website (Miles 2016).

For this analysis, three distances from each city (50, 100, and 150 miles) were analyzed for total harvestable biomass. Total tons of biomass per forest type were divided by total acres of each forest type to yield average tons of biomass per acre for each forest type. This approach could be biased in unknown ways by possible idiosyncrasies in the distribution of biomass on the landscape. Biased data could result in systematic over- or under-estimation of harvestable biomass.

Forest type data were acquired from the FSGeodata Clearinghouse (National Forest Type Dataset 2016). This geospatial dataset was created by the USFS FIA Program and the Remote Sensing Applications Center (RSAC) to show the extent, distribution, and forest type composition of the nation's forests. The dataset was created by modeling forest type from FIA plot data as a function of more than 100 geospatially continuous predictor layers. Among the predictor layers used were DEMs and DEM derivatives, Moderate Resolution Spectroradiometer (MODIS) multi-date composites, vegetation indices and vegetation continuous fields, class summaries from the 1992 National Land Cover Dataset (NLCD), various ecologic zones, and summarized PRISM climate data.

Land ownership data were used to further analyze potential biomass availability (

Figure 3). Protected areas that preclude harvest were identified and included areas such as National Park Service lands, designated wilderness areas, and U.S. Department of Defense lands. These areas were excluded from harvestable biomass calculations.

GIS maps of slope were derived from a 60-meter resolution DEM (

Figure 4). Areas above 40% slope were excluded from further analysis because it is not standard practice to use mechanical harvesting equipment on steep slopes in New Mexico.

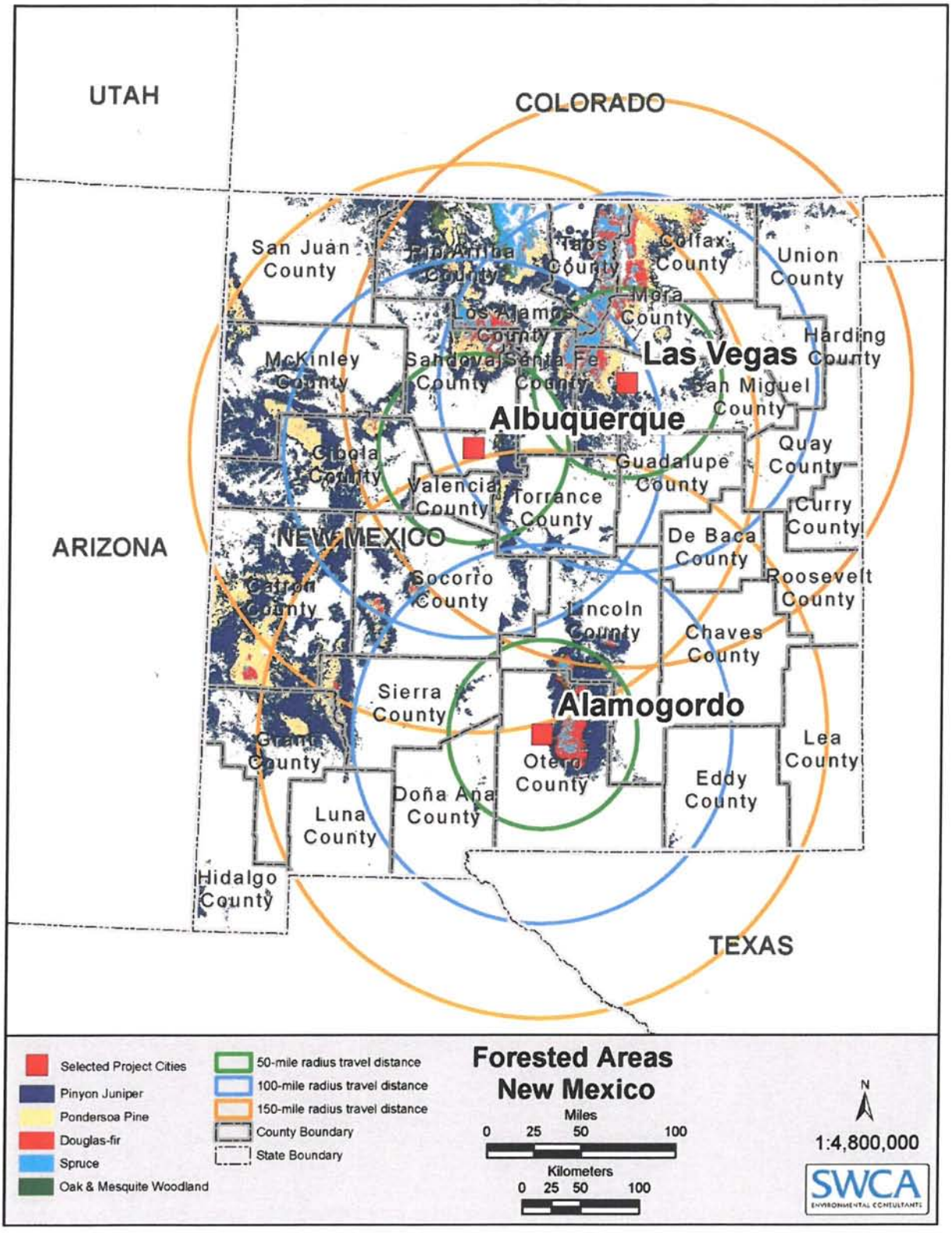

Figure 2. Forested regions of New Mexico by forest type. Aspen and Mixed Oak are not visible at this scale.

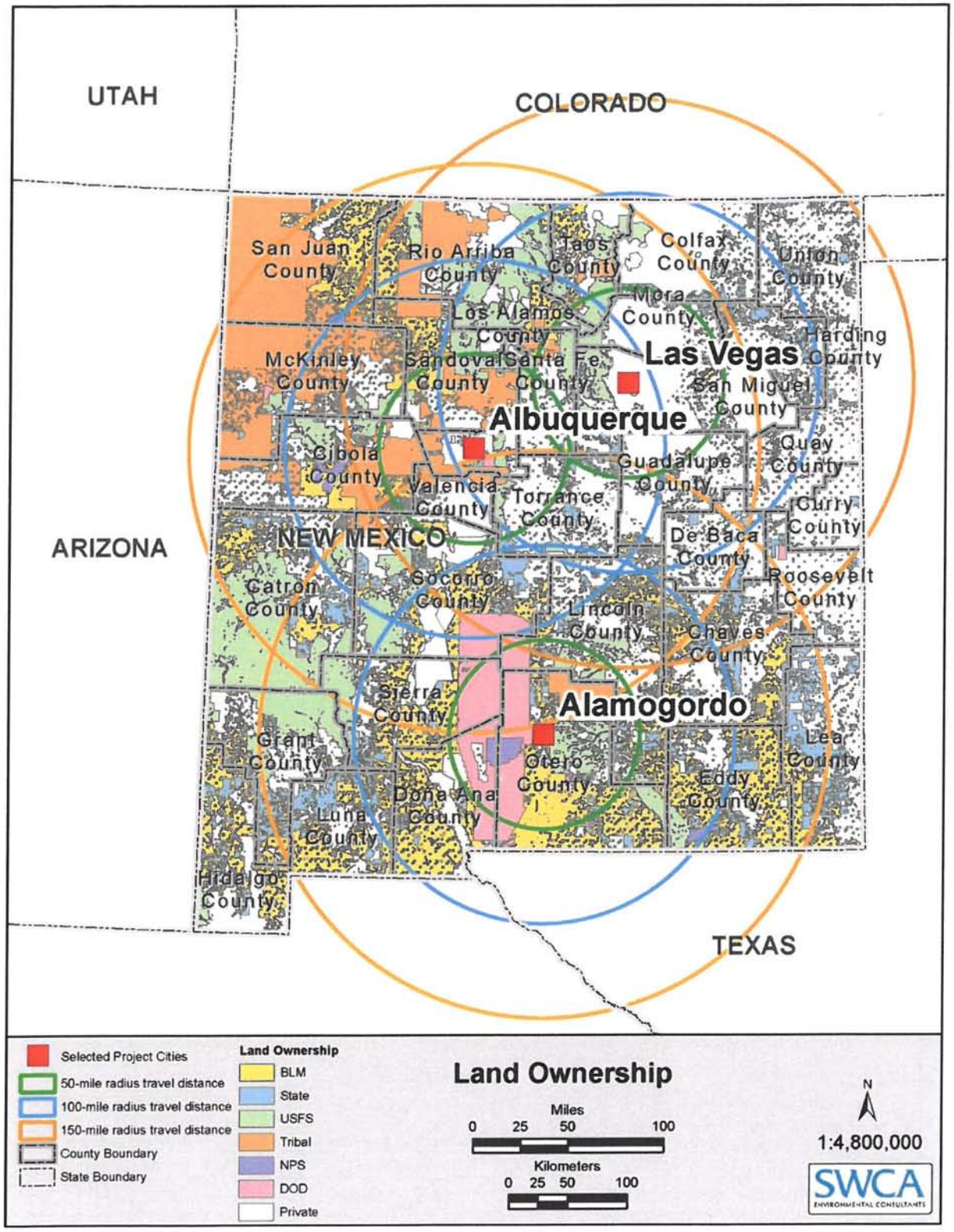

Figure 3. Land ownership in New Mexico.

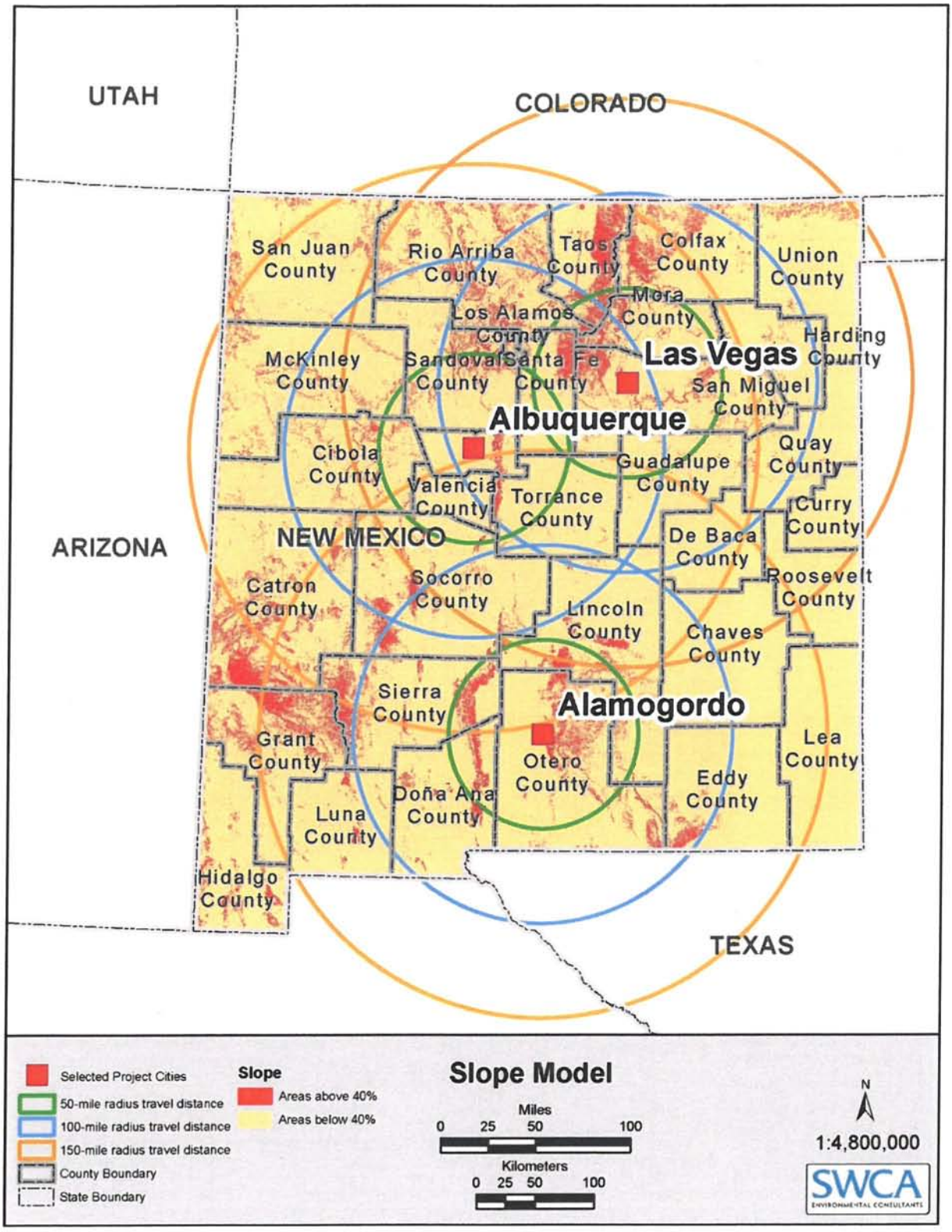

Figure 4. DEM-derived slope map of New Mexico, illustrating slopes greater than 40%.

Results

The results of this study are summarized in the tables below and show the total forest biomass calculated based on FIA data across the three analyzed sites (Albuquerque, Alamogordo, Las Vegas) (Table 1). For example, total forest biomass exceeds 15 million tons of oven-dry weight within 50 miles of Albuquerque; however, after subtracting reserved lands and prohibitively steep slopes the data reveal that there is much less biomass actually available (about 9.5 million tons of harvestable forest biomass) (see

Table 2).

These results show that the greater Las Vegas area has the most potentially harvestable biomass within 50 miles of the city center. Albuquerque has the least potentially harvestable biomass within 50 miles of the city center, although it has almost as much as Las Vegas within 100 miles, and much more than any other city at 150 miles. This result is partially an artifact of this analysis, which only included forest biomass within the state of New Mexico; if forest biomass in southern Colorado were included in the analysis, it is possible that Las Vegas would equal or exceed Albuquerque at the 150-mile radius.

Table 1. Total Forest Biomass, by City and Radius, in Dry Tons

City	50 Miles	100 Miles	150 Miles
Albuquerque	15,976,596	121,461,603	243,218,905
Alamogordo	22,537,997	32,780,727	75,097,523
Las Vegas	50,054,947	137,027,680	179,061,744

Table 2. Calculated Harvestable Biomass, by City and Radius, in Dry Tons

City	50 Miles	100 Miles	150 Miles
Albuquerque	9,536,963	71,033,384	163,861,783
Alamogordo	17,998,279	23,235,004	45,714,293
Las Vegas	27,062,725	83,684,273	116,169,743

Most of the potentially harvestable acres consist of Piñon-Juniper and Ponderosa Pine forests that are located primarily across private and USFS lands (Figure 5). Other large landowners include tribal lands administered by the Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM) lands, and State of New Mexico lands. Although Piñon-Juniper forests typically contain less biomass per acre than other forest types, these forests are typically much more extensive and accessible. Ponderosa Pine forests are much less extensive than Piñon-Juniper forests, but much more extensive than any other forest type, and they typically contain much more biomass per acre than Piñon-Juniper forests. Aspen, Douglas-Fir, and the woodland hardwoods group (which includes Gambel and other oak species) occupy much less total acreage.

