WILSEYVILLE WOODY BIOMASS VALUE-ADDED PRODUCT YARD FEASIBILITY STUDY

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ACKNOWLEDGMENTS

TSS Consultants typically conducts feasibility studies utilizing in-house personnel and resources. This is a business model that our firm has utilized since it was founded in 1986. The Wilseyville Feasibility Study was unique in that the client made available an array of locally knowledgeable individuals and networks that proved invaluable during the data gathering and analysis phase of this study.

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The assessment team as assembled by TSS Consultants included:

- Tad Mason, Forester and CEO, TSS (Project Manager)
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ABBREVIATIONS/ACRONYMS

A range of abbreviations and acronyms were utilized in this report.

Organizations

ACCG	Amador Calaveras Consensus Group
ACCABU	Amador Calaveras Cooperative Association for Biomass Utilization
BLM	Bureau of Land Management
CCWD	Calaveras County Water District
CHIPS	Calaveras Healthy Impact Product Solutions
TSS	TSS Consultants
USFS	United States Forest Service

Other Terms

ALBC	Associated Lumber and Box Company
BDT	Bone Dry Ton(s)
Btu	British Thermal Unit
CEQA	California Environmental Quality Act
CHP	Combined Heat and Power
CPUC	California Public Utilities Commission
CUP	Conditional Use Permit
DBH	Diameter at Breast Height
EIS	Environmental Impact Statement
FSC	Fire Safe Council
GIS	Geographic Information System
GT	Green Ton
HFRA	Healthy Forest Restoration Act
IOU	Investor Owned Utility
ITC	Investment Tax Credit
MBF	Thousand Board Feet
MMBtu	Million British Thermal Units
MSW	Municipal Solid Waste
MW	Megawatt (electric)
NEPA	National Environmental Policy Act
PIER	Public Interest Energy Research
PPA	Power Purchase Agreement
PTC	Production Tax Credit
TBL	Triple Bottom Line
THP	Timber Harvest Plan
TSA	Target Study Area

INTRODUCTION

The Calaveras Healthy Impact Product Solutions, Inc. (CHIPS), a California non-profit corporation with IRS 501(c)(3) certification, has retained TSS Consultants (TSS) to provide technical assistance in evaluating the feasibility for development of woody biomass value-added utilization activities at the Wilseyville mill site in Calaveras County.

CHIPS is a member the Amador Calaveras Consensus Group (ACCG) a community based collaborative implementing an All Lands Triple Bottom Line strategy for forest restoration and fire safe communities. CHIPS is also a member of the local Amador Calaveras Cooperative Association for Biomass Utilization (ACCABU) with members that include local forest contractors, entrepreneurs and others interested in developing small biomass utilization businesses. These two organizations provided TSS a Feasibility Study Steering Committee to provide expert local knowledge and to help guide the Study consistent with ACCG and ACCABU principles and purposes.

The Wilseyville site is strategically located tributary to sustainably available forest biomass feedstocks. For a number of years the site supported a commercial-scale sawmill (Associated Lumber and Box Company) that sourced sawtimber from the surrounding region. It was situated at Wilseyville due to the strategic site location relative to forest resources. CHIPS is currently in discussions with the Calaveras County Water District to purchase 20 acres of the former sawmill site for a utilization product yard.

STUDY OBJECTIVES

CHIPS seeks to optimize value-added opportunities for utilization of woody biomass material generated as a byproduct of forest fuels treatment and restoration activities in the upper Mokelumne and Calaveras River watersheds. The long-term plan is to facilitate a cooperative of distributed product yards that complement each other so that community-based enterprises are strategically coordinated and scaled to local sustainability. Sustainability is defined as a healthy equilibrium in the triple bottom line between local environment, community, and economy.

Key questions to be addressed by this study effort include:

- What value-added forest biomass utilization business models, scaled to local resource sustainability, have the highest potential for successful implementation by local contractors?
- Which business models are complementary such that a coordinated approach is possible – one that facilitates multiple businesses producing a variety of value-added products?

- How should these multiple businesses coordinate so that a healthy equilibrium and triple bottom line, represented by a balance between local environment, community and economy, is accomplished?

SCOPE OF WORK

Detailed below are tasks that TSS has implemented in support of this feasibility study. TSS utilized relevant data and information from existing assessments and studies conducted in the region as well as new data generated as a result of this study. In addition, TSS accessed local knowledge and experiences provided by the project Steering Committee.

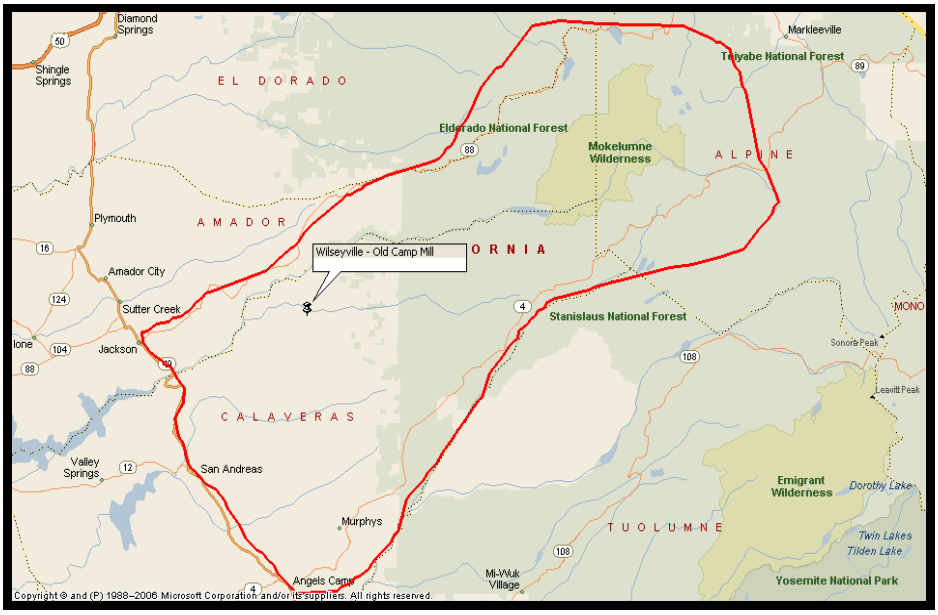
This Scope of Work provided general guidance and intent for this feasibility study.

Task 1. Pre-Work Conference

Convene a meeting with the project Steering Committee. Review approach and implementation schedule/work plan for the feasibility study. Confirm primary Steering Committee contacts. Review availability of existing studies and data, focused on both local biomass feedstock availability and value-added utilization opportunities. Confirm target study area for sourcing of potential biomass feedstock resources. Set dates for Phase I and Phase II meetings with the Study Steering Committee.

Figure 1 highlights the draft target feedstock sourcing areas for the Upper Mokelumne and Calaveras River watersheds and surrounding region.

Figure 1. Target Study Area Scope of Work



Task 2. Site Visits and Phase I Meeting

A. Conduct site visits to review current operations at the Wilseyville Transfer Station and tour the Old Camp Mill site.

B. Conduct Phase I meeting with the Steering Committee for active discussions to tap local experience and knowledge regarding potential woody biomass feedstock sources and value-added opportunities. Structure discussions so that meeting participants are encouraged to actively participate in a problem-solving exercise that pinpoints the heart of the matter addressing not only opportunities but challenges/issues regarding sourcing of appropriate feedstocks and processing operations that optimize value-added outcomes. Lessons learned from projects and operations that have been conducted or are currently underway within the Target Study Area will be selected for detailed discussions. Reports or other documentation regarding feedstock sourcing and value-added utilization opportunities at operations in other regions (e.g., Hayfork, California; Wallowa, Oregon) will be reviewed and discussed.

C. Summarize Phase I meeting results and disseminate meeting notes to participants.

Task 3. Woody Biomass Feedstock Availability and Cost Analysis

A. Utilizing outcomes from the site visits and Phase I stakeholder meeting completed in Task 2, conduct a feedstock availability analysis. Emphasis will be focused on forest and agricultural feedstock availability within the Target Study Area. Whenever possible, local knowledge and resources will be tapped to secure relevant data and information. Local biomass sources considered (but not limited to) include:

- Federal land management agencies sponsored fuels reduction and forest restoration.
- Fire Safe Council sponsored fuels treatments within the wildland urban interface (consistent with Community Wildfire Protection Plans).
- Private and public lands watershed restoration.
- Green waste from residential tree trimming and brush removal operations.
- Forest residuals generated as a byproduct of forest management activities (residuals that are typically piled and burned).
- Agricultural residuals generated as a byproduct of orchard or vineyard management activities.

B. Confirm costs associated with harvest, collection, processing and transport of forest biomass feedstocks within the Target Study Area. Confirm current market prices for forest biomass feedstocks sourced from the Target Study Area. Key feedstock availability and cost issues will be addressed, such as:

- Time of year availability.
- Volume (in tons) available near term (3 to 5 years), mid term (5 to 10 years) and long term (10+ years).
- Impacts of key variables (such as terrain and removal technique) on the cost of harvest, collection, processing and transport.
- State and federal environmental analysis (CEQA/NEPA) required to access forest and agricultural biomass feedstocks.
- State and federal taxes applicable to biomass feedstock sourcing operations (e.g., state yield tax).
- Number of jobs created or retained as a result of harvest, collection, processing and transport activities.

C. Synthesize Task 3 findings and deliver to project Steering Committee.

Task 4. Value-Added Opportunities Analysis

A. Utilizing outcomes from the site visits and stakeholder meetings completed in Task 2 as well as feedstock availability analysis results generated in Task 3, conduct a value-added opportunities analysis. Emphasis will be focused on utilization of feedstocks deemed available at volumes and prices generated as a result of Task 3. Whenever possible, local knowledge and resources will be tapped to secure relevant data and information. Additionally, a review of literature documenting value-added opportunities and outcomes (including lessons learned) will be conducted.

B. A matrix of value-added utilization opportunities will be created with specific attributes listed and assigned relative values. Included in the attribute list will be social return on investment such that investment in jobs and community are assigned a relatively high value. Ranking of the value-added opportunities will be conducted with feedback from the project Steering Committee.

   Value-added opportunities considered and included in the ranking matrix will include (but not be limited to):

   - Chips for power and thermal energy
   - Soil amendments and landscape cover
   - Animal bedding
   - Post/pole products for agricultural use
   - Post/pole products for architectural use
   - Fencing products
   - Firewood and densified fuel logs
   - Small scale combined power and heat production
   - Greenhouse and native plants nursery
   - Rustic furniture/outdoor recreation sets (e.g., swing sets)

C. Synthesize Task 4 findings and deliver to project Steering Committee.

Task 5. Phase II Meeting and Detailed Value-Added Opportunity Analysis

A. Convene second meeting with the Steering Committee to review and discuss in detail the Task 3 and 4 findings. Primary focus of the meeting is to review and prioritize key opportunities regarding feedstocks and value-added uses. Using the value-added opportunities matrix as a guide, detailed discussions regarding the most appropriate technologies and markets will be considered. The outcome of the meeting will be a selection of the top two value-added opportunities (from the matrix created in Task 4) for detailed analysis and assessment.

B. Up to four value-added opportunities will be analyzed in more detail with a focus on near-term opportunities (one to five years). In addition, targeted end use markets will have three specific regions with specific market distances from the Wilseyville product yard:

- Local – 1 to 60 mile radius
- Regional – 61 to 150 mile radius
- External – 151+ mile radius

Of particular interest and priority are opportunities to move products into first, the local markets, second, the regional markets and last, the external markets.

In addition to markets, time horizons will be considered. Two planning horizons will be considered: near term (one to five years) and mid term (six to ten years). As stated earlier, the primary focus will be on the near-term planning horizon.