At each distance from Albuquerque, Piñon-Juniper forests contain more than half of all of the harvestable biomass, with Ponderosa Pine forests typically containing a quarter of the remaining

biomass. Piñon-Juniper forests contain proportionally less biomass around Alamogordo and Las Vegas, but are still the dominant forest type at all distances from these cities (Figure 6). Within 50 miles of Las Vegas, more than two-thirds of the Piñon-Juniper and Ponderosa Pine biomass occurs on private lands. In fact, there are more tons of Piñon-Juniper and Ponderosa Pine biomass available on private lands within 50 miles of Las Vegas than there are in all of the forest types and all landowners within 50 miles of Albuquerque and Alamogordo.

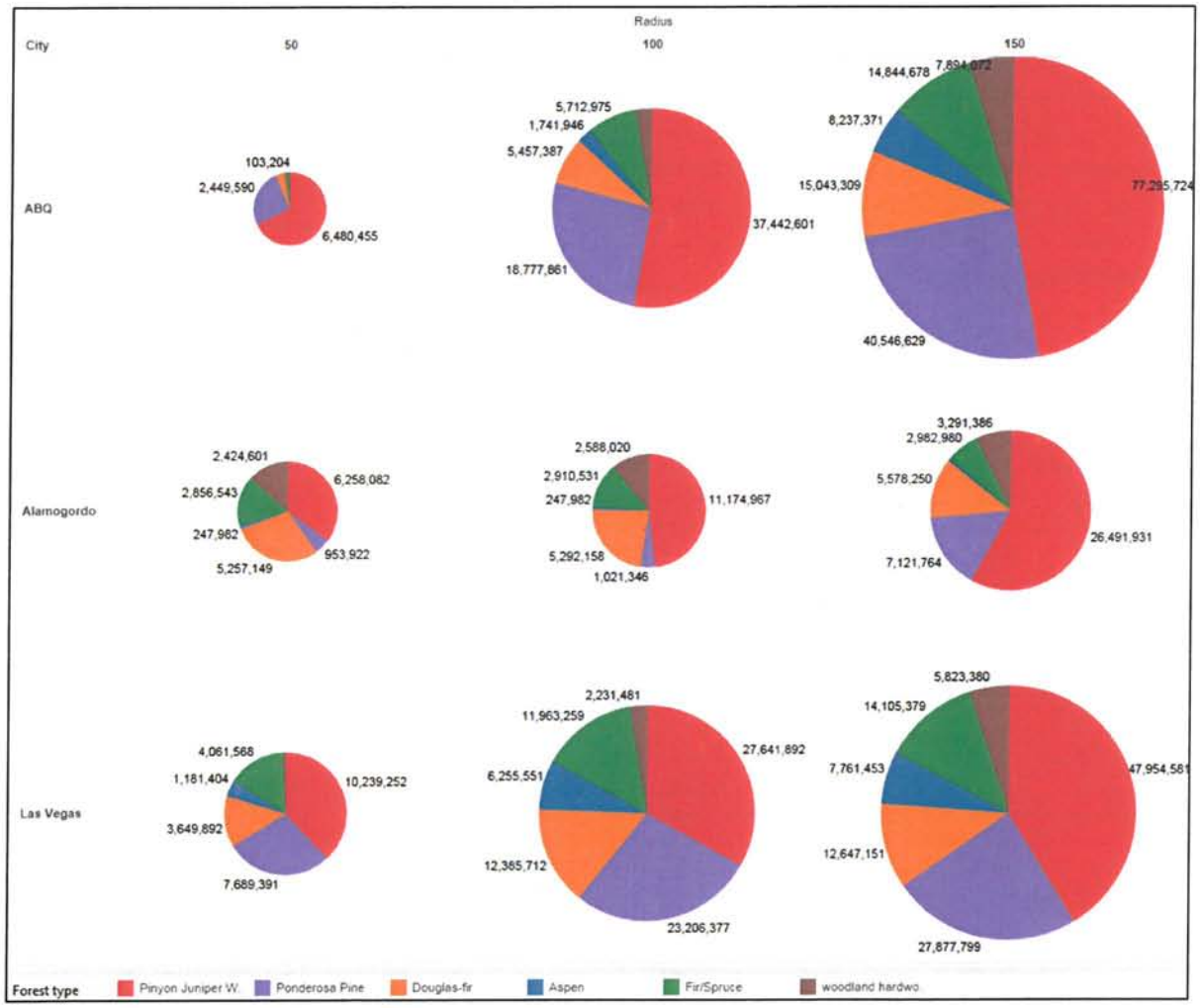

Figure 5. Tons of dry biomass by forest type, city, and distance from city.

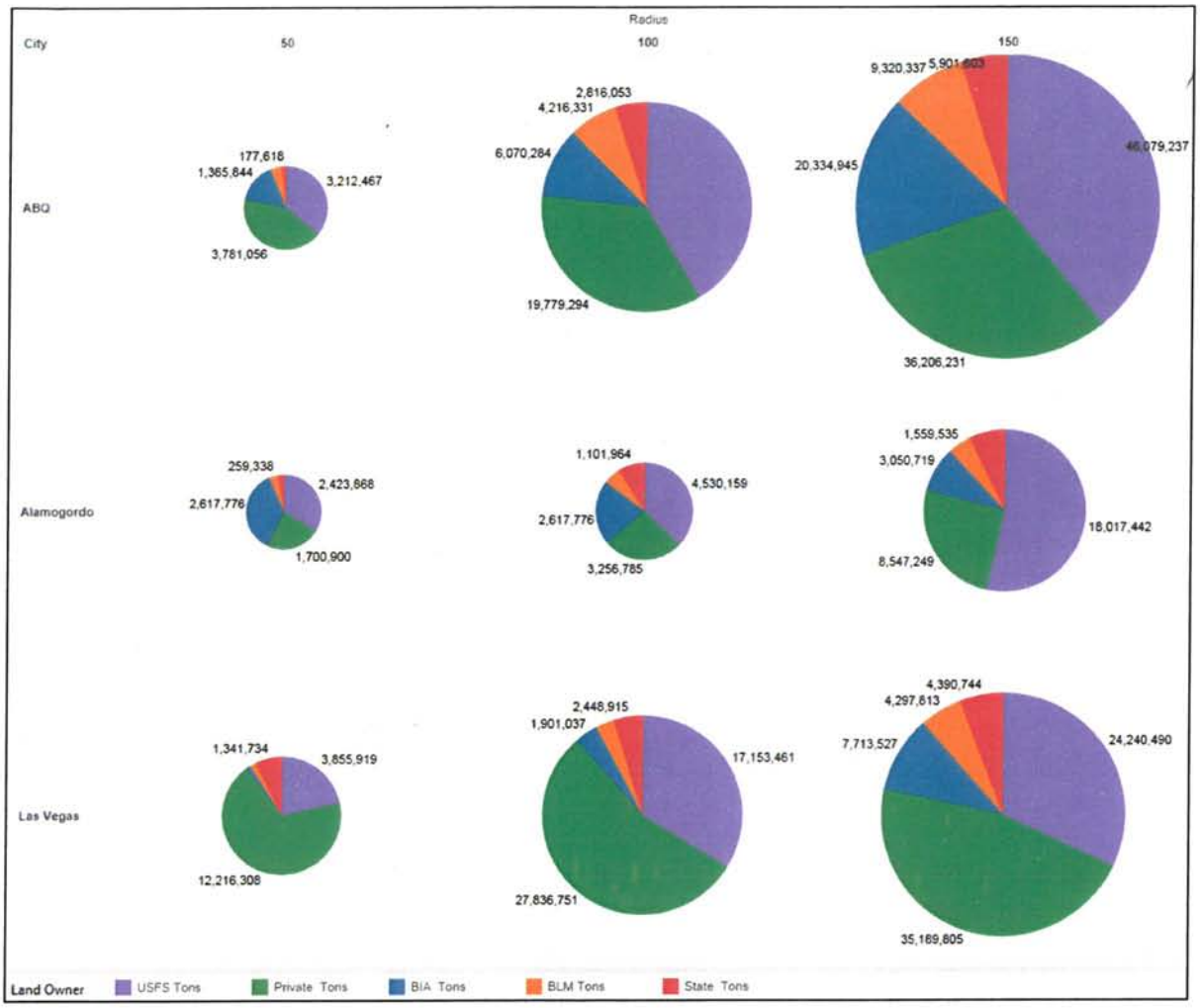

Figure 6. Tons of dry Piñon-Juniper and Ponderosa Pine biomass by landowner, city, and distance from city.

Most of the potential wood biomass is available from Piñon-Juniper and Ponderosa Pine forests and located on private and USFS lands. These forests are in dire need of forest thinning operations to reduce the risk of catastrophic wildfire and improve watershed health and functioning, so there is broad public support for thinning operations. It is important to note the important distinction between thinning and clear-cut harvesting. To support forest restoration objectives, only a fraction of the harvestable biomass would be thinned from the landscape.

The forest industry in New Mexico is driven by forest restoration to reduce fuel loading, reduce the threat of catastrophic wildfire, and improve wildlife habitat. Current restoration and thinning prescription guidelines were collected from multiple sources (Abella et al. 2009; Hunter et al. 2007; Huffman et al. 2013; Reynolds et al. 2013). Forestry guidelines are given in both trees per acre and as basal area. Basal area guidelines are commonly used in the forestry profession and reflect the cross-sectional area of tress at breast height in the stand but do not give a measure of spacing between trees or size of the trees. For the purposes of analyzing forest biomass, the

following section uses basal area (expressed as square feet per acre) because it is more readily converted to tons per acre of aboveground tree biomass.

While there is no single management prescription used across all forest types, several standards are commonly cited. Perhaps the most widely available standard is the USFS Rocky Mountain Research Station's GTR 310 (Reynolds et al. 2013), which provides detailed analysis and prescriptions for restoring Ponderosa Pine and Mixed Conifer (i.e., Douglas-Fir-dominated) forests using thinning and prescribed fire on USFS lands. GTR 310 recommends thinning stands to a basal area of 40 to 80 square feet per acre, or about 20 to 60 trees per acre. The GTR 310 prescriptions are referenced for most thinning projects on federal lands. For state and private lands, Natural Resources Conservation Service (NRCS) prescriptions for habitat enhancement are frequently used. These prescriptions, as laid out in the NRCS Forest Stand Improvement Specification (NRCS 2013), call for a range of basal area target ranges depending on the site index of the forest stand. Site index is a measure of the potential productivity of a forest stand based on soil, hydrology, aspect, and elevation, and is determined on a site-specific basis by the land manager. Table 3 provides the target area basal ranges for each site index.

Table 3. NRCS Basal Area Target Range Prescriptions (square feet/acre)

Site Index	Piñon-Juniper	Ponderosa	Mixed Conifer
Low	10–30 (savannah)	40–50	80–90
Medium	90–100 (persistent)	50–70	90–100
High	N/A	70–80	100–120

To estimate the total biomass available through forest restoration thinning projects, a median range of 40 to 80 square feet per acre was used for all forest types. The proportion of biomass available via thinning for any given project will be site-specific and based on site index and manager discretion. However, at the landscape scale, the proportion of biomass available through thinning is expected to occur within the ranges given in Table 4.

Table 4. Proportion of Total Biomass Potentially Available through Thinning

Location	Piñon-Juniper	Ponderosa	Mixed Conifer
Albuquerque	29%–51%	41%–61%	54%–68%
Alamogordo	30%–51%	23%–48%	48%–64%
Las Vegas	28%–50%	40%–60%	50%–66%

According to the analysis above, approximately half of the potentially harvestable biomass from Piñon-Juniper and Ponderosa Pine forests in New Mexico would be available from restoration thinning projects. The areas with the thickest trees have the highest proportion of total biomass potentially harvestable. Prioritizing these areas with the highest amount of biomass will help decrease harvest costs per acre.

Wood Fiber Conclusions

There is sufficient raw wood fiber available around each of the cities analyzed that could supply the required 252,000 dry tons per year necessary for economic and financial feasibility of a wood pellet production facility.

USFS and other federal lands, including BLM- and BIA-administered lands, require National Environmental Protection Act (NEPA) compliance documentation before any change in management, which would include large forest restoration or biomass harvesting projects.

However, as noted in the results section discussion of land ownership, there is more potentially available Piñon-Juniper and Ponderosa Pine biomass on private lands within 50 miles of Las Vegas (about 12 million dry tons) than there is of all forest types and all landowners within 50 miles of Albuquerque or Alamogordo. The large amount of available biomass on private lands in New Mexico means it may be possible to purchase wood fiber directly from landowners without waiting for NEPA compliance on federal lands.

Supply Chain

Identifying and developing a reliable supply chain will be a critical factor in the success of the project. A 4 – 6 month inventory staged on-site will be required prior to beginning operations. A 2 – 3 month inventory harvested and staged at the pick-up sites will be expected to be maintained throughout normal operation, so as to have a means of surviving any sudden supply shocks.

Currently the supply chain lacks the capacity to meet the demand for wood fiber. The project proponent has identified a three-tiered approach to developing the supply chain. The levels, in order of preference, are 1) contracting with existing operations, 2) capitalizing operations and providing short-term technical support to assist the development of the supply chain, and 3) hiring local foresters and providing long-term technical support to manage the procurement process. The following discussion addresses the status of the current supply chain and capital and operating costs. Labor costs, which would be applicable for alternative 3, are discussed below in the labor pool discussion.

Suppliers

The capacity in New Mexico has decreased significantly over the past 10 years with a decline of more than 70% in the harvesting and processing sector since 2007. This can directly be attributed to the 70% decline in harvest since 1997 (Sorenson et al. 2016). The forest industry has evolved from timber production to forest restoration (Buck Sanchez, USFS, personal communication October 27, 2016). Therefore, there are currently relatively few harvesting firms with the ability to build the necessary capacity to support a processing plant (Brent Racher, personal communication, August 29, 2016). It is probable that few firms in New Mexico currently possess all the specialized equipment needed in order to support this scale of biomass removal, but could likely obtain if the demand was present. However, New Mexico State Forestry maintains a list of firms listed in the current Price Agreement for Forest Brush Management Treatments. A list of these producers can be found in Table 5. This list should not be considered inclusive, nor a recommendation of suppliers with the capacity to meet the wood supply demands. Additionally, a number of processing facilities (Table 6) have logging operations that will produce residuals that are not marketable. A recent study of wood waste utilization in the Taos, New Mexico, region, estimated approximately 27,876 bone dry tons of wood residuals economically available annually in a 50-mile radius from Taos (TSS Consultants 2017). The sources included timber harvest, forest restoration and fuel treatment, Piñon-Juniper treatment, construction and demolition wood waste, and residential tree trimming. An additional source of residuals may be forest products manufacturing; however, no data are available at this time.

Table 5. Timber Harvesting Companies in New Mexico Listed in the 2015–2016 State of New Mexico Price Agreement for Forest Brush Management Treatments

Company	Contact	Region	Services	Comments
A&E Enterprises	PO Box 10 Cloudcroft, NM 88317 (575) 430-0256	Southeast	Mechanical thinning	Piñon-Juniper (PJ), Ponderosa Pine (PP), Mixed Conifer (MC)
Alamo Navajo School Board, Inc.	Bill Ferranti PO Box 5907 Alamo, NM 87825 (575) 854-2543 Ext. 1326	Northeast, west-central, south-central	Mechanical, hand thinning	PJ, PP, MC
Alternative Forestry Unlimited	Michael Deubel 89 Lost Spring Rd HC 68 Box 8 Mimbres, NM 88149 (575) 956-9622	Statewide	Hand thinning	PJ, PP, MC
American Conservation Experience	2900 N. Fort Valley Rd. Flagstaff, AZ 86001 (928) 226-6960	Statewide	Hand thinning	PJ, PP, MC
Bartley Enterprises, LLC	PO Box 801 Ruidoso, NM 88355 (575) 937-3565	South-central	Mechanical thinning	PJ, PP
Blackmon Tree and Landscaping	577 Gavilon Canyon Rd Ruidoso, NM 87345 (575) 808-1814	South-central, Southwest	Hand thinning	MC
Boss Reclamation, LLC	PO Box 8330 Ruidoso, NM 88355 (575) 378-4369	Statewide	Mechanical thinning	PJ, PP, MC
Conservation Services, LLC	PO Box 216 Jarales, NM 87023 (505) 864-6605	Statewide	Mechanical, hand thinning	PJ, PP, MC
Double Arrow Bar	PO Box 1931 Elephant Butte, NM 87935 (505) 859-9707	Northeast, central, south-central, southwest	Mechanical, hand thinning	PJ, PP, MC
ESM Utilities	PO Box 511 Canjilon, NM 87515	Northeast	Hand thinning	PJ, PP, MC

Company	Contact	Region	Services	Comments
Forest Fitness	6 Tall Pinons Tijeras, NM 87059 (505) 350-8426	Statewide	Mechanical, hand thinning	PJ, PP, MC
Garcia Logging	PO Box 55 Gallina, NM 87017	Northeast	Mechanical thinning	PJ, PP, MC
Garcia Welding, LLC	4189 El Llano Rd Las Vegas, NM 87701	Northeast	Hand thinning	PJ, PP, MC
Gila Tree Thinners	3701 Tracy Circle Silver City, NM 88061 (575) 388-4130	Southwest	Mechanical, hand thinning	PJ, PP, MC
Isaac Herrara Logging	1203 State Hwy 434 Guadalupita, NM 87722 (505) 235-7069	Northeast, north-central	Mechanical thinning	PJ, PP
Jensen Contracting	PO Box 2115 Ruidoso, NM 88353 (575) 937-2614	Statewide	Mechanical, hand thinning	PJ, PP, MC
Johnson Environmental	2236 Idaho Dr Alamogordo, NM 88310 (575) 937-3046	Statewide	Mechanical, hand thinning	PJ, PP, MC
Los Arboles	2124 Raymac Rd. SW Albuquerque, NM 87105 (505) 967-5628	Statewide	Mechanical, hand thinning	PJ, PP, MC
Mesa Vista Ecological Services, LLC	2520 Madre Dr. NE Albuquerque, NM 87112	Statewide	Mechanical, hand thinning	PJ, PP, MC
NRG Consulting Services	505 Dove Ranch Rd Bayfield, CO 81122 (970) 403-2386	Northeast, north-central, central	Hand thinning	PJ, PP, MC
Northeastern Construction	925 Milles Ave Las Vegas, NM 87701 (505) 454-8143	Northeast	Mechanical, hand thinning	PJ, PP, MC

Company	Contact	Region	Services	Comments
North Ridge Forest Products	PO Box 484 Mora, NM 87732 (505) 718-5691	Northeast, north-central, central, south-central	Mechanical, hand thinning	PJ, PP, MC
Pa and Sons Wood & Tree Thinning	PO Box 163 Holman, NM 87723 (575) 799-4598	Statewide	Mechanical, hand thinning	PJ, PP, MC
Padilla Logging Restoration, LLC	PO Box 87510 Abiquiu, NM 87510 (505) 685-0799	Northeast, central	Hand thinning	PJ, PP, MC
Pro Tree Service	18 N. Zamora Rd Tijeras, NM 87059 (505) 286-8217	Statewide	Hand thinning	PJ, PP, MC
Restoration Solutions, LLC	PO Box 98, 201 County Line Rd Corona, NM 88318 (575) 937-5551	Statewide	Mechanical thinning	PJ, PP, MC
San Isidro Permaculture	29 Hidden Valley Dr Santa Fe, NM 87505 (505) 983-3841	Northeast, north-central, central	Hand thinning	PJ, PP, MC
Southwest Stumpgrinding, LLC	70 Nightingale Ln Tijeras, NM 87059 (505) 379-0704	Statewide	Mechanical, hand thinning	PJ, PP, MC
Southwest Wood Products	PO Box 351 Cleveland, NM 87715 (505) 617-0211	Statewide	Mechanical, hand thinning	PJ, PP, MC
Sweat LLC	PO Box 30174 Pensacola, FL 32503 (850) 912-8760	Statewide	Mechanical, hand thinning	PJ, PP, MC
TC Company	20114 US Hwy 84 Hernandez, NM 87537 (505) 929-1245	Statewide	Mechanical thinning	PJ, PP, MC

Table 6. Wood Processing Facilities

Mills/Loggers	Location	Forest	Owner/Status	Logging Operations
K&B Timber Works	Reserve, NM	Gila	James Kellar	Yes
Gila Wood Net	Silver City, NM	Gila	–	No
Turkey Creek Forestry Services	Alamogordo, NM	Lincoln	Kelly Williams	Yes
Ellinger Logging	Alamogordo, NM	Lincoln	George Ellinger	Yes
John Wilkinson	La Luz, NM	Lincoln	–	Yes
Jimmy Bridge	Tularosa, NM	Lincoln	–	No
Mescalero Sawmill	Mescalero, NM	Mescalero, Lincoln	Closed	No
Mount Taylor Mill Works	Milan, NM	Cibola	Matt Allen	Yes
Barela Timber Mgt	Las Vegas, NM	Santa Fe, Carson	–	No
W.H. Moore Cash Lumber	Espanola, NM	Santa Fe, Carson	–	No
Spotted Owl Timber	Santa Fe, NM	Santa Fe	–	No
Hansens Logging	Santa Fe, NM	Santa Fe	–	No
Conley's Lumber Mill	Espanola, NM	Santa Fe, Carson	Terry Conley	Yes
Conley (Walatowa)	Jemez, NM	Santa Fe	–	Yes
Olguin's Forest Products	Taos, NM	Carson	Dan Barrone	Yes
Kuykendall Lumber	Tres Piedras, NM	Carson	Roy Kuykendall	Yes
Old Wood, LLC	Las Vegas, NM	Carson	David Old	Yes
Adolfo Torres	Canutillo, TX	Lincoln, Gila	–	Yes

Cost Analysis to Remove Raw Material

The cost to remove biomass has several associated cost that are highly variable depending on location and can include environmental compliance, treatment prescription, forest density, equipment used, stumpage fees, and transportation costs. Average cost associated with the harvesting and chipping can range from $40 per green ton up to $115 per green ton depending on tree density and subsidies available (Mackes 2010). Projects removing small-diameter timber and other unmerchantable saw timber like Piñon-Juniper are often subsidized through programs such as the USFS Collaborative Forest Restoration Program (CFRP) to assist the producer with the harvesting.

Different land management agencies in New Mexico have different pricing they pay or charge for removing forest products from the landscape. The two largest land management agencies within the project area boundaries are the New Mexico State Land Office (SLO) and the USFS. In order to get the prices for USFS charges for products fiscal year 2016, cut and sold sheets for Region 3 were used. Cut and sold sheets show total volumes and values of all forest products sold and harvested from the National Forest System lands. These reports also show the amounts and values of species and products sold and harvested (USFS 2016b). The costs vary depending on location, type of material, and forest district. The three districts used for this analysis were the Carson, Cibola, Lincoln, and Santa Fe National Forests. The volumes used on these sheets are hundred cubic feet (CCF). It is assumed that 1 CCF equals approximately 1.2 dry tons of chips. If each plant requires 252,000 dry tons, then 210,000 CCF of material would need to be obtained.

For the Las Vegas area price determination, the cost of the material for the Carson and Santa Fe National Forests was used. Biomass removal falls under the fuelwood category for most accurate pricing of material. Cost on the Carson and Santa Fe National Forest charge range from $5.00 to $12.50 per CCF. To sustain a biomass plant it is estimated that 210,000 CCF would be needed. It is assumed that not all material would come from the National Forests; however, because they are such large landowners, a good majority might be available. Therefore, if half of the material that were needed for a biomass plant could be harvested off the National Forests in this region, the associated costs for the material would range from $525,000 to $1,260,000 per year. Cost for Albuquerque would be similar to those of Las Vegas for material; however, material from the Lincoln National Forest is the least expensive with the cost per CCF at $6.00 to 7.00.

Getting estimates of costs on associated private and state lands are difficult, as these type of sales generally do not occur. However, the SLO does release the estimates contractors provide to conduct thinning for brush management. These estimates are based on thinning different densities from heavy to light and by different methods (mechanical and hand thinning). Prices for mechanical thinning range from $600 to $3,000 per acre in heavy timber to $400 to 2,000 per acre in light timber in most regions throughout the state.

Capital/Operating Expenses

Capital and operating cost information in New Mexico is lacking, due in large part to the current state of the forestry industry. However, a recent study conducted by the U.S. Endowment for Forestry and Communities (Qian and McDow 2013) provides a case study of capital and operating costs in east Texas. Additionally, Table 7 is adapted from a case study conducted in 2005 for a biomass logging operation in east Texas; the unit cost is in 2005 dollars. The total cost has been calculated to reflect the total amount of green tons required per processing facility. A similar study conducted by Deloitte and Touche LLP conducted in northeastern Ontario, Canada, in 2008 found costs were approximately 20% higher (Qian and McDow 2013). These studies define the cost parameters associated with capitalizing and supporting the development of a forest industry to meet the demand.

Table 7. Capital and Operating Costs for a Biomass Logging Operation in East Texas

Item	Cost ($) for 400,000 green tons	Unit Cost ($/green ton) (2005)
Annual Capital Cost (depreciation from equipment and truck, assuming purchased new)	**$ 1,072,000.00**	**$ 2.68**
Total Operating Cost	**$ 5,204,000.00**	**$ 13.01**
Repair and maintenance	$ 944,000.00	$ 2.36
Diesel fuel (0.03 gallon/horsepower-hour, $3.5/gallon off-highway diesel)	$ 1,868,000.00	$ 4.67
Lube	$ 472,000.00	$ 1.18
Large parts (tires, etc.)	$ 136,000.00	$ 0.34
Insurance premium	$ 284,000.00	$ 0.71
Wages	$ 1,400,000.00	$ 3.50
Other costs	$ 100,000.00	$ 0.25
Total annual cost	**$ 6,276,000.00**	**$ 15.69**

One of the largest expenses incurred would be the purchasing of forest harvesting and processing equipment, where cost can range from $50,000 to upwards of a million. However, it is important to have the right equipment for the job so biomass can be efficiently removed from the landscape. There are many different types of equipment needed to assist in the extraction of forest material. This equipment ranges from chainsaws ($1,000) to feller-bunchers ($75,000–$850,000) to industrial chippers and grinders ($50,000–750,000). The type of equipment used would vary on a project by project basis depending on the vegetation type and physiographic parameters. For example, when working in Piñon-Juniper woodlands, a combination of chainsaws and tracked excavators would be used to extract the biomass before it was grinded or chipped. Ponderosa Pine and Mixed Conifer forest would require a combination of feller-bunchers, harvesters, and skidders before shredding or chipping. Costs vary greatly depending on whether equipment is purchased new or used. It should also be noted that there are several different types of each of the equipment that can be used in different settings, so each project area will need different equipment in order to efficiently remove the material.

Transportation Costs

A GIS model using the ESRI Drive Distance Analysis tool was created to calculate mean drive distance from forested acres to potential biomass facility sites in Albuquerque, Alamogordo, and Las Vegas. This model uses all roads in New Mexico, including USFS roads, to calculate the shortest driving distances. For the purposes of analysis, the model was used to generate distance ranges in 25-mile increments.

To calculate mean transportation cost per ton, an expert-determined cost of $0.19 to $0.22 per green ton per mile was used (Brent Racher, personal communication, August 29, 2016) (Table 8). This is the appropriate planning range used by New Mexico contractors to transport raw biomass,

assuming a cost basis of fuel of $2.00 to $3.50 per gallon diesel. Fuel costs can significantly impact total operating costs. Table 8 summarizes the cost per mile averaged for distances from the processing facility and is calculated for green tons and dry tons.

Table 8. Transportation Cost

Miles	0–25	25–50	50–75	75–100	100–125	125–150
Cost per green ton	$2.37–$2.75	$7.12–$8.25	$11.88–$13.75	$16.63–$19.25	$21.38–$24.74	$26.13–$30.25
Cost per dry ton	$3.77–$4.37	$11.31–$13.10	$18.85–$21.83	$26.39–$30.56	$33.93–$39.29	$41.47–$48.02

RESIN SUPPLY

The manufacturing of wood pellets requires a sufficient supply of plastic resins, which serves as the binder of the wood fiber, and in order to be economically and financially feasible, at least 38,000 tons per year of #2 and #4 plastic material would be required per processing facility. The types of resin suitable for use in wood pellet manufacturing include those labeled as Plastic #2 and Plastic #4. Plastic #2 (high density polyethylene [HDPE]) is considered a low-hazard plastic and is often used for milk, water and juice bottles, cleaning supplies, and personal care products such as shampoo, as well as grocery bags and cereal box liners. Plastic #4 (low density polyethylene [LPDE]) is another low-hazard plastic and is used in bags for bread, newspapers, produce, household garbage, and frozen foods.