Key metrics to be addressed in the analysis include:

- Minimum volume and type of woody biomass feedstock(s) required for an appropriately scaled (sustainable) value-added activity
- Delivered cost (at Wilseyville) for each feedstock by type
- Processing and support equipment required and onsite infrastructure required to support it
- Capital cost of equipment
- Permits required for a value-added activity at the Wilseyville site
- Onsite resources required (e.g., energy, water) and projected cost of these resources
- All-in cost forecast for value-added products at the Wilseyville site delivered to local, regional and external markets
- Local, regional, and external market demand (customers, volumes) for value-added product, including potential revenue estimates
- Local market competition for production of similar products

- Direct employment (by type) created in the local market area
- Potential partnering opportunities with strategic firms (equity partners)
- Confirm opportunities for local businesses to coordinate and realize the triple bottom line (balance between local environment, community and economy)
- Potential grant funding opportunities

C. Summarize Phase II meeting results and disseminate to meeting participants. Synthesize Task 5 findings and deliver to project Steering Committee.

Task 6. Draft Feasibility Study Report

Based upon information, research findings, and stakeholder input assimilated in Tasks 2 through 5, generate a draft feasibility study report. The feasibility study report will be written with the target audience in mind, including the project Steering Committee, CHIPS, Amador Calaveras Consensus Group, Amador Calaveras Cooperative Association for Biomass Utilization, Sierra Nevada Conservancy Rural Business Enterprise Grant team, local entrepreneurs and informed members of the public.

The draft feasibility study report will include, but not be limited to, the following:

- Title page
- Table of contents
- List of tables/figures
- Introduction
- Key findings
    - Biomass feedstock availability/pricing
    - Value-added opportunities considered
    - Value-added opportunities analysis results
    - Recommendations/next steps to consider
- Environmental setting and target study area
- Wilseyville transfer station/Old Camp mill site review
- Biomass feedstock resource availability and delivered cost
- Value-added opportunities
- Observations
- Grant funding resources
- Appendices

The feasibility study report document will present a clear plan addressing specific steps to consider in moving forward with optimized business models for value-added opportunities at the Old Camp Mill site. Of keen interest to the CHIPS organization and other regional stakeholders is a feasibility study that provides innovative solutions to long-term challenges and addresses the following questions.

- What value-added forest biomass utilization business models, scaled to local resource sustainability, have the highest potential for successful implementation by local contractors?
- Which business models are complementary such that a coordinated approach is possible – one that facilitates multiple businesses producing a variety of value-added products?
- How should these multiple businesses coordinate so that a healthy equilibrium and triple bottom line, represented by a balance between local environment, community and economy, is accomplished?

Task 7. Final Feasibility Study Report and Presentation

Based on input from CHIPS and the Steering Committee, a final feasibility study report document will be issued. The final report will be generated within two weeks of receiving input. Findings and a review of the feasibility study recommendations will be presented to CHIPS, the project Steering Committee, and other key stakeholders.

KEY FINDINGS

Summarized below are findings generated as a result of this feasibility study.

Biomass Feedstock Availability and Pricing

The greater Wilseyville region includes heavily forested landscapes that are managed almost evenly between public agencies and private landowners. Woody biomass material sourced from forest operations, fuels treatment activities and local transfer stations are sustainably available in volumes that could support value-added utilization enterprises located at the Wilseyville site. Table 1 provides an overview of potentially available wood waste volumes by biomass source. The standard unit of measure for woody biomass is bone dry ton (BDT).[1]

Table 1. Biomass Material Potentially Available

BIOMASS MATERIAL SOURCE	BDT PER YEAR	
	LOW RANGE	HIGH RANGE
Timber Harvest Residuals	21,000	42,000
Fuels Treatment Activities – USFS/BLM	8,250	13,750
Fuels Treatment Activities – FSC/NRCS/CHIPS	5,625	13,125
Urban Wood Waste – Wilseyville Transfer Stations	160	175
Agricultural Residuals	0	0
TOTAL	**35,035**	**69,050**

[1]One bone dry ton is the nominal equivalent of 2,000 pounds of dry wood fiber (no moisture content).

Table 2 summarizes the estimated costs of collection, processing and transport to deliver biomass material to the Wilseyville site.

Table 2. Biomass Material Collection, Processing and Transport Costs with Wilseyville Site as Delivery Point

BIOMASS MATERIAL SOURCE	DELIVERED MATERIAL	LOW RANGE	HIGH RANGE
Timber Harvest Residuals	Chips	$45/BDT	$60/BDT
Pre-Commercial Thinning Activities and Timber Harvest	Small Logs	$32/GT	$42/GT
Fuels Treatment Activities – USFS/BLM	Chips	$45/BDT	$60/BDT
Fuels Treatment Activities – Fire Safe Councils/NRCS/CHIPS	Chips	$50/BDT	$70/BDT
Urban Wood Waste –Received in raw form	Limbs, Construction Debris, Misc. Wood	$5/BDT	$15/BDT

Assumptions used to calculate range of costs:

- No service fees or cost share arrangement available from public agencies or private landowners.
- One-way transport averages 30 miles for biomass and small logs.
- Forest biomass is collected and processed (chipped) into truck at $30-$33/BDT.
- Small logs are harvested, collected and loaded onto log truck at $25-$28/GT[2] (about $150/MBF[3]).
- Haul costs are $85/hour for standard chip truck/trailer.
- Haul costs are $100/hour for walking floor chip truck trailer.
- Haul costs are $85/hour for standard log truck.
- Biomass chips average 14 BDT/load.
- Small logs average 24 GT/load (about 4 MBF).

[2]GT= green ton. One green ton represents 2,000 pounds of wood fiber.
[3]MBF = one thousand board feet. One board foot is equivalent to a board that is 12" wide, 12" long and 1" thick.

Value-Added Opportunities Considered

A range of value-added utilization options were considered. Figure 2 is a value-added utilization matrix that was developed jointly by TSS and the University of California Cooperative Extension.[4]

Figure 2. Value-Added Utilization Matrix

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Wood fuel pellets	Commercially deployed	Clean, dry (<10% mc) chip, needs to be <1% ash.	15	85	Pellet mill, dryer, cooler, hammermill, packaging.	Domestic users now, animal bedding now, potential for boilers (including co-fire with coal), niche barbeque pellets? Large scale gives access to international markets for co-firing.	Use of biomass from forest possible (e.g., small logs or chips low in bark) - key issue and expense is drying system. Larger scale facility will face challenges in gaining market share for domestic stoves. Large-scale export facility will have feedstock sourcing challenges and exposure to currency exchange rate risk.
Fuel bricks	Commercially deployed	Chip, dry (<15% mc), needles, bark okay.	3	6	Brick machine, dryer, cooler, hammermill, packaging.	Substitute for firewood is the primary market.	Potential to use field dried material as feedstock?
Fire logs	Commercially deployed	Clean, dry (<10% mc) chip, needs to be <1% ash.	3	9	Log machine, dryer, cooler, hammermill, packaging.	Substitute for firewood is the primary market.	Use of biomass from forest possible (e.g., small logs or chips low in bark) - key issue and expense is drying system.

[4]Gareth Mayhead, Academic Coordinator, Forest Products provided assistance in the development of the value-added matrix.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Wood plastic composites (WPC)	Commercially deployed	Clean, dry (2-12% mc) wood flour. Wood is ~55% of feedstock along with plastic and additives. Recycled wood use common.	0	0	Blender (compounder extruder), extrusion line, cooler, cut-off saw.	Landscape (bender board), decking, park furniture (picnic tables and seats).	Requires cost effective thermoplastic feedstock (HDPE, LDPE, PP, PVC). Utilize recycled plastics (milk jugs, plastic bags). Commercial facilities typically use pine, oak and maple. Blending (compounding) of wood and plastic may be two processes or single process depending upon equipment. Commercial molding processes typically continuous extrusion or batch injection molding. Other processes such as resin transfer molding (RTM) and others not commercially deployed. Could just make compounded wood-plastic pellets for WPC manufacturers.
Compound pellets for WPC production	Commercially deployed	Clean, dry (2-8% mc) wood flour. Wood is ~55% of feedstock along with plastic and additives. Recycled wood use common.	0	0	Compounder extruder.	Existing WPC mills (none in CA).	Cheaper way to get into WPC market place than making finished products.
Decorative bark	Commercially deployed	Small roundwood that is easily de-barked. Raw bark from sawmills is common feedstock source.	2	6	Debarker (flail, ring or rosser head), screen (trommel or flat).	High value up in urban areas (FOB $<100/ton).	As sawmill residuals become scarce, value of bark for landscape cover increases. Alternative use is hog fuel.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Decorative chip	Commercially deployed	Bark free and sized (no fines) wood chip.	2	6	Debarker (flail, ring or rosser head), screen (trommel or flat).	Colorized landscape cover sold in bulk and/or bagged.	Colored landscape cover requires additional equipment (colorizer). Feedstock (bark free chip) has alternative markets such as pulp/paper and furnish for composite products (particleboard/hardboard/decking).
Heating (buildings)	Commercially deployed	Woody biomass chipped to 3"minus, 50% mc, 3% ash.	1	2	Boiler system and hot water or steam delivery system.	Especially cost effective if replacing existing heating oil or propane heat. Can use for cooling also (using absorption chillers).	Fuel sizing has been an issue with recently installed thermal energy facilities. Typical installations include schools, hospitals, and community buildings.
Firewood	Commercially deployed	Roundwood (hardwood is preferred) logs that can be processed using automated firewood processor.	2	8	Log splitter or firewood processor.	Could be marketed to urban centers in boxes or bundles. Hardwood worth more. Higher prices for firewood near to affluent urban areas.	Numerous firewood contractors already in place. Some large contractors have significant market share.
Post and pole	Commercially deployed	Straight, low taper softwood (lodgepole, ponderosa, white fir) is preferred.	5	15	Rosser head peeler and/or doweller. Sorting line. Bucking saw.	Sold to treating facilities. Market treated posts for landscape timbers, vineyards (used to suspend vine wires) fences, furniture.	Need to treat - nearest facility is in Riverbank, CA.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Small-scale sawmill	Commercially deployed	Medium to large size roundwood.	2	10	Debarker, head rig, resaw, edger.	May need to target specialty markets to secure optimal value for products.	Tough to compete with large-scale sawmills for logs and lumber sales. Niche markets for lumber is important. Most lumber is low-value commodity product.
Lumber kiln	Commercially deployed	Lumber products or firewood.	1	2	Kiln (steam or dehumidifier).	Kiln dried lumber has added value in the market place. Transport of dried lumber products is more cost effective (due to lower weight).	Could also dry firewood or heat treat lumber and packaging to meet ISPM15. Could use waste wood as a fuel source.
Gasification	Demonstration projects	Woody biomass chipped to 3"minus, 30% mc, 3% ash. Drier fuel preferred.	2	5	Gasifier, gas clean-up, IC engine or turbine-generator.	Technology is evolving quickly and is becoming more cost effective.	More appropriate where electrical and thermal energy wholesale rates are high or in remote installations where power is not currently available.
Slow pyrolysis	Commercially deployed	Wood pieces (flexible spec).	1	2	Charcoal kiln.	Charcoal for cooking, artist's charcoal, filtration, soil amendment (biochar).	Very few slow pyrolysis units currently deployed.
Mild pyrolysis (torrefaction)	Pilot projects/R&D	Wood pieces (spec is vendor specific).	0	0	Reaction unit.	Co-firing in coal power plants (no modifications required to coal handling systems) or as fuel supplement for biomass power plants.	Torrefied fuel could be highly marketable due to BTU/pound and impervious to water. Coal is a key solid fuel in the marketplace and tends to set the price point.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	High	Main Equipment	Market Potential	Comments
Fast pyrolysis	Pilot projects/R&D	Small (1/4" minus), dry, clean wood particles.	0	0	Reaction unit.	Char for filtration, cooking, soil improvement. No ready market for bio oil, except at oil refineries (upgrader).	Some significant investments made in R&D, including demonstration facilities (portable and fixed). Promising technology that may be commercially viable soon.
Solid fuel steam cycle (biopower)	Commercially deployed	Woody biomass chipped to 3"minus, 50% mc, 3% ash. Drier fuel preferred.	2	30	Fuel handling, boiler, turbine-generator, emissions control, water cooling and recovery.	Technology is evolving quickly and is becoming more cost effective.	More appropriate where electrical and thermal energy wholesale rates are high. Typically found in states with attractive Renewable Portfolio Standards.
Air filtration media	Commercially deployed	Virgin material that will grind to large heterogeneous particles.	0	0	Grinder and screen.	Wastewater treatment facilities, etc.	Need other market for grinder material (e.g., hog fuel or landscaping) that does not meet specifications for filtration media.
Compost	Commercially deployed	Greenwaste (tree trimmings/grass clippings) is optimal.	2	6	Grinder, screen and windrow turner.	Soil amendment market is seasonal. Compost and mulch operations work best on same site. Typically sold in bulk or bagged.	There may be opportunities to install compost operation near existing landfills to divert greenwaste away from landfills.
Mulch	Commercially deployed	Greenwaste (tree trimmings/grass clippings) is optimal.	2	6	Grinder and screen.	Soil amendment market is seasonal. Compost and mulch operations work best on same site.	Very similar to compost operation. In fact, compost/mulch operations typically share the same site.