RESIN AVAILABILITY

In order to determine if and where this material is available, SWCA has conducted interviews with numerous suppliers. The discussion is based on our interviews and inquiries regarding availability and costs. It should be noted that a number of suppliers did not respond or told us to call back "when the plant is built." Thus we were unable to obtain a complete review of the availability of resins.

The resin market in the Southwest is composed of suppliers who collect recycled materials from single bin residential customers, suppliers who appear to be brokers, buying and selling on the spot market, or a combination. Single stream recycling requires sorting. Number 1 and #2 plastics are sorted first, leaving a mix of #3 through #7 plastics. The market for #2 resins is described as mature. There appears to be no consistent collection of low density films.

There appears to be no one supplier that has the capacity to provide the volume of material required. It is likely that a number of suppliers would commit to long-term contracts; however, many have existing agreements and others do not enter into long-term agreements. Regional community collectors from New Mexico, Arizona, and Utah could provide over 10,000 tons annually at current availability. Waste Management, who serves the Denver market, did not respond to SWCA's inquiry. Other suppliers from Texas, California, or Mexico will be needed.

SUPPLIERS

Suppliers were contacted throughout the Southwest, focusing on New Mexico and neighboring states. Potential suppliers of the resin are listed in Table 9.

Table 9. Overview of Resin Suppliers in the Southwest

Company	Contact	Locations	Product Supplied	Available Quantity	Cost	Comments
Friedman Recycling	David Friedman, President (602) 269-9324 Dfriedman@friedmanrecycling.com Rob Taylor, Albuquerque Plant Manager (505) 358-9974 Robert.taylor@friedmanrecycling.com	NM (Albuquerque), AZ (Phoenix, Tucson), TX (El Paso	#2 and # 4 plastics from a variety of sources, including cities, towns, and tribal entities in NM, AZ, and TX.	5,000 tons/year/ plant (20,000 tons total)	$0.20/lb plus transportation	New Mexico communities deliver all recycled material to Friedman. New agreement with Walmart for plastic bags. Available quantities unknown. Willing to enter into long-term agreement. Could possibly increase collection or seek out additional supplies.
ReCommunity	Chris Coady, Regional Business Development - West Region (845) 527-8862 Christopher.Coady@recommunity.com www.recommunity.com Rick Peters – West Region Manager Rick.peters@recommunity.com	AZ (Phoenix, Tucson), TX (San Antonio)	Accepts # 2 and # 4 plastics from residential single bin pick-up. No plastic bags.	Did not provide	$0.275/lb milk jugs; no price available for film	LPDE not consistently collected Has access to film, will require pre-processing. Films collected as mixed stream after #1 and #2 sorting. Mixed stream includes #3–#7 and will require further sorting. Willing to talk further if facilities are built.
Waste Management	vendorrelations@wm.com www.wm.com	CO (Denver)	Accepts # 2 and # 4 plastics from residential single bin pick-up in Denver and other Colorado cities, and Farmington, NM.	Not available	Not available	Did not respond to inquiries. Requires business information to get into system.
Prime Plastic Products, Inc.	Judy Josol (760) 734-3900 judy@primeplastic.com www.primeplastic.com	UT, CA	HDPE grocery films.	40–50 tons per month (HDPE grocery films)	$0.12/lb delivered	Quoted availability and cost for HDPE grocery films available. Willing to enter into long-term contract.
Recycling Technology Consultants	Christina Martinez (713) 460-9440 cmartinez@rtcplastics.com www.rtcplastics.com	TX (Houston)	HDPE, LDPE plastics.	44,000 lb/load	$0.24/lb	Grinding, shredding, bailing facilities. Did not specify how many loads they could deliver. Did not respond to further inquiries.

Company	Contact	Locations	Product Supplied	Available Quantity	Cost	Comments
Renovanz	Paul Capone Office: +52 871. 209.71.00 Cell: +52 1 871 354 5727 paul@renovanz.com www.gruporeciclaje.com	Mexico	Grocery bags, bottles, and Milk jugs (bales and regrind).	Could supply 3,100 tons/month; 20 ton shipments	Not available	Did not respond with cost information.
Worldwide Recycler Service Inc.	Sheena Tricoche' Project Manager (936) 239-5220 plasticworldoffice@gmail.com www.worldwiderecyler.com	TX	HDPE scrap, black/yellow pipe turnings, HMW, .05 melt, .950 density, in bales.	30,000 lbs	$0.25/lb	Do not enter into contracts. Marketing strategy appears to be buy and sell as the product comes in. Prices and product availability vary.
Plader Recycling	Francisco Rodarte (915) 629-9679 www.indrodarte.com	TX (El Paso)	Source of material is from Mexico.	Not available	Not available	Could not receive email due to virus. Did not respond to phone inquiries.
Good Steward Recycling	Shirley Young (214) 631-6888 Finance@usgoodsteward.com www.usgoodsteward.com	TX (Dallas)	Listed on website: HDPE milk jar HDPE purge, HDPE barrels, LPDE film A.	HDPE (milk jar) 200–400 MT/month; LPDE film no quantities listed	Not available	Called for info was told to email. No response received.
Encore Recycling	Aviv Halimi (323) 446-3287 aviv@encore-recycling.com encore-recycling.com	CA	Washed and extruded pellets.	1,000 tons per month	$0.40 to $0.50/lb	Only sell washed and extruded pellets, Willing to allocate all capacity on a 20-year agreement.
Domodo International	Jerry (626) 618-0660 jerry@domodointl.com www.domodointl.com	CA, TX	LDPE lumps, HDPE lumps, LDPE virgin resin, HDPE virgin resin, HDPE powder resin.	4 rail loads a week	Not available	Did not respond to further questions regarding cost.

Cost Analysis

Resin

The cost of resin supply is addressed in Table 9 above. Costs ranged from $0.12/lb to $0.50/lb. The median cost appears to be approximately $0.20 to $0.25/lb.

Transportation

For purposes of this analysis it is assumed that the resin would need to be transported to three chosen processing locations (Alamogordo, Las Vegas, and Albuquerque). Distances and availability for both commercial vehicular traffic and considerations for freight rail are considered. A GIS database was created to analyze distance and cost of transport of materials from each recycling facility (when identified) to processing location. Distances for both vehicular and rail transportation will be calculated when the location of the material is known. Vehicular traffic is assumed to be limited to interstate and highway systems.

The transportation information for road and railways was derived from a combination of publically available GIS datasets. This data set primarily represents interstate highways, but in a few areas U.S. highways were included: Arizona Roads – 2011 U.S. Census Bureau's MAF/TIGER GIS data; New Mexico – 2011 University of New Mexico Earth Data Analysis Center Streets GIS data; and Texas – 2014 Texas Department of Transportation Highway GIS data. The freight rail information was derived from U.S. Census Bureau 2011 MAF/TIGER GIS data.

Transport of the resin materials needed to create the plastic pellets is considered below. The actual cost of transportation of the materials from supplier to the plant locations will vary by carrier and distance traveled, but the estimated number of trips necessary to ship the required amount of resin can be calculated based on general assumptions of volume and mass of materials, and the capacity (both volume and weight limits) of various freight methods. Table 10 describes the average rates, capacity and weight limit of three freight methods. Rail transport is described as a range of values, as types of rail cars vary greatly by capacity.

Table 10. General Capacity and Weight Limits for Freight Methods

Method		Rate	Capacity (cubic yards)	Weight (tons)
Truck				
	Van	$1.60/mile[1]	100[3]	20[3]
	Flatbed	$1.89/mile[2]	n/a	20[3]
Rail				
	Car	$2,925–5,592/car[4]	185–370[5]	70–100[5]

[1]DAT. 2016. "National Van Rates" Truck Rates per Mile. DAT Trendlines 9/3/2016. Available at: http://www.dat.com/resources/trendlines/van/national-rates. Accessed September 6, 2016.
[2]DAT. 2016. "National Flatbed Rates" Truck Rates per Mile. DAT Trendlines 9/3/2016. Available at: http://www.dat.com/resources/trendlines/flatbed/national-rates. Accessed September 6, 2016.
[3]D&P Construction Co. Roll Off & Recycling Division. 2016. Semi Hauling. Available at: http://dandpconstruction.com/services/semi_hauling/. Accessed September 26, 2016.
[4]Freight Rail Reform. 2015. 2015 EC Rate Premium Study; Chemical and Allied Products. Available at: https://www.freightrailreform.com/wp-content/uploads/2015/03/2015-EC-Rate-Premium-Study.pdf. Accessed September 26, 2015.
[5]CSX. 2016. Railroad Equipment. Available at: https://www.csx.com/index.cfm/customers/resources/equipment/railroad-equipment/. Accessed September 26, 2016.

The Solid Waste Bureau of New Mexico states the average weight of one cubic yard of compacted HDPE (#2) plastic would equal 270 lbs, and the average weight of one cubic yard of baled plastic film (#2 and #4) is 847 lbs (New Mexico Solid Waste Bureau 2016). The estimated annual number of trips for each freight method for 38,000 tons of each type of plastic, based on capacity and weight restrictions for each freight method described in Table 10 above, is described in Table 11 below.

Table 11. Annual Loads per Freight Method and Plastic Type Required to Transport 38,000 Tons of Resin Material

Plastic	Van	Flatbed	Rail car
HDPE	3,167	1,900	1,652–844
Film	1,900	1,900	535–380

CRITICAL ISSUES ANALYSIS – PERMITTING REQUIREMENTS

The critical issues analysis below includes an analysis of the federal and state environmental compliance regulations and other factors that may affect procurement of feedstock materials. It is assumed that compliance will not be necessary on private lands unless there is a federal nexus that is trigged through funding sources. SWCA is familiar with federal and state environmental regulations, including USFS regulations.

FEDERAL LANDS

National Environmental Policy Act

USFS and other federal lands, including BLM- and BIA-administered lands, require NEPA compliance documentation before any change in management, which includes large timber or biomass harvesting projects. In SWCA's experience, NEPA compliance for these type of projects require 2 to 3 years to complete public notification and prepare required documentation, including Endangered Species Act (ESA) consultation with the U.S. Fish and Wildlife Service (USFWS) and Clean Water Act (CWA) consultation with the U.S. Army Corps of Engineers (USACE).

NEPA is the governing statute that determines the scope of permitting requirements on federal lands and for projects that have a federal nexus, such as projects receiving funding by the federal government. Projects that trigger NEPA must document potential environmental effects of the proposed action in an environmental assessment (EA) or an environmental impact statement (EIS).

Some agencies are able to utilize categorical exclusions (CEs) for projects that do not individually or cumulatively have a significant effect on the human environment. Using a CE allows agencies to save money and time that would ordinarily be required for completion of an EA or EIS. For example, the USFS is able to apply CEs to collaborative forest thinning projects up to 3,000 acres. These projects must comply with additional requirements, including maximizing retention of old growth and large trees, not establishing permanent roads, and decommissioning temporary roads within 3 years of project completion. They are limited to areas in the wildland urban interface (WUI) or in areas in Condition Class 2 and 3, in Fire Regime Groups I, II, and III if outside the

WUI. (Farm Bill 2014). Most of the areas in New Mexico with sufficient biomass would fall under one of these condition classes or fire regime groups which would allow for the use of the CE.

Some funding sources, such as the CFRP, encourage EA documentation even on smaller thinning projects to ensure comprehensive documentation of potential impacts. An EIS is required for projects that have a significant and unmitigated impact on a protected resource. Table 12 summarizes NEPA permitting costs on federal lands.

Table 12. Federal Lands NEPA Permitting Cost and Time Estimates

	CE	EA	EIS
Time required	6–12 months	24–36 months	24–48 months
Cost	$5,000–$25,000	$25,000–$75,000	$100,000+

Time and cost estimates encompass a range of values, depending on project size and location and resources potentially impacted. These cost estimates include both cultural and natural resource surveys.

Endangered Species Act

The ESA makes it illegal to kill, harm, or otherwise "take" any listed species. Several ESA-listed species occur in the forested mountains of New Mexico. Probably the most important of these to forest management is the Mexican spotted owl. The Mexican spotted owl is a resident species in the forested mountains of New Mexico, breeding from March through August. It inhabits dense mixed conifer habitats zones with complex vegetation structure, so it is usually only a consideration when working in high elevation mixed conifer (i.e., Douglas-Fir-dominated) forests.

The Mexican spotted owl was listed as threatened by the USFWS on March 16, 1993, due to declining population and concerns about ongoing threats to its habitat. Critical habitat was designated on August 20, 2004. The most recent Mexican Spotted Owl Recovery Plan, published in 2012 (USFWS 2012), emphasizes moving potentially suitable habitat toward a set of desired conditions. The plan is explicitly geared toward promoting forest restoration through mechanical thinning across most forest areas, including designated critical habitat. However, the plan does not recommend thinning operations near Mexican spotted owl nesting core areas, where Section 7 consultation with the USFWS is required to conduct mechanical treatment.

Clean Water Act

The CWA is the primary federal law in the United States governing water pollution. Permits are required for activities that impact or discharge into jurisdictional waters of the U.S. Waters with a "significant nexus" to "navigable waters" are considered jurisdictional under the CWA. In New Mexico, the USACE considers all drainages, including intermittent and ephemeral channels, as waters of the U.S.

Most forestry projects in New Mexico do not require consultation with USACE over CWA permits because there is no direct impact to waters of the U.S.

National Historic Preservation Act

The National Historic Preservation Act of 1966 and in accordance with policies and regulations implementing Section 106 of the National Historic Preservation Act (Public Law 89-665), as amended, federal and state agencies are required to evaluate the impact of all federally funded or permitted projects on historic properties through the Section 106 review process. It is expected that any project on federal or state land will have to undergo this process. The range in costs are largely dependent on the site density of the project area with cost for surveys and reporting typically ranging in the $30 to $80/acre range.

Private Lands

NEPA documentation is not required on private lands. While the ESA protects individual animals and plants listed as threatened or endangered, habitat protections only apply on federal lands. Mexican spotted owls rarely occur on private forest land, which is usually at lower elevations without suitable habitat. Archeological surveys are not required on private lands unless there is a federal nexus triggered from the funding sources.