Process or Product	Development Status	Feedstock Specifications	Jobs (FTE) Low	Jobs (FTE) High	Main Equipment	Market Potential	Comments
Chip for pulp/paper or composite panel furnish	Commercially deployed	Woody biomass chipped to 3"minus, 50% mc, bark free with few fines.	3	6	Debarking equipment (e.g., chain flail) chipper and screen.	No pulp/paper operations operating in CA. Two composite panel facilities in CA (Martel and Rocklin).	Very limited markets (no pulp mills and two composite panel operations) in CA. Chip export market may ramp up and demand in the Pacific Rim trends higher.
Anaerobic digestion	Commercially deployed	Wide range of feedstocks greenwaste, manure, and food waste.	1	2	Digester.	Compost market. Methane can be used for heat or electricity generation.	Could complement agricultural or food waste streams. Typically collocated with agricultural operations (dairy).
Veneer	Commercially deployed	Straight logs with limited taper. 8"+ diameter.	40	80+	Steaming vats, veneer lathes, trimming, rolling stock.	Plywood and LVL mills are in Oregon, peeler cores (2"-4") sold into post and pole market.	Typically a large commercial-scale facility (process 420 blocks per hour).
Animal bedding (shavings)	Commercially deployed	Small roundwood (ponderosa pine preferred).	2	6	Shaver, screens, drying, packaging.	Can be sold in bulk and/or in bags.	One commercial operation within 60 miles of Wilseyville, at Chinese Camp in Tuolumne County.

Value-Added Opportunities Analysis Results

Four value-added opportunities were selected by the Project Steering Committee[5] for more detailed analysis. These included:

- Small-scale combined heat and power
- Firewood processing
- Small-scale sawmill
- Biomass fiber to local markets

Small-Scale Combined Heat and Power

Technologies to convert woody biomass material to thermal and electrical energy have evolved significantly in recent years. Especially impressive has been the improved conversion efficiencies and cost effective operations associated with biomass gasification technologies. The primary obstacle to success is the current wholesale power market value for small-scale renewable power generation. The California Public Utility Commission is currently in the feed-in tariff rulemaking process for small-scale (<3 MW) renewable power generation facilities. If the new feed-in tariff rate structure accounts for the avoided cost benefits to electric ratepayers associated with forest biomass power, a small-scale combined heat and power generation facility at Wilseyville will be economically viable.

Firewood Processing

There are well-developed local and regional firewood markets that a commercial-scale firewood processing facility at Wilseyville could cost effectively serve. The capital cost associated with a firewood processing operation is manageable and return on equity calculations are favorable. Key drivers for success include raw material expense (cost of firewood logs) and the market value for firewood sold into local and regional markets. There may be an opportunity to sell packaged firewood (bundled and palletized) into regional and external markets. This will require a well-defined and targeted marketing plan and additional packaging equipment.

Small-Scale Sawmill

A small-scale sawmill located at Wilseyville will have ready access to sawlogs generated within the TSA. Strategically located between large-scale commercial sawmills, the Wilseyville yard has a transport cost advantage that will allow the facility to source sawlogs at cost effective prices. Wilseyville sawmill operations revenue is a function of local lumber sales. Lumber sales will depend on competitive pricing of finished product, both rough green lumber and dry finished lumber. There may be an opportunity to develop a secondary manufacturing product line focused on value-added production of wood boxes and display cases for end markets such as local and regional wineries.

[5]During the July 18, 2011 Steering Committee meeting and reviewed again during the October 5, 2011 Steering Committee meeting.

Secondary manufacturing will require additional processing equipment. A marketing plan should be considered to address lumber sales and secondary manufacturing sales opportunities. Due to the highly competitive regional lumber markets, the sawmill product marketing plan should target local sales.

Biomass Fiber to Local Markets

Local commercial markets for biomass fiber are limited to existing and planned biomass power generation facilities. The newly refurbished Buena Vista Biomass Power facility is located closest to the Wilseyville product yard and should be considered as a potential long-term customer.

ENVIRONMENTAL SETTING

The product yard site is located near the community of Wilseyville in the Blue Mountain region of Calaveras County. Situated at 2,800 foot elevation, the site is the former location of a commercial-scale sawmill owned and operated by the Associated Lumber and Box Company (ALBC) and is centrally located relative to forest resources. The community of Wilseyville was named in honor of Lawrence Wilsey, General Manager of several ALBC sawmills.[6] The ALBC sawmill reportedly operated from 1942 to 1968 and was a modern sawmill for its day. The entire facility occupied about 200 acres.

Figure 3 provides an aerial image of the site with a legend highlighting the location of major buildings and other infrastructure. Like many mills constructed in this era, there were onsite boilers that utilized wood waste to generate steam used to drive manufacturing equipment. Due to the relatively mild climate, much of the rough sawn lumber was air dried on site.

[6]Per the Sierra Nevada Logging Museum website.

Figure 3. Associated Lumber and Box Company, Wilseyville Sawmill

The site is currently owned and managed by the Calaveras County Water District (CCWD). CCWD manages the site for wastewater treatment with much of the site utilized as a wastewater spray field. The Water District is currently in discussions with the CHIPS Board of Directors to sell 20 acres of the old sawmill site for creation of a product utilization yard.

Figure 4 provides an aerial image of the old mill site today, with approximate location of the product yard highlighted in red.

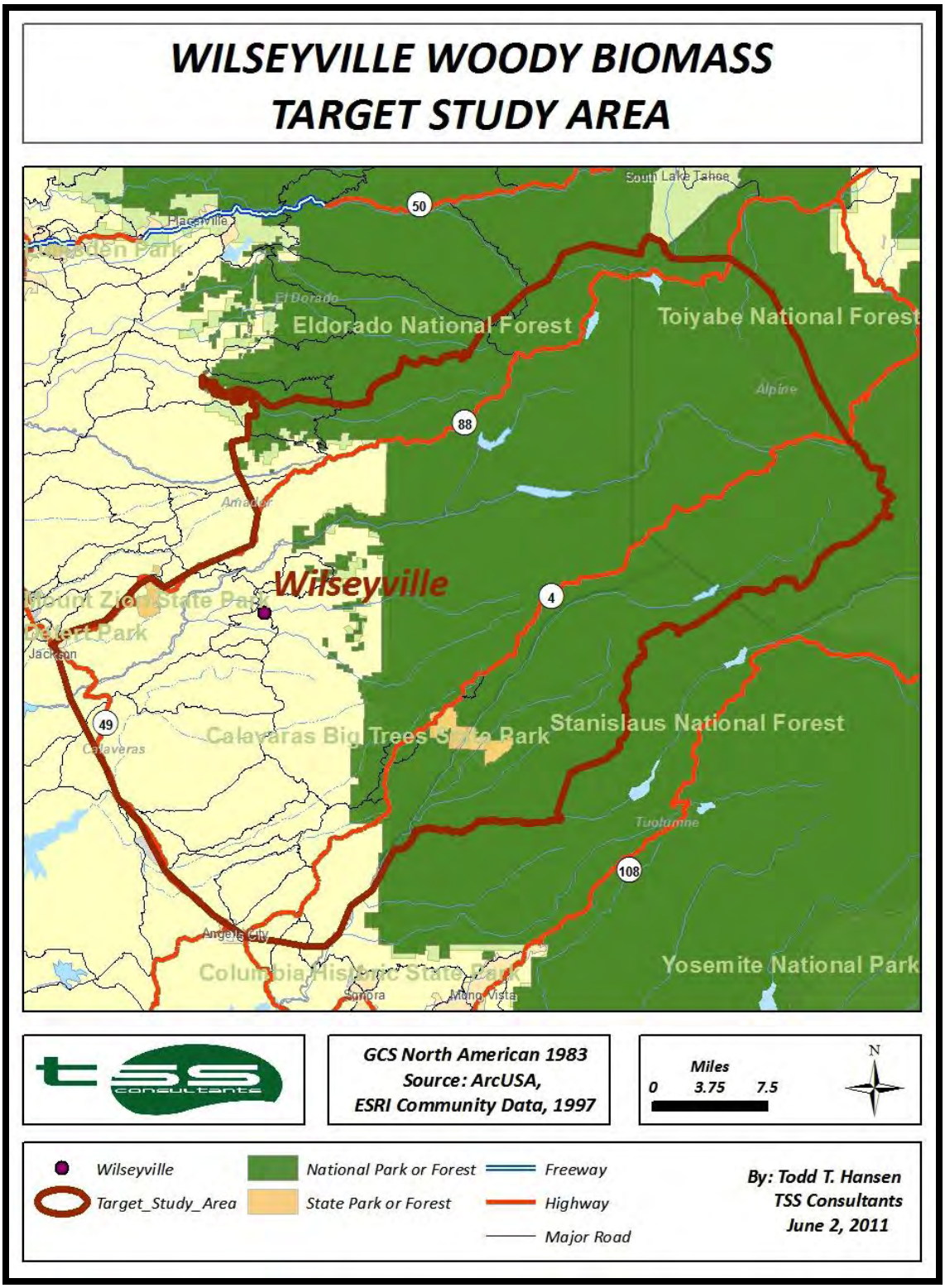
Figure 4. Old Mill Site with Product Yard Location

TARGET STUDY AREA

Consistent with the objectives of the woody biomass feedstock availability analysis, the forested landscapes and watersheds located within a logical haul distance of the Wilseyville site were included in the Target Study Area (TSA). Figure 5 highlights the updated TSA.[7]

[7]As defined by feasibility study project steering committee.

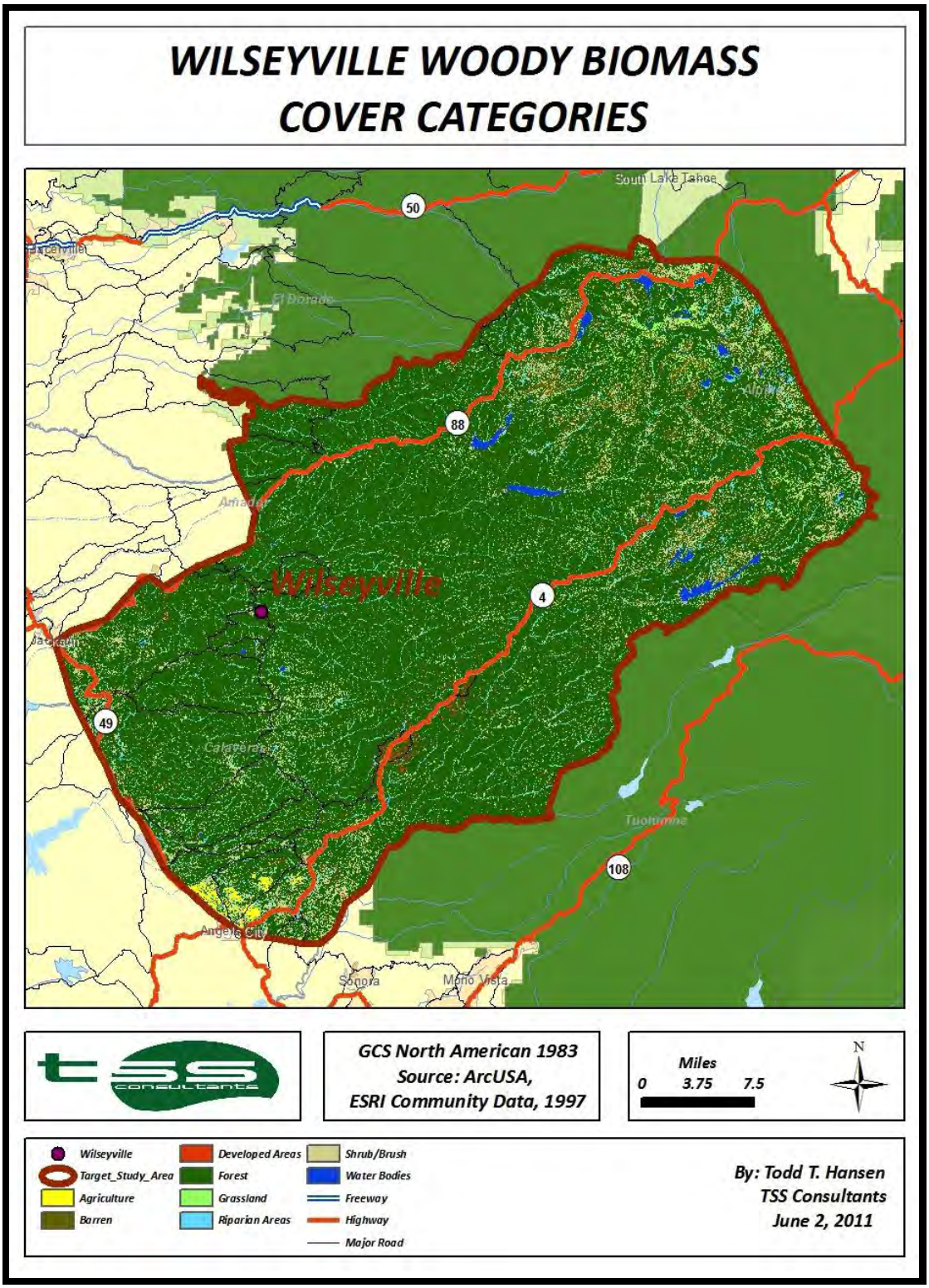
Figure 5. Target Study Area



Vegetation Cover and Land Ownership/Jurisdiction

Woody biomass availability for any given region is heavily dependent on vegetation cover, land management objectives and ownership. Vegetation cover within the Wilseyville TSA is predominantly forest (80%), shrubs/brush (8%) and riparian (6%) cover. Figure 6 shows vegetation cover types within the TSA.

Figure 6. Vegetation Cover Within the Target Study Area



Vegetation cover types significantly influence woody biomass availability. Depending on management objectives, certain cover types could generate significant volumes of woody biomass material for use as feedstocks for value-added utilization. Table 3 summarizes vegetation cover by category within the TSA.

Table 3. Vegetation Cover Within the TSA

COVER CATEGORIES	ACRES	PERCENT OF TOTAL
Agriculture	2,792	0.3%
Barren	24,037	2.8%
Developed Areas	11,262	1.3%
Forest	688,466	80.2%
Grassland	5,149	0.6%
Riparian Areas	51,283	6.0%
Shrub/Brush	68,212	7.9%
Water Bodies	7,041	0.8%
TOTALS	**858,241**	**100.0%**

Land ownership drives vegetation management objectives and within the TSA, the USDA Forest Service (USFS) is the most significant land manager with responsibility for approximately 49% of the landscape. Private land makes up about 46% and the Bureau of Land Management (BLM) makes up relatively little acreage at 4%. Federal land management agencies (USFS and BLM) together manage approximately 53% of the landscape. Federal jurisdiction and management objectives have a significant influence regarding woody biomass material availability within the TSA.

Figure 7 highlights the locations of the various ownerships and jurisdictions.

Figure 7. Land Ownership/Jurisdiction Within the TSA

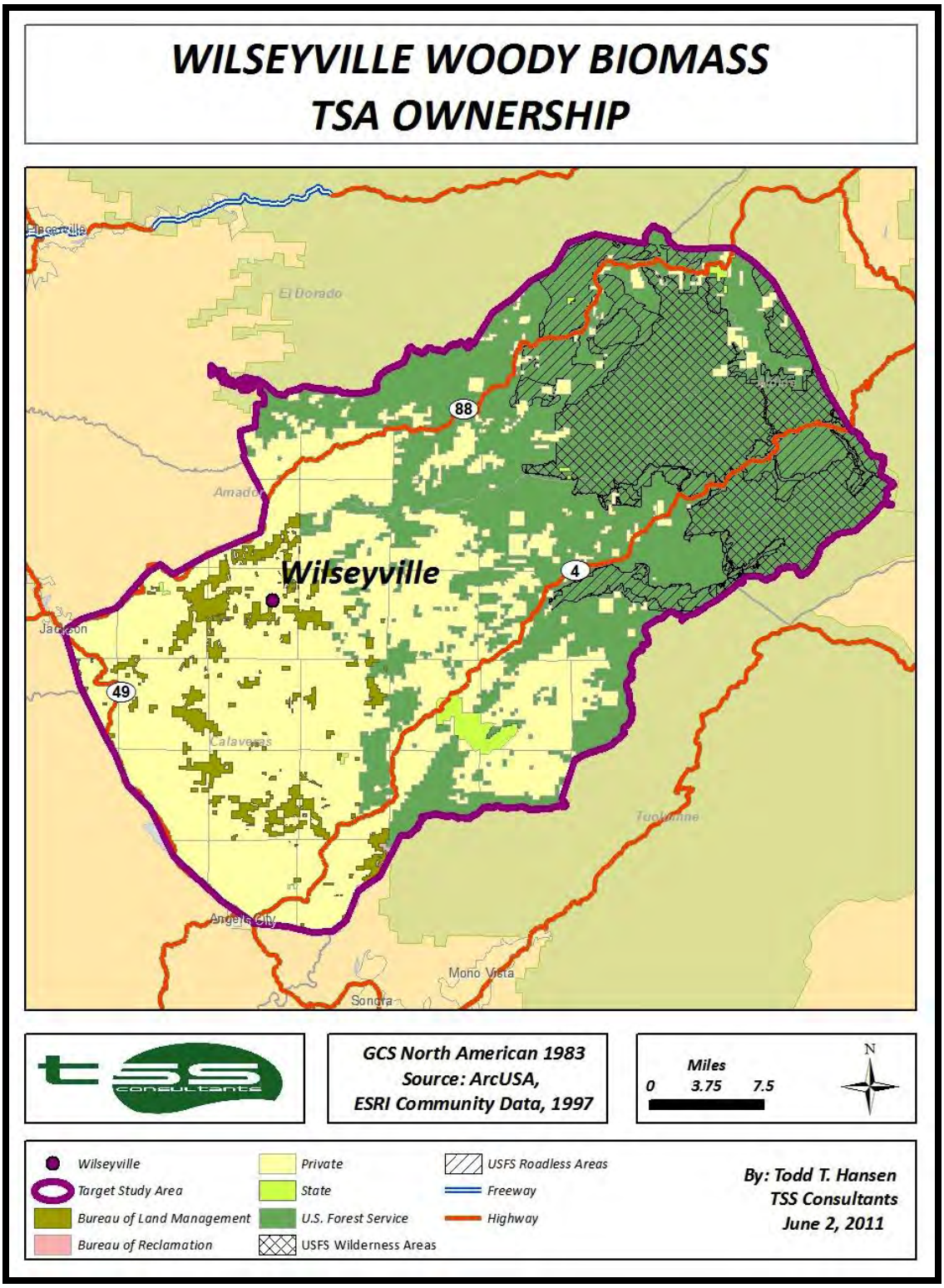


Table 4 summarizes land ownership and jurisdiction within the TSA.

Table 4. Land Ownership/Jurisdiction Forest Vegetation Cover Within the TSA

LAND OWNER/MANAGER	FORESTED ACRES	PERCENT OF TOTAL
BLM	28,001	4%
Bureau of Reclamation	189	0%
Private	318,489	46%
State of California	6,489	1%
USFS	335,299	49%
TOTALS	**688,467**	**100%**

There are several land management classifications within the USFS jurisdiction. Some classifications do not allow for biomass material removal. For example, areas designated as wilderness and roadless areas are not subject to active vegetation management activities. Of the approximately 335,300 acres of forested landscape managed by the USFS, about 58% (193,292 acres) have management objectives that allow biomass material removal. Table 5 provides details of USFS land classifications that support forest vegetation cover and are located within the TSA.

Table 5. USFS Jurisdiction/Land Classification Within the TSA

LAND CLASSIFICATION	FORESTED ACRES	PERCENT OF TOTAL
USFS Wilderness	87,887	26%
USFS Roadless	54,120	16%
USFS Net Available for Vegetation Management Activities	193,292	58%
TOTALS	**335,299**	**100%**

Topography Within the Target Study Area

Forest biomass recovery activities are generally restricted to topography that will allow ready access for equipment and crew. Steep topography over 35% slope gradient is considered to be the breakoff point for ground-based logging and/or biomass recovery equipment on federally (USFS and BLM) managed lands. Private land managers typically utilize ground-based equipment on slopes up to 50%, but the cost of operating on sustained slopes above 35% are typically quite high and are considered prohibitive. Figure 8 highlights topography that is over 35% slope within the TSA.

Figure 8. Slope Analysis of the TSA

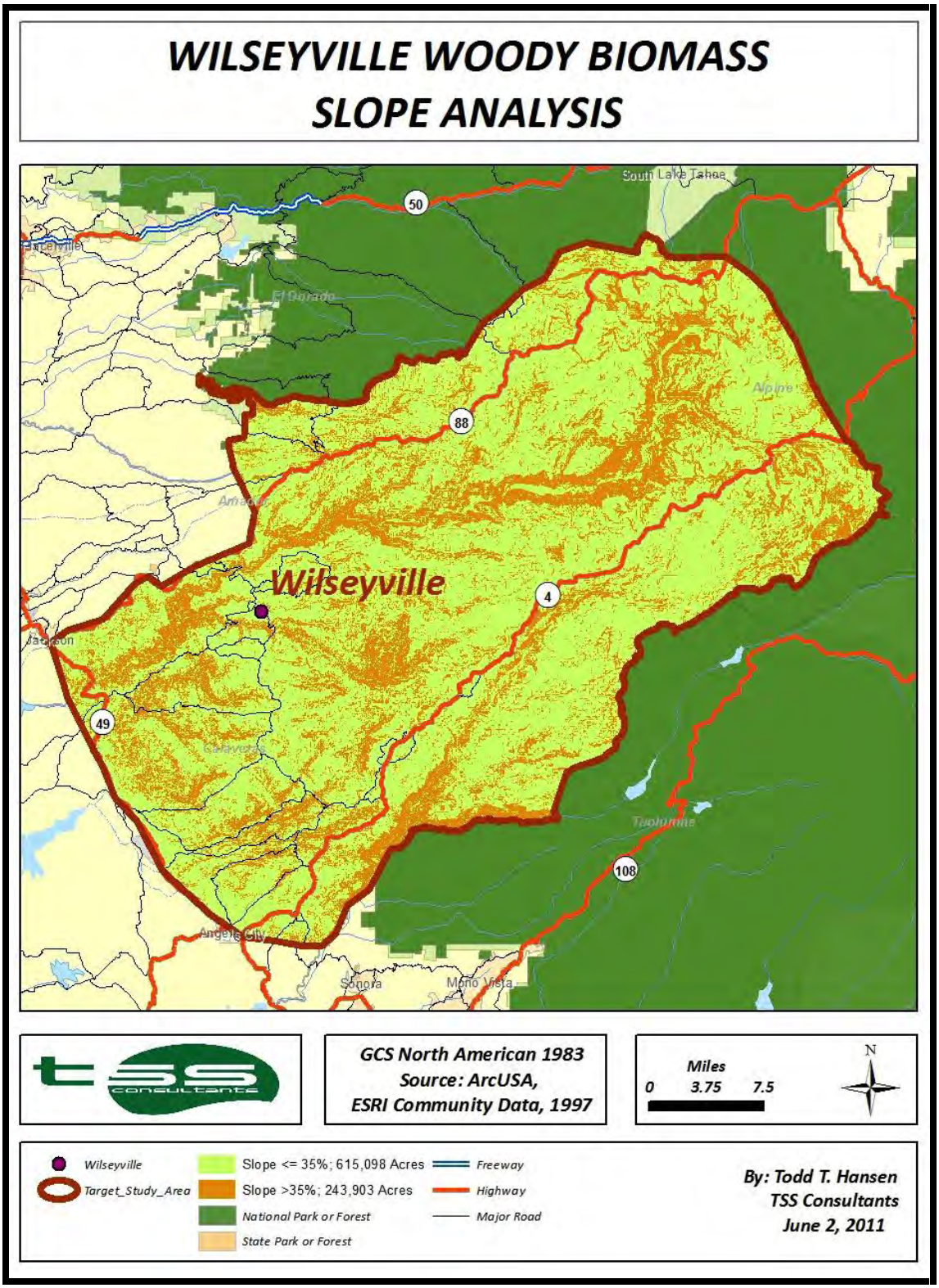


Table 6 provides figures regarding TSA topography by slope class.