State Lands

The New Mexico State Heritage Protection Act covers state and federal lands in New Mexico and requires cultural surveys for any proposed projects. Management planning of state lands is coordinated by the SLO. Forest thinning projects have been permitted through a process that includes a Right of Entry permit and a Business Lease/Harvest Agreement. New Mexico State Forestry works with the SLO to ensure that state harvesting regulations and best management practices are incorporated in the planning process.

Potential Opposition

Unlike in the Pacific Northwest, in New Mexico there is little organized opposition to forest thinning for forest and watershed health. For example, groups such as WildEarth Guardians, which formerly (under the name Forest Guardians) protested timber sales, now promote forest restoration and even conduct post-fire thinning as part of their program dedicated to watershed restoration. Collaborative projects such as the USFS CFRP enjoy broad support, as there is general consensus that New Mexico's forests need active management to return them to ecological functioning and prevent destructive mega-fires. From 2001 to 2013, the CFRP funded 175 projects that treated over 30,000 forested acres in New Mexico (CFRP 2016).

ECONOMIC FEASIBILITY

TYPE OF MANUFACTURING SITE REQUIRED

SWCA understands that 30 to 80 acres of industrial-zoned land would be required for the construction and operation of a wood pellet plant. Additionally, infrastructure such as electricity and/or natural gas, water mains, and/or wells are required to either be existing on-site or be installed. Proximity to a rail siding of at least 7,500 feet is also required for operations. Below is a summary of the current infrastructure and land available at the different proposed locations.

SITE AVAILABILITY

LAS VEGAS

Within the city limits of Las Vegas, there are 41 acres of land zoned for existing industrial use (M-1, M-2, and M-3), and 85 acres in the extraterritorial zone (EZT). Additionally, within the city limits, there are 679 acres of land classified as "urban vacant," which may or may not be suitable for a wood pellet plant (City of Las Vegas 2011). One potentially suitable site is zoned for industrial use and located within the EZT.

Lease and Purchase Costs

As of June 2016, the average asking price for industrial properties in New Mexico was $67.92 per square foot. This is a decrease of nearly 10% from 2015 average prices (Loopnet 2016a). For the same time period, the average industrial lease cost was $7.42 per square foot (Loopnet 2016a). This is an increase of 4% from 2015 prices. These average prices are assumed to be the square footage of existing buildings and other infrastructure on industrial properties, and the costs associated with leasing or purchasing undeveloped, industrial-zoned land are likely to vary.

One 30.9-acre parcel near the Las Vegas city limits, located in an industrial park and appropriately zoned, is listed for sale as of September 2016. This parcel is listed for $1,545,000 and includes existing electric and water utility infrastructure (Homefinder 2016).

ALAMOGORDO

The project proponent has identified a site on Mescalero tribal lands. Currently, there is one additional identified parcel within Alamogordo city limits that is zoned M-2 (Industrial) and would meet the size requirements.

Lease and Purchase Costs

As of June 2016, the average asking price for industrial properties in New Mexico was $67.92 per square foot. This is a decrease of nearly 10% from 2015 average prices. For the same time period, average industrial lease cost was $7.42 per square foot. This is an increase of 4% from 2015 prices. These average prices are assumed to be the square footage of existing buildings and other infrastructure on industrial properties, and the costs associated with leasing or purchasing undeveloped, industrial-zoned land are likely to vary.

One 143.76-acre, industrial-zoned parcel near the Alamogordo city limits is listed for sale as of September 2016 (Loopnet 2016b). This parcel is listed for $495,000 and includes existing electric utility infrastructure.

ALBUQUERQUE

The project proponent has identified a site in the south valley of Albuquerque on the abandoned General Electric site. The site has all the characteristics, including greater than 30 acres, near rail and highway transportation routes and is zoned for commercial/manufacturing. However, the site is within the flight path for the Albuquerque Sunport, has more stringent air quality permitting requirements and congestion in the metro area makes transport of raw materials to the processing facility more difficult.

Lease and Purchase Costs

As of June 2016, the average asking price for industrial properties in New Mexico was $67.92 per square foot. This is a decrease of nearly 6% from 2015 average prices (Loopnet 2016a). For the same time period, average industrial lease cost was $7.42 per square foot (Loopnet 2016a). This is an increase of 5.5% from 2015 prices. These average prices are assumed to be the square footage of existing buildings and other infrastructure on industrial properties, and the costs associated with leasing or purchasing undeveloped, industrial-zoned land are likely to vary.

In June 2016, the average asking price for industrial properties was $67.52 for the metro area and an average price was $70.62, a year over year decline of 10.7% and 10.65, respectively. Lease prices averaged $7.52 per square foot for the metro area and $7.63 per square foot for the city, a year over year increase of 6.8 % and 5.8%, respectively (Loopnet 2016a).

PERMITTING REQUIREMENTS

The New Mexico Environment Department Air Quality Bureau Permitting Section processes permit applications for industries that emit pollutants, except in Bernalillo County and tribal lands. Bernalillo County, including Albuquerque, has regulatory authority for air quality permitting. The U.S. Environmental Protection Agency (EPA) has regulatory authority for tribal lands. Industries that wish to build or modify facilities that emit air pollutants into the air must obtain an air quality construction permit.

Industrial facility emissions and permitting requirements are evaluated based on location within an Air Quality Control Region (AQCR), available Prevention of Significant Deterioration (PSD) increments within that AQCR, proximity to Class 1 areas, and determination of whether the proposed facility is a major or minor source of any regulated pollutant. Major sources are defined as sources that have a potential to emit more than 100 tons per year for criteria pollutants. Minor sources have potential emission rate greater than 10 pounds per hour or 25 tons per year.

For major sources, air quality emissions and dispersion are modeled to ensure compliance within PSD increments for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter equal to or less than 10 microns in diameter (PM_{10}), or particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$) to determine whether the emission rates exceed the EPA's de minimus ton per year levels (New Mexico Environment Department Air Quality Bureau 2016). Pre-construction

air monitoring may also be required in some areas. Major source baseline dates are fixed dates identified in the Clean Air Act. Minor Source baseline dates are determined by the first complete PSD received by the New Mexico Air Quality Bureau for that AQCR.

Class 1 areas are designated areas considered most susceptible to PSD impacts. Sites near Class 1 areas may impact modeling and permitting for a proposed manufacturing facility in that area.

ALAMOGORDO

Alamogordo falls in the El Paso-Las Cruces-Alamogordo Interstate AQCR 153 (New Mexico Environment Department Air Quality Bureau 2016). AQCR 153 includes Doña Ana, Otero, Sierra, and Lincoln Counties. The region is semi-desert with sparse cover interspersed with mountains that extend down the middle of the region. Mean monthly temperatures vary from a low of 29.7°F in January to 82.8°F in July. Diurnal temperature changes often exceed 30°F. Average rainfall ranges from 7.9 inches in the southern desert to 25.8 inches in the mountains. Average annual wind speed is approximately 10 miles per hour.

There are no Class 1 areas near Alamogordo.

There is one non-attainment area in Doña Ana County for PM_{10} caused by uncontrollable natural events. Doña Ana County has submitted a Natural Events Action Plan.

Minor source baseline dates are represented in Table 13.

Table 13. AQCR 153 Minor Source Baseline Dates

Pollutant	Minor Source Baseline Date
NO_2	August 2, 1995
SO_2	None
PM_{10}	June 16, 2000
$PM_{2.5}$	None

One site under consideration in the Alamogordo area is on Mescalero Apache tribal lands. The EPA would have permitting authority for this site.

LAS VEGAS

Las Vegas falls in the Northeastern Plains Intrastate AQCR 154 (New Mexico Environment Department Air Quality Bureau 2016). AQCR 154 includes Colfax, Guadalupe, Harding, Mora, San Miguel, Torrance, and Union Counties. The landscape ranges from grasslands, plateaus and mesas, and mountains in the northwestern portion of the region. The climate is semiarid with the exception of the mountains. Average annual temperatures range from 33°F to 74.0°F. Annual precipitation ranges from 15 inches in the plains and plateaus to 22 inches in the mountains.

The Pecos Wilderness is a Class 1 area near Las Vegas, and this proximity may impact modeling and permitting for a proposed manufacturing facility Las Vegas.

There are no non-attainment areas within the AQCR 154.

Minor source baseline dates are represented in Table 14.

Table 14. AQCR 154 Minor Source Baseline Dates

Pollutant	Minor Source Baseline Date
NO_2	None
SO_2	None
PM_{10}	None

The New Mexico Environment Department Air Quality Bureau is the permitting authority for this location.

ALBUQUERQUE

Albuquerque falls in the Albuquerque-Mid Rio Grande Intrastate AQCR 152 (New Mexico Environment Department Air Quality Bureau 2016). AQCR 152 includes portions of Sandoval and Valencia Counties and all of Bernalillo County. The topography ranges from the Rio Grande valley to the Sandia Mountains in the east and the Jemez Mountains in the northwest. Mean daily temperatures range from 22°F to 92°F, with a 30°F diurnal variation. Average wind speed is approximately 9 miles per hour, although it is much higher in the spring, creating occasional dust storms. Average annual precipitation is approximately 8.8 inches, occurring in primarily as occasional showers during the summer monsoon season (July–September) and winter precipitation. Thermal inversions occur frequently in winter, which tend to trap pollutants at ground level.

There are no Class 1 areas near Albuquerque.

There are no non-attainment areas within AQCR 152.

Minor source baseline dates are represented in Table 15.

Table 15. AQCR 152 Minor Source Baseline Dates

Pollutant	Minor Source Baseline Date
NO_2	March 26, 1997
SO_2	May 14, 1981
PM_{10}	March 26, 1997
$PM_{2.5}$	February 11, 2013

Bernalillo County is the permitting authority.

SITE INFRASTRUCTURE AND TRANSPORTATION LOGISTICS

AVAILABILITY OF POWER SUPPLY

The Public Service Company of New Mexico (PNM) supplies electricity to cities in New Mexico. Electrical rates in the discussion below are based on the national and state industrial rates as presented in Table 16.

Table 16. National and State Industrial Electricity Rates ($ per kilowatt hour)

	2013	2014
New Mexico	$0.0636	$0.0661
United States	$0.0689	$0.0710

Source: U.S. Energy Information Administration, Form EIA-861, "Annual Electric Power Industry Report." Form EIA-861S, "Annual Electric Power Industry Report (Short Form)."

LAS VEGAS

There are two potential sites available that would have access to existing utility infrastructure: the Wood Business Park and the Dee Bibb Industrial Park. The Las Vegas San Miguel County Economic Development Corporation administers incentives for businesses locating in San Miguel County offered through the City of Las Vegas and San Miguel County (available at http://lvsmecon.org). These incentives include property tax abatement, infrastructure improvement, and New Mexico Local Economic Development Act support.

Wood Business Park

The Wood Business Park has water, natural gas, electric, and high speed internet available. A Burlington Northern Santa Fe (BNSF) rail spurs is located within the park with the capacity to park 50 rail cars. Another 50 rail cars can be parked nearby in Las Vegas (Wm. Hendrickson, personal communication, November 7, 2016). The site is located adjacent to Interstate 25 with access on Airport Road. The Las Vegas airport is 1 mile east. In total, 143 acres are available, 78 acres in Phase 1. There are incentives for job creation and maintenance of common areas and public access streets. A long-term lease is negotiable. Old Wood, LLC is an anchor wood products tenant.

Dee Bibb Industrial Park

The Dee Bibb Industrial Park is located just south of town off of Interstate 25. There is no rail access and the Phase 1 is nearly filled. There are 31 acres available in Phase 2; however, San Miguel County has not purchased the land yet. All utilities are provided.

ELECTRICAL

PNM supplies the city of Las Vegas electricity via the Northern New Mexico transmission system, with the majority of power provided by coal (62.4%) and nuclear (22.0%) resources. The remainder of the power comes from natural gas (9.5%), wind (5.5%), and solar (0.5%) sources.

Electricity Costs

It is assumed that the wood pellet plant would require 9.6 megawatts of power per hour of operation, and operation is expected to continue at a rate of 24 hours per day for 350 days per year. This would require 80,640,000 kilowatt hours (KWH) per year. At the PNM Industrial Power Service rate of $0.0744/KWH, the monthly operating cost of the plant would come to approximately $500,000, with a minimum monthly rate of $13,400 for the first 2,000 KVA (1,000 volt amps). Additional KVA over this amount would accrue at $5.95, which is not calculated in this estimation. Therefore, the monthly electrical cost would amount to a minimum of $513,400. This would result in a minimum yearly electrical cost of $6,161,000. Table 16 describes the national and state average industrial electricity rates for comparison.

NATURAL GAS

Within city limits, the City of Las Vegas Gas Department supplies natural gas via a system of metal and plastic pipelines. Outside of city limits, there is no direct delivery of natural gas available, though delivery to on-site storage tanks is available.

Natural Gas Costs

It is assumed that the wood pellet plant would require 9.6 megawatts of power per hour of operation, which would equal 960 therms of natural gas, and operation is expected to continue at a rate of 24 hours per day for 350 days per year. This would require 8,064,000 therms per year.

Current of Las Vegas Natural Gas rates are $2.77 per 1000 cubic feet (MCF). This is equivalent to $0.277 per therm (1 therm is approximately equivalent to 100 cubic feet (CCF)). There is a monthly service fee for large volume users of $72 per month. The monthly operating cost, including the monthly fee would be approximately $186,216. The annual operating cost is approximately $2,234,592.

If the wood pellet plant is sited at a location to which city-provided natural gas is available, associated fees include processing of application ($13.68), the installation of connection lines (varies), the installation of a meter ($450 plus the costs of an appropriately sized meter), and deposits.

Industrial Water Availability

The City of Las Vegas is located in the Rio Gallinas Basin, which is a priority basin for Active Water Resource Management. This basin is an area that is dominated by surface water rights and is highly susceptible to drought (Water Master Report 2012). If a well is preferred or required, a New Mexico Water Well permit would need to be obtained from the New Mexico Environment Department. The cost of this permit is $125.

Water is supplied by the City of Las Vegas Water Department. The City of Las Vegas City Code states (Las Vegas, New Mexico, Chapter 440-25, Water Ordinances) that in order to receive municipal water services to locations outside the city limits, owners are required to transfer water rights or water supply payment ($1,500 per acre/foot) to the City of Las Vegas in exchange for water services. The water right amounts required to be transferred are based on an acre-foot consumptive use basis, and the necessary amounts required for transferal or purchase are determined by the type of land use.

ALAMOGORDO

Because the parcel is located within city limits, electric and gas utility infrastructure is readily available in the area. An extension of electric line or gas line to the plant facilities on the parcel may be needed.

Electrical

PNM supplies the city of Alamogordo electricity, with the majority of power provided by coal (62.4%) and nuclear (22.0%) resources. The remainder of the power comes from natural gas (9.5%), wind (5.5%), and solar (0.5%) sources.

Electricity Costs

It is assumed that the wood pellet plant would require 9.6 megawatts of power per hour of operation, and operation is expected to continue at a rate of 24 hours per day for 350 days per year. This would require 80,640,000 KWH per year. At the PNM Industrial Power Service rate of $0.0744/KWH, the monthly operating cost of the plant would come to approximately $500,000, with a minimum monthly rate of $13,400 for the first 2,000 KVA. Additional KVA over this amount would accrue at $5.95, which is not calculated in this estimation. Therefore, the monthly electrical cost would amount to a minimum of $513,400. This would result in a minimum yearly electrical cost of $6,161,000. Table 16 describes the national and state average industrial electricity rates for comparison.

Natural Gas

The New Mexico Gas Company supplies the city of Alamogordo with natural gas services.

Natural Gas Costs

It is assumed that the wood pellet plant would require 9.6 megawatts of power per hour of operation, which would equal 960 therms of natural gas, and operation is expected to continue at a rate of 24 hours per day for 350 days per year. This would require 8,064,000 therms per year. New Mexico Gas Company December 2016 natural gas rates are $0.3655 per therm (https://www.nmgco.com/Current_Natural_Gas_Rates.aspx, accessed 12/28/2016), the monthly operating cost of the plant would come to approximately $245,616. This would result in a minimum yearly natural gas cost of $2,947,392.

Industrial Water Availability

The City of Alamogordo is located in the Tularosa Basin, which is not currently considered a priority basin for Active Water Resource Management, though it subject to drought. If a well is

preferred or required, a New Mexico Water Well permit would need to be obtained from the New Mexico Environment Department. The cost of this permit is $125.

The City of Alamogordo Water Department supplies water within city limits. The City Code of Alamogordo (Alamogordo, New Mexico, Code of Ordinances, Article 28-03) states that "every property within the municipal boundaries shall be deemed to have water and sewer utility service available if service lines exist from the city water and sewer mains to the property and such properties shall be subject to customer charges and capital improvement charges as set by city commission for the respective services." Outside city limits, water is only supplied to residential properties by the City of Alamogordo, and therefore commercial or industrial properties outside of city limits would need to locate other sources. The City of Alamogordo also provides reclaimed water for use, after establishment of an account and application for a meter is completed. This water is charged at a rate of $1.20/100 cubic feet. For properties supplied by the Alamogordo Water Department, water conservation measures are in effect from May 1 to November 1 and are detailed in the city code (Alamogordo, New Mexico, Code of Ordinances, Article 28-03-033), and additional water rationing may occur when deemed necessary.

ALBUQUERQUE

Because the parcel is located within city limits, electric and gas utility infrastructure is readily available in the area. An extension of electric line or gas line to the plant facilities on the parcel may be needed.

Electrical

PNM supplies the city of Albuquerque electricity, with the majority of power provided by coal (62.4%) and nuclear (22.0%) resources. The remainder of the power comes from natural gas (9.5%), wind (5.5%), and solar (0.5%) sources.

Electricity Costs

It is assumed that the wood pellet plant would require 9.6 megawatts of power per hour of operation, and operation is expected to continue at a rate of 24 hours per day for 350 days per year. This would require 80,640,000 KWH per year. At the PNM Industrial Power Service rate of $0.0744/KWH, the monthly operating cost of the plant would come to approximately $500,000, with a minimum monthly rate of $13,400 for the first 2,000 KVA. Additional KVA over this amount would accrue at $5.95, which is not calculated in this estimation. Therefore, the monthly electrical cost would amount to a minimum of $513,400. This would result in a minimum yearly electrical cost of $6,161,000. Table 16 describes the national and state average industrial electricity rates for comparison.

Natural Gas

The New Mexico Gas Company supplies the city of Albuquerque with natural gas services.

Natural Gas Costs

It is assumed that the wood pellet plant would require 9.6 megawatts of power per hour of operation, which would equal 960 therms of natural gas, and operation is expected to continue at

a rate of 24 hours per day for 350 days per year. This would require 8,064,000 therms per year. New Mexico Gas Company December 2016 natural gas rates are $0.3655 per therm (https://www.nmgco.com/Current_Natural_Gas_Rates.aspx, accessed 12/28/2016), the monthly operating cost of the plant would come to approximately $245,616. This would result in a minimum yearly natural gas cost of $2,947,392.

Industrial Water Availability

The City of Albuquerque is located in the Albuquerque Basin, which is not currently considered a priority basin for Active Water Resource Management, though it subject to drought and the aquifer that historically supplied much of the city's water needs is now considered delicate. Currently, water in Albuquerque is supplied in combination by this aquifer, and from surface water diverted from the Colorado River basin and into the Rio Grande. If a well is preferred or required, a New Mexico Water Well permit would need to be obtained from the New Mexico Environment Department. The cost of this permit is $125.

The Albuquerque Bernalillo County Water Utility Authority (ABCWUA) supplies water to the Albuquerque metropolitan area. Under New Mexico state law (New Mexico Statutes Annotated 1978, Section 72-1-10), the ABCWUA has the power to "set policy and regulate, supervise and administer the water and wastewater utility of Albuquerque and Bernalillo County, including the determination and imposition of rates for services." The ABCWUA and Sewer Rate Ordinance describes water use conservation and use restrictions, as well as provides industrial rate schedules for potable and non-potable (at 80% the cost of potable) water, as well as sewer service, based on meter size, as well as monthly fixed costs. Additionally, a 5% revenue increase has been approved and is effective July 1, 2017. Section 1-1-8 describes charges associated with utility expansion and establishment of new service. Under the 2024 Water Conservation Plan (ABCWUA 2013), new programs are designed to focus on conservation programs for non-residential customers, with the goal of reducing per-capita water use from 150 to 135 gallons per person per day by 2024.

Transportation Infrastructure

New Mexico has excellent highway and rail infrastructure, which gives industry in the state direct access to the East and West Coasts, Texas, the Midwest, and with the international borders of Canada and Mexico.

Rail Infrastructure

Both the BNSF and Union Pacific railroads provide direct service to the Ports of Long Beach and Houston, as well as ports of entry at the Mexican and Canadian borders (Figure 7). The proposed facility would need to submit an application to generate a Rail Service Agreement with one of these major carriers.

Supply Road Infrastructure

In New Mexico truck weight limits are 80,000 pounds on interstate highways and 80,640 pounds on all other roads. The legal truck length is 65 feet on non-designated highways and 57 feet 6

inches for all other areas (New Mexico Motor Transport 2016). All sites are located near interstate or U.S. highways (Figure 8).

Wood Fiber

Most of the wood fiber that would be harvested would come from National Forest lands, state lands, and private lands. Road infrastructure on USFS lands is typically good as the agency maintains its roads on an as needed basis and would likely be able to support the trucks hauling the material with minimal maintenance. The road infrastructure for material coming off of state land and private land is more of an unknown. However, many of the parcels of state land have ranch roads that allow access to most of the areas where harvesting would be targeted. The supply road infrastructure is not expect to limit the biomass availability except in times of severe weather.

The cost per mile of transporting biomass from the field to the processing facility is summarized in (Table 8) above.

Las Vegas

Transport to Market Infrastructure

The rail infrastructure in this area is managed by BNSF and contains lines that would allow for product to reach the West Coast and/or Texas for international shipping. The capacity of the rails within New Mexico and the region is highlighted in Figure 7 below. The closest international port(s) are Long Beach, California, and Houston, Texas, which are between 1,030 and 1,200 rail miles from the potential site depending on the route taken.

Supply Road Infrastructure

The potential site location in Las Vegas is located adjacent to Interstate 25, which is a major north-south route, and approximately 130 miles from Interstate 40, which is the major east-west route.

Alamogordo

Transport to Market Infrastructure

Rail would be the likely source of transportation to get the product to the markets. The rail infrastructure in this area is managed by Union Pacific and contains lines that would allow for product to reach the West Coast and/or Texas for international shipping. The capacity of the rails within New Mexico and the region is highlighted in Figure 7 below. The closest international port(s) are Long Beach and Houston, which are approximately 890 to 920 rail miles from the potential site depending on the route taken.

Supply Road Infrastructure

The potential site location in Alamogordo is located approximately 70 miles from Interstate 25, which is a major north-south route, and from Interstate 10, which is the major east-west route.

ALBUQUERQUE

TRANSPORT TO MARKET INFRASTRUCTURE

The rail infrastructure in this area is managed by the BNSF and contains lines that would allow for product to reach the West Coast and/or Texas for international shipping. The capacity of the rails within New Mexico and the region is highlighted in Figure 7 below. The closest international port(s) are Long Beach and Houston, which is approximately 890 to 1,050 rail miles from the potential site depending on the route taken.

SUPPLY ROAD INFRASTRUCTURE

The potential site location in Albuquerque is located adjacent to Interstate 25, which is a major north-south route, and 10 miles from Interstate 40, which is the major east-west route.

Figure 7. Rail infrastructure in New Mexico and regionally to the international ports of Long Beach and Houston.

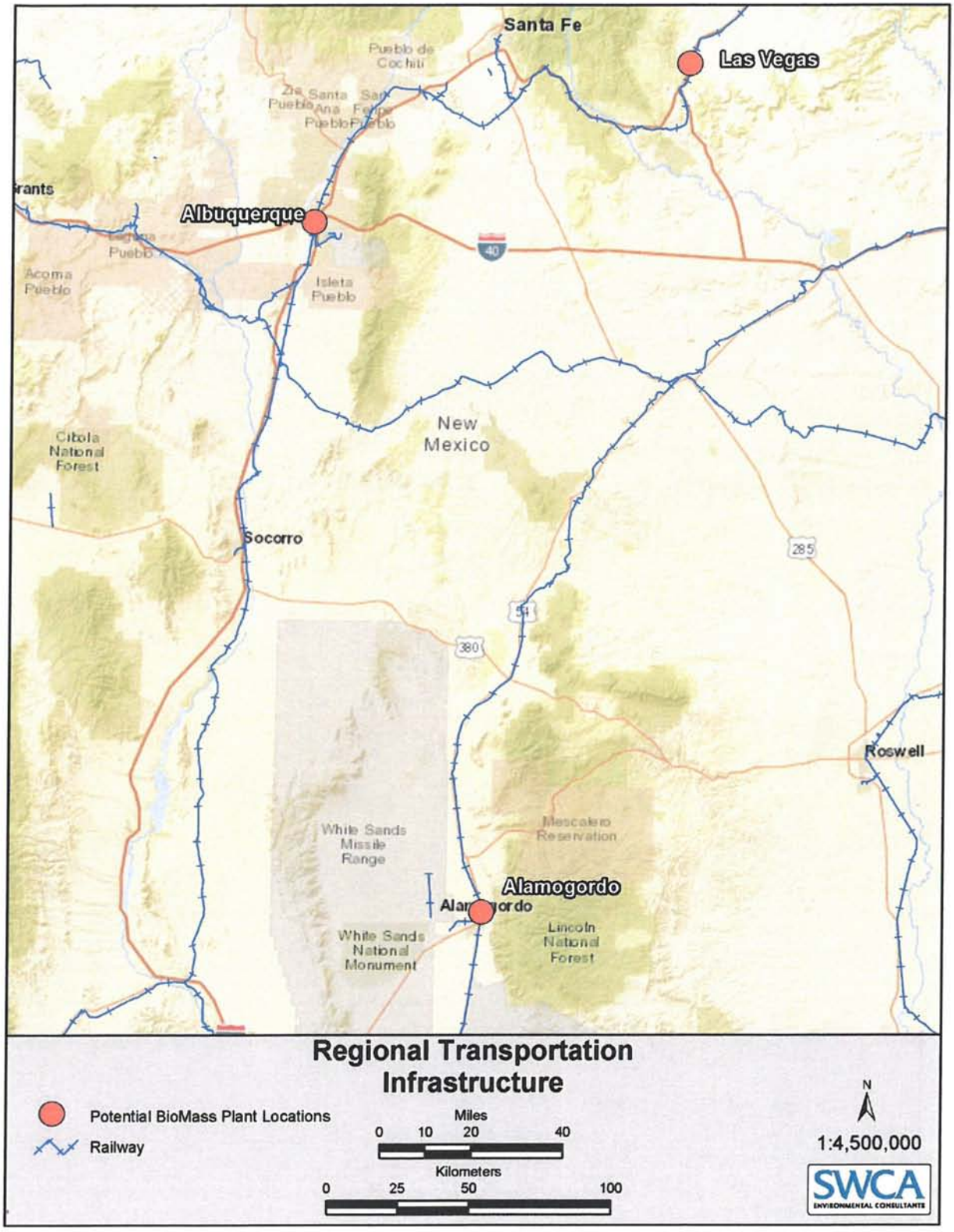

Figure 8. Regional transportation infrastructure.

LABOR POOL

The availability of an appropriately skilled and available labor pool within a reasonable distance of the wood pellet plant is an important consideration in this analysis. Below is a summary of the past and current demographic makeup, available labor force, and educational attainment for each proposed location.

STAFFING REQUIREMENTS

Each plant location is estimated to require a staff of 46 to 52 employees of various skill levels. There would be one salaried management-level position that would work directly in the plant, with the potential for three other positions at a similar level, overseeing wood procurement, plastic procurement, and plant logistics. It is assumed that these positions would require a college degree. There would also be 45 hourly positions that would work directly in the plant, and an additional three positions for administrative support. It is assumed that these positions would require a range of educational attainment, from college degrees to high school diplomas, or in cases certain positions may require less education.

LAS VEGAS

Overall, the city of Las Vegas and the county of San Miguel have seen decreasing populations. Since 2000, Las Vegas has had an overall population decrease of 8.6%. Table 17 describes national, state and regional population trends from 2000 to 2015, as well as rate of change.

Table 17. Las Vegas Total Resident Population

	2000[1]	2010[2]	% change 2000–2010	2015[3]	% change 2010–2015
United States	281,421,906	309,346,863	9.9%	321,418,820	4.1%
New Mexico	1,819,046	2,059,179	13.2%	2,085,109	1.3%
San Miguel County	30,089	29,393	-2.3%	27,967	-4.9%
Las Vegas	14,650	13,753	-6.1%	13,386	-4.8%

[3] U.S. Census Bureau, Population Estimates Program (PEP), Updated annually. http://www.census.gov/popest/. U.S. Census Bureau, 2015 Census of Population, P94-171 Redistricting Data File. Updated every 10 years. http://factfinder.census.gov.
[2] U.S. Census Bureau, 2010 Census of Population, Public Law 94-171 Redistricting Data File. Updated every 10 years. http://factfinder.census.gov.
[1] U.S. Census Bureau, 2000 Census of Population, Public Law 94-171 Redistricting Data File. Updated every 10 years.