Table 6. Topography Classification Within the TSA

TOPOGRAPHY	ACRES	PERCENT OF TOTAL
35% Slope and Less	615,098	72%
Greater than 35% Slope	243,903	28%
TOTALS	**859,001**	**100%**

Almost three-quarters of the topography within the TSA is 35% slope or less and is considered potentially available for biomass recovery activities. Of course, land management classifications such as wilderness or roadless area override slope conditions and are not considered available for biomass recovery activities.

TSS further analyzed the slope topography to account for acres by ownership that are potentially available for vegetation management. Table 7 summarizes the results.

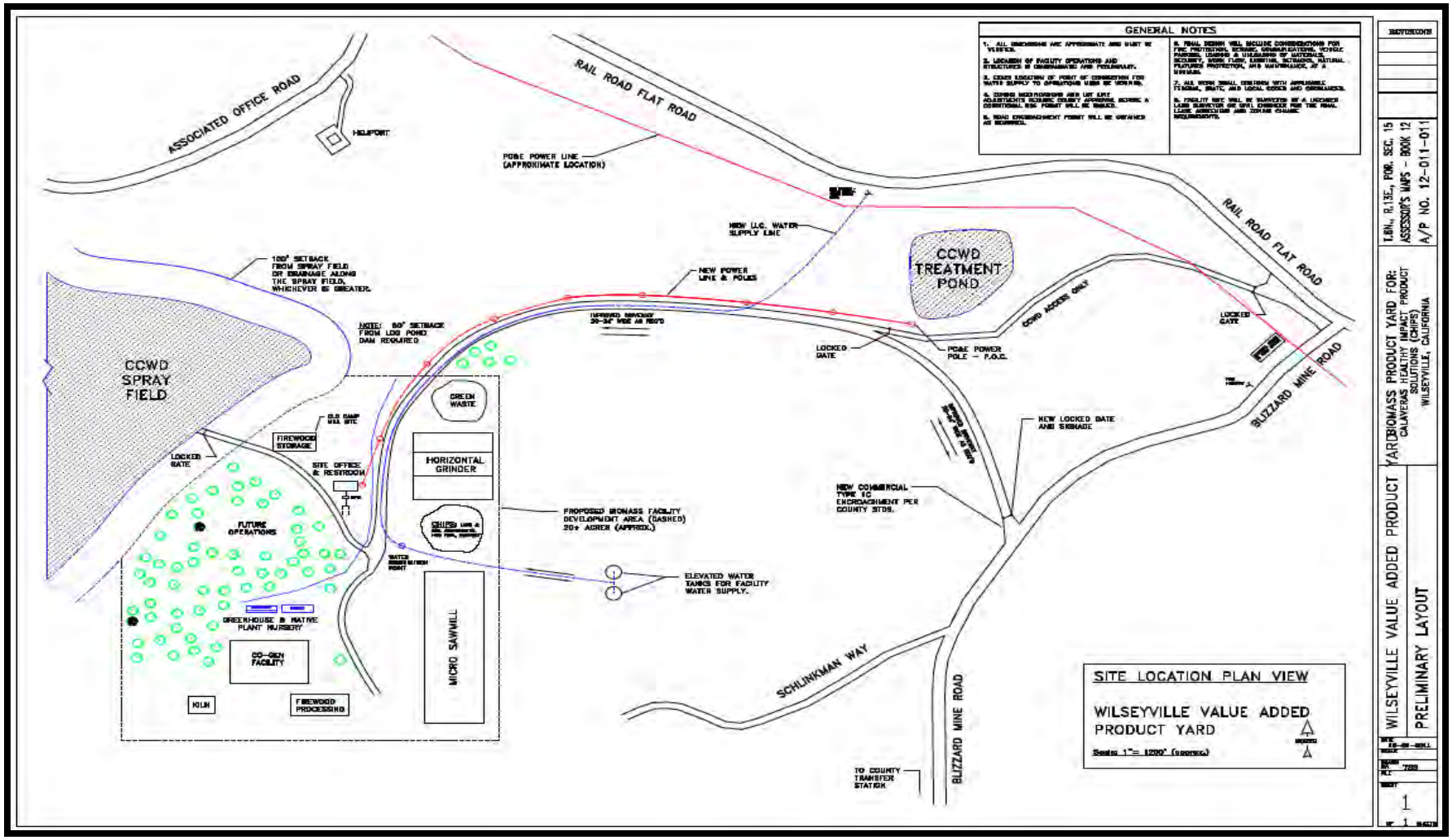
Table 7. Topography Classification by Ownership Within the TSA

OWNERSHIP	< 35% SLOPE ACRES	>35% SLOPE ACRES	<35% SLOPE PERCENT OF TOTAL	>35% SLOPE PERCENT OF TOTAL
USFS (Net Available)	55,333	20,529	73%	27%
BLM	13,744	17,701	44%	56%
Private	296,068	91,265	76%	24%
TOTALS	**365,145**	**129,495**		

OLD MILL SITE REVIEW

The old mill site location for the CHIPS product yard is in a highly disturbed state, particularly the area where the CCWD wastewater spray field is currently located. There are also remnants of the main sawmill facility (cement pads) and a log pond on the site. Figure 9 is a draft site plan that highlights potential locations of value-added processing operations at the product yard.

Figure 9. Product Yard Draft Site Plan[8]



[8]Basic site template was provided courtesy of Kevin Hansen and KRH Engineering. TSS updated this site plan to accommodate infrastructure necessary for value-added processes.

Considering the proposed uses and the site itself, two principal siting issues stand out: zoning and land use permitting, and biological resources.

Zoning and Land Use Permitting

The subject property is currently zoned as Public Service (PS) due primarily to the use of the property by the CCWD and their wastewater treatment system. Under the Calaveras County Zoning Ordinance Section 17.48.10, the purpose of the PS zone is to classify lands that are used for public purposes, public utilities, and for public agencies. Permitted uses, and uses which are allowed consistent with the PS zoning status, include the following:

- All public uses, buildings, facilities, structures, offices, maintenance yards or storage facilities, provided that there are no toxic or hazardous materials stored at the site, and except those enumerated in Section 17.48.030 of the Calaveras County Zoning;
- Residence for security personnel;
- Accepted farming practice.

Uses requiring a Conditional Use Permit:

- Hydroelectric power generation projects by public or private entities;
- Sanitary and septic waste disposal facilities;
- Class II or Class III landfills;
- Temporary employee housing, except for one mobile home for security purposes;
- Public or private entity facilities which involve the storage, handling, or use of toxic or hazardous materials;
- Fire protection facilities;
- Correction or prison facilities;
- Animal shelters;
- Commercial agriculture;
- Ambulance services.

In addition, the County Zoning Ordinance allows for other potential uses in the PS Zone with the following clause:

"Upon findings by the planning commission that a use is consistent with the purposes of this chapter, the use may be added to this section, provided that the commission concurrently initiates a change in this chapter for inclusion of the use."

The CHIPS Project Manager[9] contacted the Planning Director of Calaveras County Planning Department to confirm the permitted uses for what is being proposed within the PS zoning (see figure 9 above) at the product yard. Rebecca Willis, Planning Director, through Ministerial Action confirmed that the projected activities in the proposed CHIPS product yard are consistent with the PS zoning designation (see Appendix B for correspondence from the Planning Department). A Conditional Use Permit (if required) may place other environmental

[9]Rick Breeze-Martin, Project Manager, CHIPS.

compliance requirements on the site and its operations.

Biological Resources

During a site visit on June 7, 2011, it was observed that the areas where the proposed facilities have been preliminarily planned are reverting back to their natural state. This may require some biological resources study (to be determined during the initial phase of the California Environmental Quality Act process as led by the County Planning Department).

Environmental Compliance

Several of the proposed uses will require an air emissions permit from the Calaveras County Air Pollution Control District (CCAPCD). For example, a small sawmill might generate fugitive emissions (sawdust or dust from log truck traffic) that will require control and the accompanying need for a permit. A lumber dry kiln will require a combustion system (wood fired or liquid petroleum gas) to create the necessary heat for the system. A combustion system using biomass fuel (lumber scraps or firewood) will require an air emissions permit from the CCAPCD. The air permit will likely have minimal compliance requirements, as a small lumber kiln does not fall under the Best Available Control Technology requirements due to its relatively small scale. If needed a small dry kiln (under 50 MMBtu/hour) fired on liquid petroleum gas (propane) is exempt from air permits per CCAPCD Rule 402.

WOODY BIOMASS FEEDSTOCK RESOURCE AVAILABILITY AND COST ANALYSIS

Woody biomass material sources considered in this study includes a range of forest, agricultural and wood waste management activities:

- Forest management activities:
  - Timber harvest operations.
  - Fuels treatment/forest restoration projects.
  - Timber stand improvement projects.
- Raw material/woody biomass from urban wood waste (construction/demolition wood, pallets, tree trimmings).
- Agricultural residuals generated as a byproduct of orchard or vineyard management activities.

Forest-Sourced Biomass

Timber Harvest Residuals

Timber harvest residuals can provide significant volumes of woody biomass material. Typically available as limbs, tops and unmerchantable logs, these residuals are waste byproducts of commercial timber harvesting operations. As such, these residuals have no merchantable value though they can be a relatively economic raw material fuel supply for the emerging added value woody biomass utilization effort. Once collected and processed using portable chippers or grinders, this material is an excellent biomass fuel source or feedstock for compost/mulch.

Small, nonmerchantable logs that do not meet sawlog specifications could also be recovered from timber harvest operations. In some cases the larger sawlogs (e.g., 10" and larger diameter measured small end inside bark) command a higher value, which could leave smaller logs available for value-added utilization (depending on sawlog pricing). These smaller logs could be delimbed to a manageable diameter (e.g., 2") and made available for value-added uses such as firewood, post/poles or animal bedding logs.

Timber harvest activity within the State of California is monitored by the State Board of Equalization (BOE). The BOE levies timber harvest taxes based on annual timber harvest levels. A review of the 2006 through 2010 timber harvest data was conducted to confirm historic timber harvest activities within the TSA. Table 8 provides the results.

Table 8. 2006 Through 2010 Timber Harvest Volume Produced Within the TSA (Expressed in MBF[10]/Year)

COUNTY	2006	2007	2008	2009	2010	5 YEAR AVERAGE HARVEST	% OF COUNTY IN TSA	WEIGHTED AVERAGE HARVEST
Alpine	51	0	0	0	2,192	449	29%	129
Amador	27,274	18,297	24,626	5,927	7,718	16,768	37%	6,235
Calaveras	33,523	27,138	33,235	16,162	25,679	27,147	73%	19,854
El Dorado	99,508	91,055	44,726	20,181	19,832	55,060	7%	3,718
Tuolumne	48,392	50,558	52,975	26,976	23,596	40,499	9%	3,656
Totals	**208,748**	**187,048**	**155,562**	**69,246**	**79,017**	**139,924**		**33,591**

Results of the historic timber harvest review confirm that harvest levels over time have been inconsistent. A primary driver is the demand for sawlogs, which was significantly diminished in 2009 and 2010 due to curtailment of the Sierra Pacific Industries sawmill at Standard. The Standard mill has been rebuilt and is currently in commercial operation,[11] which should ramp up harvest levels to pre-2009 levels.

The 2006 through 2010 historic record of timber harvest across all five counties results in an average annual harvest of 139,924 MBF. The TSA is made up of portions of these counties and using GIS analysis, TSS was able to determine the portion of each county that lies within the TSA (see Table 8). Using this data, a weighted average timber harvest figure was

[10]MBF = thousand board foot measure. One board foot is nominally 12" long by 12" wide and 1" thick.
[11]Per discussions with Tim Tate, SPI forester.

calculated for each county. From this methodology, TSS was able to conclude that the average annual timber harvest for the TSA amounts to 33,591 MBF per year.