Environmental Justice Populations

Table 18 describes the socioeconomic makeup of the state, county, and city in regards to environmental justice population indicators. The city of Las Vegas may qualify as an environmental justice population, as the percentages of minority or low-income populations are proportionally greater than that of the county and state.

Table 18. Poverty and Race by Planning Area in 2010

	Percent Minority*	Percent Below Poverty level
Las Vegas	35.13%	37.3%
San Miguel County	33.4%	25.5%
New Mexico	31.6%	21.3%

* All non–"white alone."
U.S. Census Bureau, 2010–2014 American Community Survey 5-Year Estimates.

AVAILABLE LABOR POOL

Las Vegas had an unemployment rate of 7.7% in 2015, with an estimated 849 potential members of the civilian labor force without jobs. With staffing requirements of up to 50 employees, it is likely that the city has an appropriate number of workers available. Table 19 describes labor face and unemployment numbers and rates from 2009 to 2015, as well as number of jobs provided by the construction and manufacturing industries. Las Vegas is also home to New Mexico Highlands University and Luna Community College, which could be partners to work with in order to develop curriculum in support of a growing forest industry.

Table 19. Total Civilian Labor Force for San Miguel County

	2009	2010	2011	2012	2013	2014	2015
Civilian Labor Force[1]	13,294	11,173	11,044	11,103	11,076	10,927	10,988
Unemployed (rate)[1]	977 (7.3%)	1,072 (9.6%)	1,053 (9.5%)	987 (8.3%)	924 (8.3%)	895 (8.2%)	849 (7.7%)
Jobs by Industry							
Manufacturing (31–33 NAICS)[2]	62	62	64	65	74	100	98

[1]New Mexico Department of Workforce Solutions, TABLE D - Labor Market Information Series.
[2]New Mexico Department of Workforce Solutions, TABLE C - Civilian Labor Force, Employment, Unemployment and Unemployment Rate.

Table 20 describes the educational makeup of the population 25 years and older of Las Vegas. The majority of the population (77.6%) has attained at least a high school diploma, while nearly 30% of the population has an associate's degree or higher.

Table 20. Educational Attainment of Population 25 Years and Older in Las Vegas, New Mexico

	New Mexico		Las Vegas	
	Population	Percent of Population	Population	Percent of Population
<9th grade	96,892	7.1%	820	9.3%
9th–12th grade, no diploma	121,093	8.9%	1,164	13.1%
High school graduate	358,007	26.3%	2,231	25.2%
Some college	324,492	23.9%	2,173	24.5%
Associate's degree	104,758	7.7%	670	7.6%
Bachelor 's degree	201,686	14.8%	921	10.4%
Graduate or professional degree	153,085	11.3%	882	10.0%

Source: U.S. Census Bureau, 2010–2014 American Community Survey 5-Year Estimates.

Labor Costs

The estimated cost of paying 45 to 48 full-time hourly manufacturing and administrative employees in San Miguel County, as wage data are not available for Las Vegas, would equate to $20,430 to $21,792 per week, totaling $1,062,360 to $1,133,184 in wages per year. The estimated cost of paying one to four management-level, salaried employees in San Miguel County would equate to $656 to $2,624 per week, totaling $34,112 to $136,448 in wages per year. These estimates would result in an annual cost of $1,096,472 to $1,249,672 in wages. Table 21 compares median income and weekly wages at the national, state and regional level.

Table 21. Per Capita Income and Average Weekly Wages

	United States	New Mexico	San Miguel County	Las Vegas
Median Household Income (2014)*	$53,482	$44,968	$28,292	$21,539
Per Capita Income (2014)*	$28,555	$23,948	$18,355	$17,106
Weekly Wages (2015 average)				
Average (all industries)**	$988	$793	$454	N/A
Manufacturing (31-33 NAICS)[1]	$1,237	$1,104	$484	N/A
Management of Companies and Enterprises (55 NAICS)[1]	$2,630	$1,299	$656	N/A

* U.S. Census Bureau, 2010–2014 American Community Survey 5-Year Estimates.
**Private wages (no government) Bureau of Labor Statistics.
[1] New Mexico Department of Workforce Solutions, Quarterly Census of Employment and Wages; Fourth Quarter 2015.

Alamogordo

Overall, the county of Otero has seen moderate increases in population, while the city of Alamogordo saw a drop in population between 2000 and 2010, it has since been increasing. Since 2000, Alamogordo has had an overall population decrease of 13.6%. Table 22 describes national, state, and regional population trends from 2000 to 2015, as well as rate of change.

Table 22. Total Alamogordo Resident Population

	2000[1]	2010[2]	% change 2000-2010	2015[3]	% change 2010-2015
United States	281,421,906	309,346,863	9.9%	321,418,820	4.1%
New Mexico	1,819,046	2,059,179	13.2%	2,085,109	1.3%
Otero County	62,298	63,797	2.4%	65,415	0.9%
Alamogordo	35,582	30,403	-14.6%	30,753	1.1%

[3] U.S. Census Bureau, Population Estimates Program (PEP), Updated annually. http://www.census.gov/popest/. U.S. Census Bureau, 2015 Census of Population, P94-171 Redistricting Data File. Updated every 10 years. http://factfinder.census.gov
2 U.S. Census Bureau, 2010 Census of Population, Public Law 94-171 Redistricting Data File. Updated every 10 years. http://factfinder.census.gov.
1 U.S. Census Bureau, 2000 Census of Population, Public Law 94-171 Redistricting Data File. Updated every 10 years.

Environmental Justice Populations

Table 23 describes the socioeconomic makeup of the state, county, and city in regards to environmental justice population indicators. The city of Alamogordo may not qualify as an environmental justice population, but Census Tract 5 may, due to increased rate of low-income populations are proportionally greater than that of the city, county, and state.

Table 23. Poverty and Race by Planning Area in 2010

	Percent Minority*	Percent Below Poverty Level
Census Tract 5**	18.4%	36.8%
Alamogordo	23.2%	18.5%
Otero County	27.3%	20.2%
New Mexico	31.6%	21.3%

* All non–"white alone."
** Census Tract in which identified parcel occurs.
U.S. Census Bureau, 2010–2014 American Community Survey 5-Year Estimates.

AVAILABLE LABOR POOL

Alamogordo had an unemployment rate of 6.2% in 2015, with an estimated 1,536 potential members of the civilian labor force without jobs. With staffing requirements of up to 50 employees, it is likely that the city has an appropriate number of workers available. Table 24 describes labor force and unemployment numbers and rates from 2009 to 2015, as well as number of jobs provided by the construction and manufacturing industries. Alamogordo is also home to a regional branch of New Mexico State University, which could be a partner to work with in order to develop curriculum in support of a growing forest industry.

Table 24. Total Civilian Labor Force in Otero County

	2009	2010	2011	2012	2013	2014	2015
Civilian Labor Force[1]	25,939	24,980	24,754	25,121	25,265	24,707	24,709
Unemployed (rate)[1]	1,750 (6.7%)	1,793 (7.2%)	1,667 (6.7%)	1,622 (6.5%)	1,610 (6.4%)	1,546 (6.3%)	1,536 (6.2%)
Jobs by Industry							
Manufacturing[2]	246	223	164	185	204	177	96

1New Mexico Department of Workforce Solutions, TABLE D - Labor Market Information Series.
2New Mexico Department of Workforce Solutions, TABLE C - Civilian Labor Force, Employment, Unemployment and Unemployment Rate.

Table 25 describes the educational makeup of the population 25 years and older of Alamogordo. The majority of the population (88.6%) has attained at least a high school diploma, while nearly 30% of the population has an associate's degree or higher.

Table 25. Educational Attainment of Population 25 Years and Older in Otero County

	New Mexico		Alamogordo	
	Population	Percent of Population	Population	Percent of Population
<9th grade	96,892	7.1%	963	4.5%
9th–12th grade, no diploma	121,093	8.9%	1,475	6.9%
High school graduate	358,007	26.3%	6,788	31.9%
Some college	324,492	23.9%	6,277	29.5%
Associate's degree	104,758	7.7%	2,085	9.8%
Bachelor 's degree	201,686	14.8%	2,185	10.3%
Graduate or professional degree	153,085	11.3%	1,491	7.0%

Source: U.S. Census Bureau, 2010–2014 American Community Survey 5-Year Estimates.

Labor Costs

The estimated cost of paying 45 to 48 full-time hourly manufacturing and administrative employees in Otero County, as wage data are not available for Alamogordo, would equate to $24,615 to $26,256 per week, totaling $1,279,980 to $1,365,312 in wages per year. The estimated cost of paying one to four management-level, salaried employees in Otero County would equate to $807 to $3,228 per week, totaling $41,964 to $167,856 in wages per year. These estimates would result in an annual cost of $1,321,944 to $1,533,168 in wages. Table 26 compares median income and weekly wages at the national, state, and regional level.

Table 26. Per Capita Income and Average Weekly Wages in Otero County

	United States	New Mexico	Otero County	Alamogordo
Median Household Income (2014)*	$53,482	$44,968	$40,614	$43,460
Per Capita Income (2014)*	$28,555	$23,948	$19,803	$22,768
Weekly Wages (2015 average)				
Average (all industries)**	$988	$793	$606	N/A
Manufacturing (31–33 NAICS)[1]	$1,237	$1,104	$547	N/A
Management of Companies and Enterprises (55 NAICS)[1]	$2,630	$1,299	$807	N/A

* U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates.
**Private wages (no government), Bureau of Labor Statistics.
[1] New Mexico Department of Workforce Solutions, Quarterly Census of Employment and Wages; Fourth Quarter 2015.

ALBUQUERQUE

AVAILABLE LABOR POOL

Overall, the county of Bernalillo has seen large increases in population, and the city of Albuquerque has seen an even larger increase in population between 2000 and 2010, it has since continued to increase. Since 2000, Albuquerque has had an overall population increase of 21.7%. Table 27 describes national, state and regional population trends from 2000 to 2015, as well as rate of change.

Table 27. Total Resident Population

	2000[1]	2010[2]	% change 2000–2010	2015[3]	% change 2010–2015
United States	281,421,906	309,346,863	9.9%	321,418,820	4.1%
New Mexico	1,819,046	2,059,179	13.2%	2,085,109	1.3%
Bernalillo County	556,678	662,564	19.0%	676,685	2.1%
Albuquerque	448,607	545,852	21.7%	559,121	2.4%

[1] U.S. Census Bureau, 2000 Census of Population, Public Law 94-171 Redistricting Data File. Updated every 10 years. Available at: http://factfinder.census.gov. Accessed August 2016.
[2] U.S. Census Bureau, 2010 Census of Population, Public Law 94-171 Redistricting Data File. Updated every 10 years. Available at: http://factfinder.census.gov. Accessed August 2016.
[3] U.S. Census Bureau, Population Estimates Program (PEP), Updated annually. Available at: http://www.census.gov/popest/. Accessed August 2016.

Environmental Justice Populations

Table 28 describes the socioeconomic makeup of the state, county and city in regards to environmental justice population indicators. The city of Albuquerque does not qualify as an environmental justice population, as the rate of low-income and minority populations are proportionally smaller than that of the reference areas of Bernalillo County and the state of New Mexico.

Table 28. Poverty and Race by Planning Area in 2010

	Percent Minority*	Percent Below Poverty Level**
Albuquerque	28.3%	18.5%
Bernalillo County	28.3%	18.6%
New Mexico	31.6%	21.3%

* All non–"white alone."
** All people.
U.S. Census Bureau, 2010–2014 American Community Survey 5-Year Estimates.

AVAILABLE LABOR POOL

Bernalillo County had an unemployment rate of 5.9% in 2015, with an estimated 18,874 potential members of the civilian labor force without jobs. With staffing requirements of up to 50 employees, it is clear that the city has an appropriate number of workers available. Table 29 describes labor force and unemployment numbers and rates from 2009 to 2015, as well as number of jobs provided by the manufacturing industry.

Table 29. Total Civilian Labor Force for Bernalillo County

	2009	2010	2011	2012	2013	2014	2015
Civilian Labor Force[1]	310,124	326,799	323,936	321,572	319,830	318,721	318,387
Unemployed (rate)[1]	23,361 (7.5%)	25,284 (7.7%)	23,368 (7.2%)	21,877 (6.8%)	20,792 (6.5%)	19,998 (6.3%)	18,874 (5.9%)
Jobs by Industry							
Manufacturing[2]	13,307	12,671	12,564	12,609	12,438	12,325	12,405

[1] New Mexico Department of Workforce Solutions, TABLE C - Civilian Labor Force, Employment, Unemployment and Unemployment Rate
[2] New Mexico Department of Workforce Solutions, TABLE D - Labor Market Information Series

Table 30 describes the educational makeup of the population 25 years and older of Albuquerque. A large percentage of the population (34.2%) has attained at least a high school diploma, while the majority (41.1%) of the population has an associate's degree or higher.

Table 30. Educational Attainment of Population 25 Years and Older for Bernalillo County

	New Mexico		Albuquerque	
	Population	Percent of Population	Population	Percent of Population
<9th grade	96,892	7.1%	17,994	4.9%
9th–12th grade, no diploma	121,093	8.9%	22,768	6.2%
High school graduate	358,007	26.3%	84,829	23.1%
Some college	324,492	23.9%	91,072	24.8%
Associate's degree	104,758	7.7%	29,011	7.9%
Bachelor 's degree	201,686	14.8%	68,304	18.6%
Graduate or professional degree	153,085	11.3%	53,615	14.6%

Source: U.S. Census Bureau, 2010–2014 American Community Survey 5-Year Estimates

Labor Costs

The estimated cost of paying 45 to 48 full-time hourly manufacturing and administrative employees in Bernalillo County, as wage data are not available for Albuquerque, would equate to $43,290 to 46,176 per week, totaling $2,251,080 to $2,401,152 in wages per year. The estimated cost of paying one to four management-level, salaried employees in Bernalillo County would equate to $1,332 to $5,328 per week, totaling $69,264 to $277,056 in wages per year. These estimates would result in an annual cost of $2,320,344 to $2,678,208 in wages. Table 31 compares median income and weekly wages at the national, state and regional level.