TSS' experience with forest biomass recovery confirms that a recovery factor of 0.9 BDT per MBF of sawlogs harvested would apply for mixed conifer stands in the TSA. This amounts to a gross potential of 30,232 BDT per year of timber harvest residuals.

Not all topography or road systems will accommodate biomass recovery operations. Based on slope analysis (see Table 7) and for the purposes of this forecast, it is assumed that 70% of the timber harvest operations within the TSA are located on topography and road systems that will support biomass recovery. Using this assumption then, approximately 21,162 BDT per year are projected to be available as timber harvest residuals from forested acres within the TSA. If small, unmerchantable logs (<10" diameter at breast height) are recovered, the timber harvest residuals could be double this volume (42,000 BDT per year).

Fuels Treatment/Forest Restoration

The Wilseyville region is home to numerous communities with residential neighborhoods situated within the wildland urban interface (WUI). Due to high fire danger conditions within the WUI, there are concerted efforts across all forest ownerships to proactively reduce hazardous forest fuels in support of defensible communities.

Discussions with the Amador Ranger District and Calaveras Ranger District,[12] the Amador and Calaveras Foothills Fire Safe Councils,[13] Bureau of Land Management,[14] Natural Resource Conservation Service,[15] Calaveras Healthy Impact Products Solution,[16] and private land management foresters[17] confirmed plans to conduct fuels treatment and forest restoration activities. Summarized below in Table 9 are the results of those interviews.

Table 9. Forest Fuels Treatment Activities Planned Within the TSA (Expressed in Acres per Year)

ORGANIZATION	FUELS TREATMENT/FOREST IMPROVEMENT PLANNED	
	LOW RANGE	HIGH RANGE
USFS – Amador and Calaveras RD	600	900
Bureau of Land Management	60	200
Amador FSC	150	250
Calaveras Foothills FSC	150	250
Natural Resources Conservation Service	50	400
CHIPS	100	150
TOTALS	**1,110**	**2,150**

[12]John Sweetman, Amador RD; Jim Junette, Calaveras RD.
[13]Cathy Koos-Breazeal, Amador FSC; Bill Fullerton, Calaveras Foothill FSC.
[14]Keith Johnson, BLM.
[15]Matt McNicol, NRCS forester.
[16]Rick Breeze-Martin, Project Manager, CHIPS.
[17]Steve Cannon, consulting forester, Tim Tate, SPI forester.

Due to very limited value-added markets for woody biomass material generated as a byproduct of forest fuels treatment activities, most of the fuels treatment operations are processing (mastication or chipping) biomass and leaving it on site or piling and burning the material. Discussions with project coordinators and foresters indicated that if a ready market for biomass existed, with values high enough to cover most of the processing and transport costs, significant biomass volume would be diverted away from current business-as-usual activities (mastication/chip/pile and burn).

Interviews with forest managers and fiber procurement foresters confirmed that between 10 and 15 BDT per acre of forest biomass is considered recoverable during fuels treatment and forest restoration activities. Assuming an average recovery factor of 12.5 BDT per acre, and the annual acres treated shown in Table 9, between 13,875 and 26,875 BDT will be generated per year from fuels treatment and forest improvement operations in the TSA.

Urban-Sourced Biomass

Wood waste generated by tree service companies, local residents, and businesses in the Wilseyville area regularly generate wood waste in the form of tree trimmings, construction debris and demolition wood. Much of this wood waste is currently deposited at the Calaveras County managed Wilseyville Transfer Station. Discussions with Calaveras County Solid Waste Department[18] confirmed that the County continues to accept wood waste at the transfer station and that a tip fee of $4 per cubic yard is charged at the gate. Prior to October 2009, there was no tip fee and a higher volume of wood waste (not surprising) was delivered. In 2008 approximately 1,950 cubic yards of wood waste was taken in. If the Wilseyville product yard is developed, a similar volume of wood waste can be expected should there be no tip fee charged. Calaveras County staff expressed a high level of interest in discontinuing acceptance of wood waste at the Wilseyville Transfer Station should the Wilseyville product yard be developed. CHIPS and County Staff are in discussions about diverting the Wilseyville wood waste stream from the transfer station to the product yard as part of coordinating public service.

TSS discussions with landfill and transfer staff over the years indicates that each cubic yard of unprocessed brush, tree trimmings and wood waste averages about 300 pounds. TSS' experience is that urban wood with a heavy green component (brush, tree trimmings) will average about 40% moisture content. Using these metrics (300 lbs/cubic yard and 40% moisture content), each cubic yard received will equal about 180 dry pounds of wood. Assuming that 1,950 cubic yards are accepted in a given year equates to 175 BDT per year.

Agricultural Byproducts

As noted in the vegetation cover analysis (see Table 3), less than 0.5% of the TSA includes land dedicated to commercial agriculture (approximately 2,792 acres). Most of these acres are likely dedicated to raising cattle and calves, which is the number one agriculture commodity in the county.[19] Some commercial agriculture crops, such as orchards, do generate wood waste in

[18]Tom Garcia, Director, Public Works Department, Calaveras County.
[19]Per the 2009 Calaveras County Crop Report.

the form of prunings generated annually and as orchards are replaced (nut orchards are removed and replaced about every 25 years). Vineyards may generate wood waste as they are removed, but removal is fairly rare, and separating the vines from the trellis cables is very costly.

The 2009 Calaveras County Crop Report confirmed that there are 800 acres of walnut orchard and 800 acres of wine grapes in the county. Discussions with local foresters and fiber managers[20] confirmed that no commercial orchards exist within the TSA and that few vineyards are in the TSA that might generate wood waste (e.g., prunings). TSS concludes that no volume of agricultural wood waste is currently available within the TSA.

Biomass Fuel Availability – Current Forecast

Summarized in Table 10 are the results of biomass material recovery analysis from forest activities and urban wood waste within the TSA.

Table 10. Biomass Material Potentially Available – 2011

BIOMASS MATERIAL SOURCE	BDT PER YEAR	
	LOW RANGE	HIGH RANGE
Timber Harvest Residuals	21,000	42,000
Fuels Treatment Activities – USFS/BLM	8,250	13,750
Fuels Treatment Activities – FSC/NRCS/CHIPS	5,625	13,125
Urban Wood Waste – Wilseyville Transfer Station	160	175
Agricultural Residuals	0	0
TOTAL	**35,035**	**69,050**

Biomass Fuel Availability – Future Forecast 2014 to 2016

Summarized in Table 11 are the results of biomass material recovery analysis adjusted for biomass availability three to five years from now.

Table 11. Biomass Material Potentially Available – 2014 to 2016

BIOMASS MATERIAL SOURCE	BDT PER YEAR	
	LOW RANGE	HIGH RANGE
Timber Harvest Residuals	22,500	44,000
Fuels Treatment Activities – USFS/BLM	13,250	18,750
Fuels Treatment Activities – FSC/NRCS/CHIPS	5,625	13,125
Urban Wood Waste – Wilseyville Transfer Station	225	250
Agricultural Residuals	0	0
TOTAL	**41,600**	**76,125**

[20]John Romena, Director of Fuel Procurement, Buena Vista Biomass Power, LLC.

Assumptions used for this forecast include:

- General improvement in the local and regional economy (more urban wood waste generated).
- Slightly improved saw timber markets (mild increase in timber harvest on public and private forest lands).
- Ramp up in forest fuels reduction activities as the ACCG All Lands TBL strategy is implemented with projects like the CFLRP Cornerstone Project.

Biomass Fuel Availability – Future Forecast 2017 to 2022

Summarized in Table 12 are the results of biomass material recovery analysis adjusted for biomass availability six to ten years from now.

Table 12. Biomass Material Potentially Available – 2017 to 2022

BIOMASS MATERIAL SOURCE	BDT PER YEAR	
	LOW RANGE	HIGH RANGE
Timber Harvest Residuals	31,500	53,000
Fuels Treatment Activities – USFS/BLM	18,250	23,750
Fuels Treatment Activities – FSC/NRCS/CHIPS	5,625	13,125
Urban Wood Waste – Wilseyville Transfer Station	275	325
Agricultural Residuals	0	0
TOTAL	**55,650**	**90,200**

Assumptions used for this forecast include:

- Continued improvement in the local and regional economy (more urban wood waste generated).
- Significantly improved saw timber markets (strong increase in timber harvest on public and private forest lands).
- Continued ramp up in forest fuels reduction activities as Cornerstone All Lands Project is fully implemented.

Costs to Collect, Process and Transport Biomass Material

Commercial-scale infrastructure to collect, process and transport biomass material currently exists within the TSA. TSS relied on interviews with local contractors in addition to TSS' past experience to analyze these costs. Table 13 provides results of the cost analysis.

Table 13. Biomass Material Collection, Processing and Transport Costs with Wilseyville Site as Delivery Point

BIOMASS MATERIAL SOURCE	DELIVERED MATERIAL	LOW RANGE	HIGH RANGE
Timber Harvest Residuals	Chips	$45/BDT	$60/BDT
Pre-Commercial Thinning Activities and Timber Harvest	Small Logs	$32/GT	$42/GT
Fuels Treatment Activities – USFS/BLM	Chips	$45/BDT	$60/BDT
Fuels Treatment Activities – FSC/NRCS/CHIPS	Chips	$50/BDT	$70/BDT
Urban Wood Waste – Received in Raw Form	Limbs, Construction Debris, Misc. Wood	$5/BDT	$15/BDT

Assumptions used to calculate range of costs:

- No service fees or cost share arrangement available from public agencies or private landowners.
- One-way transport averages 30 miles for biomass and small logs.
- Forest biomass is collected and processed (chipped) into truck for $30 to $33/BDT.
- Small logs are harvested, collected and loaded onto log truck for $25 to $28/GT.
- Haul costs are $85/hour for standard chip truck/trailer.
- Haul costs are $100/hour for walking floor chip truck trailer.
- Haul costs are $85/hour for standard log truck.
- Biomass chips average 14 BDT/load.
- Small logs average 24 GT/load.

Current Market Prices

Demand for woody biomass material currently exists within the TSA. Several biomass power plants and an animal bedding operation are actively procuring biomass in the form of chips and logs. Current prices range from $40 to $42 per BDT for biomass fuel and from $30 to $32 per GT for small, typically low-grade logs for animal bedding. The SPI Standard sawmill is purchasing logs (sawmill grade) as well.

Discussions with Buena Vista Biomass Power staff[21] confirmed plans to begin receiving limited biomass fuel deliveries commencing mid January, 2012. Commercial operations are expected to commence during first quarter, 2012, with fuel receipts ramping up to full capacity in late January or early February.

[21] John Romena, Director of Fuel Procurement, Buena Vista Biomass Power.

Time of Year Availability

Discussions with local foresters indicate that the typical season for field operations is May 1 through November 15. A variety of factors impact this, including snow depth and wet soil conditions (e.g., concerns regarding potential soil compaction). Logs for the sawmill or firewood processor will need to be stockpiled (decked) on site if there are plans to operate during the winter months. Processed forest biomass (chips) used as fuel for a small power generation facility will also need to be stockpiled on site for winter operations. Urban wood waste is typically generated year round with some seasonal fluctuation (downturn) during the holiday season (mid-November through December).

State and Federal Environmental Analysis

Commercial forest operations on private lands such as timber harvests require a State of California approved Timber Harvest Plan (THP). The California Department of Forestry and Fire Protection is the lead state agency administering THPs. THPs are compliant with the California Environmental Quality Act (CEQA).

On federally-managed lands, vegetation management activities must be compliant with the National Environmental Policy Act (NEPA). USFS and BLM conduct NEPA analysis required before commencement of vegetation management activities.

State and Federal Taxes Applicable

The California Board of Equalization levies timber harvest yield taxes on all commercial products removed from either public or private lands. Currently forest biomass from unmerchantable limbs, tops and very small stems is considered to have no commercial value and is not included in yield tax calculations.

Job Creation

Job creation from new enterprises conducting value-added processing of forest biomass material is a positive outcome of value-added processing. Estimating how many jobs might be generated is very dependent upon the enterprise considered. For example, firewood processing is quite labor intensive but composting operations are not. Additional information specific to value-added processing technologies is discussed in the value-added opportunities section of this report. (See figure 2, Value-Added Utilization Matrix above for estimates of jobs needed for different value-added economic activities).

VALUE-ADDED OPPORTUNITIES

As mentioned earlier in this report, four value-added product opportunities were selected by the Project Steering Committee during the October 5, 2011 meeting (see Appendix A, Steering Committee meeting notes) for more detailed analysis. These include:

- Small-scale combined heat and power
- Firewood processing
- Small-scale sawmill
- Biomass fiber to local markets

These value-added options are reviewed below.

Small-Scale Combined Heat and Power Facility

In recent years there have been significant improvements made to optimize the conversion of woody biomass material into both thermal and electrical energy. As a direct result of these improvements, biomass to energy conversion technologies have improved both the operating efficiencies and the economic performance of small-scale facilities. For this analysis, a 2 megawatt (MW)[22] combined heat and power facility was selected for analysis. A facility scaled at 2 MW (net power output) will require approximately 16,000 BDT per year of biomass fuel. The feedstock resource availability analysis confirmed over 35,000 BDT per year is sustainably available at this time (see Table 10).

The Phoenix Energy gasification system was selected as the preferred technology for this analysis. Other promising technologies exist and could be utilized at Wilseyville; however, Phoenix Energy currently has a 0.5 MW biomass gasification facility operating in Merced, California. Merced is located within the jurisdiction of the San Joaquin Valley Air Pollution Control District, which is one of the most sensitive and highly regulated air districts in the state. If Phoenix can meet and surpass SJVAPCD air emissions regulations, it will most likely pass Amador Air District air emissions standards.

TSS arranged for an August 29, 2011 tour of the Phoenix Energy, Merced facility. Posted below (Figures 10 through 13) are images of the facility. In addition, Appendix C includes background information and a diagram showing process flow and layout of the technology. CHIPS Project Manager Rick Breeze-Martin attended the field tour.

[22]One megawatt is the equivalent of 1,000 kilowatts of electrical energy. One MW is enough electrical energy to power about 1,000 homes.

Figure 10. Phoenix Energy Fuel Receiving System

Figure 11. Phoenix Energy Gasification Equipment

Figure 12. Phoenix Energy Gas Cleanup Equipment

Figure 13. Phoenix Energy Electrical Generator

The Phoenix Energy power generation technology is basically a four-step process.

- Step 1. Receive and store biomass fuel. Prefer fuel with 10% moisture content and sized between 4" and ¼". See Figure 9.
- Step 2. Convey biomass fuel to gasification unit for conversion to a synthetic gas (similar to natural gas or propane). See Figure 10.
- Step 3. Cool and clean up the synthetic gas. Remove impurities such as tars and particulates. See Figure 11.

- Step 4. Deliver synthetic gas to caterpillar generator set (internal combustion engine coupled to a generator. See Figure 12.

Other important data is outlined below.

- Thermal energy can be recovered and utilized to dry biomass fuel (forest biomass can have up to 55% moisture content) or to possibly dry other products (e.g., lumber, firewood). Waste heat can be extracted at three locations in the process:
  - Heat exchanger at the gas-cooling step.
  - Water jacket around the Caterpillar engine.
  - Radiator at the Caterpillar engine.
- Biomass fuel usage is approximately 2 BDT per megawatt hour (MWh)[23] or about 16,000 BDT per year for a 2 MW facility.
- Capital and construction costs for the Phoenix Energy system, with fuel receiving system and thermal energy extraction (for fuel drying), is approximately $10.4 million.
- Footprint of the fuel receiving and power generation equipment is less than one acre. Fuel storage for stockpiling fuel through winter months (when forest operations are not active due to wet soil conditions and inclement weather) may take up an additional two acres.

Appendix C provides additional details on the Phoenix Energy technology.

Financial Analysis

Using an excel-based proforma workbook, TSS conducted a financial feasibility analysis to determine what the sale price of power produced would have to be to make the project financially viable. Assumptions built into this analysis included an industry standard return on equity of 17% and currently available federal tax incentives, such as the Renewable Energy Production Tax Credit (PTC) and the Business Energy Investment Tax Credit (ITC).

Summarized below are base case assumptions used when conducting the financial analysis for a small-scale CHP facility.

- 17% return on equity (ROE) after taxes
- $10.4 million (including $0.5 million heat recovery system) capital expense
- $220,000/year labor cost (approximately five employees)
- $90,000/year maintenance cost
- $24,000/year land lease cost
- $38,000/year administration and other operating costs
- 5-year tax depreciation schedule
- Production tax credit of 1.1 cents/kWh for ten years or Investment Tax Credit of 10%
- Biochar (ash like byproduct) is sold for $45/GT (picked up at Wilseyville)
- 15-year debt service (amortization period)
- 5% interest rate on debt

[23]MWh is 1,000 kW per hour of electrical generation.

- Thermal energy recovery used to pre-dry forest biomass fuel (required to qualify for the ITC)
- 75% debt/25% equity in year one
- 1%/year escalation of fuel prices
- 1%/year escalation of power sales price

Other variables, such as the cost of biomass fuel and the availability of grant funding (to underwrite capital expenses), were included and ramped both up and down to confirm the financial impacts.

Tables 14 and 15 summarize findings of the financial analysis comparing use of the PTC and the ITC.

Table 14. Financial Proforma Results Using the Production Tax Credit

CASH GRANT FOR CAPITAL EXPENSES	BIOMASS FUEL PRICE ($/BDT)	POWER SALES PRICE ($/MWh)
$0 (Base case)	$40.00	$110.12
$0	$45.00	$115.43
$0	$50.00	$120.74
$1,250,000	$50.00	$106.51
$2,500,000	$50.00	$92.27

Table 15. Financial Proforma Results Using the Investment Tax Credit

CASH GRANT FOR CAPITAL EXPENSES	BIOMASS FUEL PRICE ($/BDT)	POWER SALES PRICE ($/MWh)
$0 (Base case)	$40.00	$113.50
$0	$45.00	$119.06
$0	$50.00	$124.37
$1,250,000	$50.00	$110.13
$2,500,000	$50.00	$95.89

The PTC provides a more optimized outcome (lower power sales price required to meet Return on Equity target) and is the preferred tax credit option when compared to the ITC. In order to qualify for the PTC, the project must be operational by December 31, 2013. Additional research (outside the scope of this evaluation) regarding PTC and ITC details should be conducted when selecting the optimized tax credit as the preferred alternative.

Power Sales

Assuming no cash grant and use of the PTC, power sales from a 2 MW net generation (2.2 MW gross) biomass power generation facility at Wilseyville must be at least $110.12/MWh ($.11/kWh) to meet the 17% Return on Equity (assuming $40/BDT fuel cost). About

$.09/kWh is at the upper end of PG&E's feed-in tariff power sales contracts at this time.[24] Cash grants or low interest loans would drive down the power sales price requirements to better qualify for a power sales contract and meet the Return on Equity threshold of 17%.

Recent California law (SB 32) is requiring that investor-owned utilities (IOU's such as PG&E, SCE and SDG&E) offer a standard feed-in tariff (FIT) rate for renewable energy generation facilities with a capacity of 3 MW or less. CPUC has requested comments on the FIT pricing. The Placer County Air Pollution Control District has gained party status and is promoting an initiative to have an energy price adder know as the Wildfire Hazard Reduction Adder, apply for all biomass power facilities located in high and medium priority landscapes considered at significant risk to wildfire. If the Wildfire Hazard Reduction Adder is accepted by the CPUC and implemented by the IOU's, wholesale energy prices for small scale biomass power plants located in at risk landscapes may qualify for an energy price adder of $.055/kWh. See Appendix D for more information on the Placer County initiative.

Firewood Processing

As the cost of fossil fuel energy (natural gas and liquid petroleum gas) used to heat homes has ramped up over time, homeowners have sought alternative energy sources such as firewood. Cost effective, renewable, easy to store and use, firewood use as a supplemental heating source has increased over the last few decades.

The heat content of any fire depends on firewood density, resin, ash and moisture. A rule of thumb often used for estimating heat value of firewood is one cord of well-seasoned hardwood (weighing approximately two tons) burned in an airtight, draft-controlled wood stove with an efficiency rating of 55-65% is equivalent to approximately 225 therms of natural gas consumed in normal furnaces having 65-75% efficiencies.[25] Generally, hardwood firewood which provides long-burning fires contains the greatest total heating value per unit of volume (cubic foot).

Discussions with local foresters[26] indicated that hardwood species logs including live oak, black oak, and madrone are removed on a regular basis during commercial harvest activities and during forest restoration/timber stand improvement activities. If a local market for hardwood logs (such as a firewood processing facility at Wilseyville) were available and priced competitively to address the costs of removal and transport and provide a reasonable return to the landowner, then a ready supply of hardwood logs could be available.

Local foresters[27] also confirmed the potential availability of softwood logs that could be available for firewood production. Diseased or insect impacted softwood species logs including ponderosa pine, white fir, red fir, Doug fir and incense cedar that do not meet sawlog specifications (due to blue stain, rot) could be available for firewood. In addition, traditionally

[24]Current feed-in tariff pricing for small renewable generators ranges from $88 to $110/MWh depending on length of contract, and is adjusted for time of day delivery.
[25]Oregon Department of Agriculture (http://www.oregon.gov/ODA/MSD/fuel_facts.shtml).
[26]Steve Cannon, Foothill Resource Management and Tim Tate, Sierra Pacific Industries.
[27]John Sweetman, Amador RD, Jim Junette, Calaveras RD, Keith Johnson, Mother Lode Field Office BLM, Tim Tate, SPI, Steve Cannon, Foothill Resource Management.

non-commercial softwood species such as foothill pine and lodgepole pine could also be available.

Current commercial markets for firewood logs are located some distance from the Wilseyville area (El Dorado, Placerville, Oroville). Prices offered for firewood logs delivered to these locations range from $850 to $900 per truckload for hardwood logs and from $600 to $700 per truckload for softwood logs. Conversations with local foresters confirmed that due to the transportation advantage (less haul distance) of the Wilseyville yard, hardwood log prices of $800 per truckload and softwood log prices of $575 per truckload would be considered competitive.

Discussions with Noble Milling and Firewood[28] (Noble) suggest that a commercial firewood processor located at Wilseyville could be a financially viable enterprise. Noble has significant experience processing and marketing both firewood and lumber in the greater Wilseyville area. Bob Noble (principal) expressed an interest in pursuing a commercial-scale, integrated firewood and sawmill operation at the Wilseyville yard. TSS worked with Mr. Noble and Gareth Mayhead, University of California Forest Products Advisor, to conduct research regarding the optimized equipment configuration, production levels, and staffing for a small commercial firewood operation integrated with a small-scale sawmill operation. Mr. Noble, Mr. Mayhead, and TSS met on several occasions (in person and via conference call) to review the range of processing equipment, rolling stock, staffing requirements, target markets and challenges associated with such an operation. Results from these discussions are incorporated into the firewood and sawmill operations analysis that follows.

Considering the range of hardwood and softwood logs available for firewood manufacturing, an equipment search was conducted and the Blockbuster Model 22 - 20 was found to be a good candidate technology. Figure 14 provides an image of this firewood processor.

[28]Bob Noble, principal, Noble Milling and Firewood.

Figure 14. Blockbuster Model 22 - 20 Firewood Processor

Financial Analysis

Using an excel-based financial proforma workbook, TSS conducted a financial feasibility analysis to determine the viability of a commercial-scale firewood processing operation using the Blockbuster processor. Delivered firewood log prices were based on locally available logs priced competitively (hardwood logs at $800/truckload and softwood logs at $575/truckload). Firewood sales assumed hardwood firewood at $225/cord and softwood firewood at $150/cord (picked up at the Wilseyville yard). In order to maintain year round cash flow (firewood sales typically peak during fall and winter months), firewood sales to a large regional commercial firewood retailer were built into the analysis. Firewood sales of $125/cord (picked up at the Wilseyville yard) were assumed for 400 cords per year to the regional firewood retailer. Assumptions built into this analysis included an industry standard return on equity of at least 17% (after taxes).