Table 31. Per Capita Income and Average Weekly Wages

	United States	New Mexico	Bernalillo County	Albuquerque
Median Household Income (2014)*	$53,482	$44,968	$48,390	$47,413
Per Capita Income (2014)*	$28,555	$23,948	$26,916	$26,876
Weekly Wages (2015 average)				
Average (all industries)**	$988	$793	$811	N/A
Manufacturing (31-33 NAICS)[1]	$1,237	$1,104	$962	N/A
Management of Companies and Enterprises (55 NAICS)[1]	$2,630	$1,299	$1,332	N/A

* U.S. Census Bureau, 2010–2014 American Community Survey 5-Year Estimates.
**Private wages (no government), Bureau of Labor Statistics
[1] New Mexico Department of Workforce Solutions, Quarterly Census of Employment and Wages; Fourth Quarter 2015

MARKET FEASIBILITY

MARKET SIZE AND DEPTH

The market for wood pellet production is driven by increased demand for renewable resources of energy in response to government policies and global agreements (Roos and Brackley 2012). International agreements, such as the Kyoto Protocol developed under the United Nations Framework Convention on Climate Change (UNNFCCC) have resulted in Southeast Asian countries, particularly Japan and South Korea to establish renewable energy policies that are increasing demand for wood pellets. The energy policy in the United States remains unclear since the United States did not participate in the Kyoto Protocol.

Woody biomass is the primary feedstock for heat and electrical energy production worldwide. The demand for biomass production is anticipated to increase three times the 2007 level by 2035 (Roos and Brackley 2012). Methods to generate heat and electricity from biomass include:

- direct firing, biomass is the only fuel used;
- co-firing, biomass is substituted for a portion of coal burned in a coal fire plant;
- cogeneration, fuel is burned to produce electricity and heat; and
- gasification, biomass is processed in a hot oxygen-starved area to produce a gas consisting mostly of carbon dioxide and hydrogen, which then fuels a turbine to produce electricity.

The European wood pellet market is well-established and can be traced back to Sweden in the 1970s when oil burners were converted to pellet fuel use. A number of policies implemented in the 1990s throughout Europe stimulated the wood pellet industry. In response to the Kyoto Protocol requirement to reduce greenhouse gas emissions 5% below 1990 levels, many European coal-fired plants found that co-firing with biomass energy is a cost-effective way to reduce greenhouse gas emissions (Roos and Brackley 2012).

Project proponents have identified Southeast Asia as a potential market for wood pellets. The discussion on potential market size and depth will focus on exporting to Southeast Asia, particularly South Korea, and domestic markets.

EXPORT

The three largest consumers of wood pellets in Southeast Asia are South Korea, Japan, and China. Roos and Brackley (2012) provide an overview of the economic and market conditions supporting the wood pellet market. The export markets to South Korea and Japan appear to have the most potential. All discussion below is derived from this report, except as noted.

South Korea has taken aggressive steps to increase its renewable energy resources, including wind power, tidal power, and biofuels. The current policy calls for increasing renewable energy from the 2007 level of 2.4% to 11% by 2030. South Korea will rely heavily on imports to meet the demand for wood biomass. In 2009, South Korea's total pellet market was estimated to be 30,000 metric tons with 10,000 metric tons imported and 20,000 metric tons produced domestically. The

demand, based on the 11% renewable energy requirement in 2020 is expected to grow to 5 million metric tons. FutureMetrics (2016) projects the demand to grow to 8.2 million tons by 2025. Japan has an established wood pellet industry for home heating and electrical power generation. In 2008, Japan produced 60,000 metric tons of wood pellets, up from 2,400 metric tons in 2003. Japan imported approximately 49,000 metric tons in 2009, with Canada as the largest supplier. A large portion of this demand is used for co-firing electrical generation. The demand is expected to grow as Japan is a signatory member of the Kyoto Protocol and is committed to reducing greenhouse gas emissions. FutureMetrics (2016) project the demand will increase to 9.0 million metric tons by 2025.

China is the second largest consumer of energy behind the United States. Developing biomass fuels has been a priority for China as it looks to supplement its coal use with wood pellets. China produced an estimated 800,000 metric tons in 2008 and 1 million metric tons in 2009. However, China relies on domestic production and imports are minimal. Thus, strong efforts would need to be made to develop the export market to China.

DOMESTIC

There are 13 coal-fueled power plants in proximity to the Four Corners region of the southwestern United States, as well as two biomass power plants. Only Snowflake White Mountain Power is currently operational, as Eagle Valley Clean Energy has been offline since a fire in 2014. Table 32 describes power plants and annual generation and consumption totals for 2015.

Table 32. Coal-fueled and Biomass Power Plants, Location, and 2015 Annual Generation

Name	Contact Information	Location	Units	Capacity (MW)	Net Generation (MW) from Coal or Biomass	Consumption of coal (short tons) or Biomass (metric tons)	Notes
Apache Generating Station	Arizona Electric Power Cooperative (AEPCO) 520-586-3631	3525 Highway 191, Cochise, AZ 85606	2	605	1,874,984	1,064,942	Units can burn coal or natural gas
Cholla Power Plant	Arizona Public Service (APS) 928-288-3381	4801 Frontage Rd., Joseph City, AZ 86032	3	1,047	5,516,636	3,240,884	1 of 4 units was retired in 2015; remaining units to be retired by 2025
Comanche Generating Station	Public Service Company of Colorado 303-571-7511	2005 Lime Rd., Pueblo, CO 81006	3	1,410	8,521,139	5,207,141	
Coronado Generating Station	Salt River Project (SRP) 928-337-4121	32062 Highway 191, Saint Johns, AZ 85936	2	767	4,922,446	3,030,498	
Eagle Valley Clean Energy LLC Biomass	Eagle Valley Clean Energy LLC	10775 Highway 6, Gypsum, CO 81637	1	11.5	n/a	n/a	Not currently operating due to fire in 2014 and eminent domain dispute with the city; burns beetle-killed trees and other wood waste
Escalante Generating Station	Tri-State Generation and Transmission 303-452-6111	County Rd. 19, Prewitt, NM 87045	1	247	1,363,998	817,932	Participated in cogeneration experiments in 1998 and 2000
Four Corners Power Plant	APS 505-598-8100	County Rd. 6675, Fruitland, NM 87416	2	2,040	10,127,868	5,669,148	3 of 5 units were retired in 2013
Hunter Power Plant	PacifiCorp 435-748-5114	State Hwy. 10, Castle Dale, UT 84513	3	1,361	9,624,346	4,303,070	

Name	Contact Information	Location	Units	Capacity (MW)	Net Generation (MW) from Coal or Biomass	Consumption of coal (short tons) or Biomass (metric tons)	Notes
Martin Drake Power Plant	Colorado Springs Utilities 719-448-4800	700 Conejos St., Colorado Springs, CO 80903	3	254	1,380,829	896,835	1 unit to be retired by end of 2017, plant scheduled to be shut down by 2035
Navajo Generating Station	SRP 928-645-8811	Hwy. 98, Page, AZ 86040	3	2,250	13,554,386	6,544,476	1 of 3 units will be retired by end of 2019
Nucla Station Power Plant	Tri-State Generation and Transmission 303-452-6111	30739 DD 30 Rd., Nucla, CO 81424	4	100	414,276	247,993	Scheduled to be shut down by the end of 2022
Ray D. Nixon Power Plant	Colorado Springs Utilities 719-448-4800	14020 Ray Nixon Rd., Colorado Springs, CO 80817	1	208	1,550,196	920,242	
San Juan Generating Station	Public Service Company of New Mexico 505-598-7200	County Rd. 6800, Waterflow, NM 87421	4	1,684	8,947,666	5,394,483	Scheduled to retire 2 units by the end of 2017
Springerville Generating Station	Tucson Electric Power (TEP) 928-337-2997	308 E Mohave St, Springerville, AZ 85938	4	1,625	10,037,452	5,808,500	
Snowflake White Mountain Power LLC	Novo Biopower LLC 928-536-2432	277 Spur Rd., Snowflake, AZ 85937	1	24	176,984	209,908	75% of fuel comes from forest-thinning in the White Mountains, 25% from paper fibers from Catalyst Paper Corp.

Source: U.S. Energy Information Administration (2016a).

Coal prices in 2015 averaged $35.13 per short ton across the Mountain states. In Arizona, the average price per short ton of coal in 2015 was $39.16, in Colorado was $34.62, in New Mexico was $42.33, and in Utah was $42.37 (U.S. Energy Information Administration 2016b). Table 33 details the source and amount of coal delivered to the power plants listed above.

Table 33. Coal Sources and Pricing per Power Plant for 2015

Power Plant	Source Mine	Amount received 2015 (tons)	Price/ short ton	Btu/lb
Apache Generating Station		**Average:**	**$51.28**	**9,509**
	El Segundo Mine (NM)	1,014,503	$42.84	9,178
	West Elk Mine (CO)	205,472	$67.72	11,694
	Black Thunder Mine (WY)	42,327	$48.19	8,941
	Antelope Coal Mine (WY)	85,156	$46.89	8,867
	North Antelope Rochelle Mine (WY)	28,031	$50.77	8,866
Cholla Power Plant		**Average:**	**n/a**	**n/a**
	El Segundo Mine (NM)	3,272,150	$29.98	9,181
Comanche Generating Station		**Average:**	**$24.80**	**8,637.60**
	Eagle Butte Mine (WY)	113	$23.39	8,300
	Black Thunder Mine (WY)	1,383,492	$24.65	8,908
	Antelope Coal Mine (WY)	1,605,648	$26.02	8,846
	Belle Ayr Mine (WY)	2,318,660	$24.92	8,579
	Buckskin Mine (WY)	122	$25.01	8,555
Coronado Generating Station		**Average:**	**$37.28**	**9,101**
	Lee Ranch Coal Mine (NM)	58,519	$46.25	9,350
	Black Thunder Mine (WY)	3,050,780	$31.95	8,795
	Antelope Coal Mine (WY)	534,371	$38.42	8,860
	Spring Creek Coal Company (MT)	662,363	$32.50	9,397
Escalante Generating Station		**Average:**	**n/a**	**n/a**
	El Segundo Mine (NM)	953,948	$37.33	9,127
Four Corners Power Plant		**Average:**	**n/a**	**n/a**
	Navajo Mine (NM) 2014	5,669,162	$31.69	8,755
Hunter Power Plant		**Average:**	**$41.75**	**11,434**
	Hunter Prep Plant (UT)	1,769,807	$38.31	11,000
	Sufco Mine (UT)	1,238,753	$40.07	10,690
	West Ridge Mine (UT)	737,085	$45.30	12,712
	Castle Valley Mine #4 (UT)	13,714	$40.27	11,851
	Castle Valley Prep Plant (UT)	2,218	$40.22	11,099
	Dugout Canyon Mine (UT)	234,672	$40.55	11,749
	Deer Creek Mine (UT)	182,943	$47.54	10,934
	Skyline Mine #3 (UT)	589,214	$40.48	11,751
Martin Drake Power Plant		**Average:**	**$27.08**	**8,876**
	Black Thunder Mine (WY)	338,087	$26.45	8,942
	North Antelope Rochelle Mine (WY)	548,577	$27.71	8,810
Navajo Generating Station		**Average:**	**n/a**	**n/a**
	Kayenta Mine (AZ)	6,573,499	$45.02	10,761
Nucla Station Power Plant		**Average:**	**n/a**	**n/a**
	New Horizon Mine (CO)	235,128	$77.03	10,351
Ray D. Nixon Power Plant		**Average:**	**$27.82**	**8,909**
	Jacob's Ranch Mine (WY)	42,301	$27.58	8,950

Power Plant	Source Mine	Amount received 2015 (tons)	Price/ short ton	Btu/lb
	Black Thunder Mine (WY)	195,973	$27.47	8,968
	North Antelope Rochelle Mine (WY)	633,573	$28.41	8,808
San Juan Generating Station		**Average:**	**n/a**	**n/a**
	San Juan Mine (NM)	5,780,325	$53.59	9,295
Springerville Generating Station		**Average:**	**$37.05**	**8,947**
	El Segundo Mine (NM)	2,836,164	$33.57	9,154
	Black Thunder Mine (WY)	1,531,134	$43.12	8,983
	Antelope Coal Mine (WY)	517,535	$35.58	8,806
	North Antelope Rochelle Mine (WY)	1,181,705	$35.93	8,846

Source: U.S. Energy Information Administration (2016a)

The investment cost to convert an existing power plant to one that is capable of co-firing coal and biomass depends on the plant capacity and service, as well as the type of the biomass fuel to be used, and the quality of the existing boiler. The costs of retrofitting an existing coal-fired power plant to enable biomass co-firing are typically in the range of $400–$600/kW for co-feed (plants (IRENA 2012). Technically, it is possible to co-fire up to about 20% of capacity without any technological modifications; however, most existing co-firing plants use up to about 10% biomass. The co-firing mix also depends on the type of boiler available. In general, fluidized bed boilers can substitute higher levels of biomass than pulverized coal-fired or grate-fired boilers (International Renewable Energy Agency 2012).

Currently, wood pellets range in price between $120–$160/ton (FutureMetrics 2016), and a densified pellet is expected to produce an average of 10,500 British thermal unit (Btu) per lb. The Btu value of this pellet is similar to that of the average Btu values of coal. Given co-firing plants generally use a mixture of 90% coal to 10% pellet, the estimated fuel cost per ton of a coal/pellet mixture would occur at an average of $45.62 (using the median price of $140/ton for pellets, and the average coal price of $35.13/short ton). This means, for a plant that burns 1,000,000 short tons of coal annually, the fuel cost would be approximately $45,620,000, or 23% greater than using coal only.

Raw Materials Procurement

Wood Fiber Off-Take Agreements

Information is not available at this time

Resin Supply Agreements

It is likely that multiple agreements with suppliers will be required. Of those who responded, three suppliers indicated willingness to enter into long term agreements, one indicated it does not enter into long-term agreements, and the others were non-committal or did not respond.

MARKET RISKS

Market risks are associated with political uncertainties that may affect policies. The export market is driven by policies to reduce reliance on fossil fuels, increase renewable energy sources, and reduce greenhouse gas emissions. The domestic market is driven by many of the same factors. The United States did not participate in the Kyoto Protocol and has not developed a consistent policy promoting the use of biofuels. With the results of the 2016 Presidential election, policies that favor the use of biofuels to reduce greenhouse gas emissions or increase the use of renewable energy resources remain uncertain. It remains to be seen what influence the United States will have on trading partners, particularly in Asia.

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