Summarized below are base case assumptions used when conducting the financial analysis for a small commercial-scale firewood processing operation.

- Minimum17% return on equity (after taxes)
- $163,850 (including wood waste fired dry kiln) capital expense

- Capital expense includes rolling stock (log loader and forklift) to be shared with firewood operation
- $88,500/year labor cost (approximately two full-time equivalent employees)
- $15,770/year maintenance cost
- $2,400/year land lease cost
- $26,000/year other operating costs (insurance, legal, utilities)
- 10-year accelerated tax depreciation schedule
- 20-year debt service (amortization period)
- 5% interest rate on debt
- 50% debt/50% equity in year one
- 1%/year escalation for firewood logs, labor costs and firewood sales
- $800/truckload for hardwood logs
- 8 cord processed per truckload of hardwood logs
- $575/truckload for softwood logs
- 8.6 cord processed per truckload of softwood logs
- 16 cords processed per eight hour day
- 3,200 cords processed annually (200 working days)
- 15% shrinkage of firewood (lost in the drying process)
- 2,720 cords sold into local and regional markets (480 cords lost to shrinkage)

Using these assumptions results in a first year positive cash flow (after expenses) of $61,000. This scenario is entitled "Base Case."

Variables, such as the cost of firewood logs and the availability of grant funding (to underwrite capital expenses), were included and ramped both up and down to confirm the financial impacts and sensitivity.

Tables 16 and 17 summarize findings of the financial analysis comparing variables such as grant availability, firewood log pricing, and firewood sales pricing.

Table 16. Proforma Results – Firewood Log Pricing and Grant Funding Sensitivity

CASH GRANT FOR CAPITAL EXPENSES	HARDWOOD LOG EXPENSE ($/LOAD)	SOFTWOOD LOG EXPENSE ($/LOAD)	YEAR ONE CASH FLOW AFTER EXPENSES	RETURN ON EQUITY (ROE %)
$0 (Base case)	$800	$575	$61,000	78%
$0	$850	$600	$52,000	68%
$0	$900	$650	$42,000	54%
$25,000	$800	$575	$61,000	93%
$50,000	$800	$575	$62,000	115%

Table 17. Proforma Results - Firewood Sales Pricing and Grant Funding Sensitivity

CASH GRANT FOR CAPITAL EXPENSES	HARDWOOD FIREWOOD SALES LOCAL ($/CORD)	SOFTWOOD FIREWOOD SALES LOCAL ($/CORD)	SOFTWOOD FIREWOOD SALES REGIONAL ($/CORD)	YEAR ONE CASH FLOW AFTER EXPENSES	RETURN ON EQUITY (ROE%)
$0 (Base case)	$225	$150	$125	$61,000	78%
$0	$200	$125	$110	$24,000	31%
$0	$250	$175	$150	$99,000	126%
$25,000	$225	$150	$125	$61,000	93%
$50,000	$225	$150	$125	$62,000	115%

Unlike the small CHP business model, there are no federal tax credits available for firewood processing operations.

Firewood Sales – Bulk

Revenue generated from firewood sales fall into three categories:

- Local hardwood sales
- Local softwood sales
- Regional softwood sales

The local sales of hardwood and softwood firewood are focused on sales to customers within a 60-mile radius of the product yard. These customers are typically rural homeowners who rely on firewood as a supplemental heating source. Demand from this customer base is very price sensitive, so it will be imperative that the market price is set at a competitive rate that will attract (and hopefully keep) customers long term. Demand from the rural homeowners is also dependent upon weather conditions. The colder the winter, the more demand there will be for home heating and for firewood.

Regional firewood sales are targeting commercial firewood customers (typically large retailers) located 61 to 150 miles from the product yard. These retail customers are made up predominantly of large-scale firewood retailers (such as California Hot Wood, Inc., Duraflame, Inc.) that have packaging facilities which accept processed and cured firewood for packaging and distribution to large retailers such as Home Depot, Walmart, and Orchard Supply Hardware. Figure 15 provides an example of packaged firewood.

Figure 15. California Hot Wood, Inc., Packaged Firewood

While the wholesale market price paid by such retailers is not competitive with local firewood sales, the bulk sales of firewood to these retailers provide year-round revenue. Cash flow is extremely important to small businesses and the firewood business is no exception. Due to the seasonal nature of firewood demand (peak demand is fall and winter), the opportunity for year round sales (and cash flow) is extremely important.

Access to firewood kilns will be helpful, as commercial firewood is required to have less than 20% moisture. The financial proformas for the firewood processing facility includes the capital cost as well as operating and maintenance costs of a waste wood fired kiln dedicated to drying firewood.

Outdoor drying of firewood is important so that a supply of dry, market-ready firewood is constantly in inventory. If packaged firewood is considered, then indoor storage of the palletized packaged firewood will be necessary.

Firewood Sales – Bundled

There will be opportunities to market bundled firewood (0.8 cubic foot package) into the regional and external markets in locations like Yosemite Park, State Parks in the Lake Tahoe area, fast food stores, and food outlets in large urban markets like Reno. Significant investment in targeted marketing and outreach would have to occur for regional and external firewood sales to be successful. Capital investment in bundling equipment and pallets (all bundled firewood is sold on pallets) would be required. For this analysis, TSS focused on bulk firewood sales. However, once the enterprise is operating efficiently and the bulk local and regional markets are served, a concerted effort to craft a marketing plan for sales of bundled firewood should be considered. Figure 16 is an example of a firewood bundle.

Figure 16. Bundled Firewood

Small-Scale Sawmill

As noted earlier in this report, the Wilseyville site supported a commercial-scale sawmill from 1942 until 1968. The region has a long history of forest management and utilization, including the use of small-scale, portable sawmills. There is an opportunity to site and operate a small mobile sawmill at the product yard, using locally available small logs (under 24" diameter on the small end). Figure 17 is an image of a small-scale mobile dimension portable mill.

A small sawmill collocated at the product yard would be a strategic addition to the firewood operation, as some of the firewood logs will no doubt meet sawlog specifications. The sawmill and firewood operation will be able to share rolling stock, such as a log loader and forklift. A log loader will be needed to off-load logs delivered to the yard, store the logs and remove the logs from storage for processing into firewood or lumber. The forklift will facilitate movement of firewood baskets (metal boxes capable of holding 1/2 cord firewood), firewood pallets (if producing firewood bundles) and units of lumber. Personnel can also be cross-trained and shared in the production of firewood or lumber, thus assisting with increased production should either operation require additional hours of production or if employees are sick.

Figure 17. Mobile Dimension Sawmill

As noted earlier in this report, the TSA is a region with an active forest management sector, one that has produced almost 140,000 MBF of sawlogs annually for the last five years (see Table 8). Discussions with a local sawmill operator[29] confirmed that about 4 MBF per day of sawlogs are required to sustain a small-scale mill. This equates to about one truckload of sawlogs per day. Forecast over one year operation (assuming 160 days operating per year), the sawmill would require about 640 MBF.

With the Wilseyville site located strategically between the commercial-scale forest products sawmills located in Lincoln (to the north) and Standard (to the south), the product yard should be able to cost effectively source sawlogs to support a small sawmill. Distance from Wilseyville to Sierra Pacific Industries Lincoln sawmill is 81 miles and to Sierra Pacific Industries Standard sawmill is 58 miles.

Lumber Dry Kiln

The sale of dry lumber allows sawmill operators to provide a blend of finished lumber products to their customers. Some sawmills are strategically located in relatively dry, windy climates that facilitate air drying of lumber. Air drying also requires large expanses of flat land to store the finished lumber as it dries. The Wilseyville site climate will accommodate the air drying of lumber, as was the business model with the Associated Lumber operation. Unfortunately, the product yard has very little flat landscape that will be available for air drying.

A lumber kiln will be needed to produce dry lumber. Once dried, the lumber can be sold dry rough or planed and sold as dry finished. In addition, there may be an opportunity to use the

[29]Bob Noble, Noble Milling and Firewood.

dry finished lumber in the manufacture of value-added products such as wood boxes for local wineries or for packaged firewood.

For the purposes of this analysis, a propane fired lumber kiln capable of drying up to 8 MBF per charge was assumed to be installed at the project yard. Propane (liquid petroleum gas) is a preferred fuel due to its predictable and easily managed heating properties. In addition, a lumber planer was included in the capital cost assumptions. The planer will facilitate surfacing of dried lumber for value-added products such as interior paneling, exterior siding or for use in manufacturing wood boxes.

Financial Analysis

Using an excel-based financial proforma workbook, TSS conducted a financial feasibility analysis to determine the viability of a small-scale sawmill operation using a model 128 Mobile Dimension sawmill.[30] Delivered sawlog prices were based on locally available logs priced competitively (softwood sawlogs at $350 to $500/MBF) delivered to the Wilseyville site. Lumber sales assumed rough green boards at $375 to $800/MBF and dry finished lumber at $650/MBF for ponderosa pine lumber picked up at the yard. In order to maintain year round cash flow, it will be important to maintain lumber inventory and operate the sawmill 160 days per year (about eight months/year). The dry kiln will also need to operate at least on an eight month/year basis in coordination with the sawmill. About half of the lumber produced and sold will be dried and planed. Assumptions built into this analysis included an industry standard return on equity of at least 17%.

Summarized below are base case assumptions used when conducting the financial analysis for a small commercial scale sawmill operation:

- Minimum 17% return on equity (after taxes)
- $114,062 (including propane fired lumber kiln) capital expense
- Capital expense includes rolling stock (log loader and forklift) to be shared with firewood operation
- $107,335/year labor cost (approximately four full-time equivalent employees)
- $8,110/year maintenance cost
- $4,500 every 10 years maintenance cost for sawmill engine overhaul
- $2,400/year land lease cost
- $40,000/year other operating costs (e.g., propane, gasoline, diesel)
- 10-year accelerated tax depreciation schedule
- 20-year debt service (amortization period)
- 5% interest rate on debt
- 50% debt/50% equity in year one
- 1%/year escalation for sawlogs, labor costs and lumber sales
- $375/MBF for ponderosa pine, white fir and Doug fir sawlogs
- $450/MBF for incense cedar sawlogs
- 1.25:1 lumber over-run factor

[30]As suggested by Bob Noble, Noble Milling and Firewood.

- 5 MBF lumber produced per eight hour day
- 800 MBF lumber produced annually (160 working days/year)
- 400 MBF rough green lumber and 400 MBF dry finished lumber sold into local and regional markets

Using these assumptions results in a first year positive cash flow (after expenses) of $48,000 and a return on equity (ROE) of 90%. This scenario is entitled "Base case."

Variables, such as the cost of sawlogs and the availability of grant funding (to underwrite capital expenses), were included and ramped both up and down to confirm the financial impacts and sensitivity.

Tables 18 and 19 summarize findings of the financial analysis comparing variables such as grant availability, sawlog pricing, and lumber sales pricing.

Table 18. Proforma Results – Sawlog Pricing and Grant Funding Sensitivity

CASH GRANT FOR CAPITAL EXPENSES	SOFTWOOD LOG EXPENSE PP, WF AND DF ($/MBF)	SOFTWOOD LOG EXPENSE IC ($/MBF)	YEAR ONE CASH FLOW AFTER EXPENSES	RETURN ON EQUITY (ROE)
$0 (Basecase)	$375	$475	$48,000	90%
$0	$425	$525	$30,000	57%
$0	$475	$575	$12,000	22%
$25,000	$375	$475	$49,000	116%
$50,000	$375	$475	$50,000	163%

Table 19. Proforma Results – Lumber Sales Pricing and Grant Funding Sensitivity

CASH GRANT FOR CAPITAL EXPENSES	ROUGH GREEN LUMBER SALES PP, WF AND DF ($/MBF)	ROUGH GREEN LUMBER SALES IC ($/MBF)	DRY FINISHED LUMBER SALES ($/MBF)	YEAR ONE CASH FLOW AFTER EXPENSES	RETURN ON EQUITY (ROE)
$0 (Basecase)	$375	$800	$650	$48,000	90%
$0	$325	$750	$575	$20,000	57%
$0	$425	$850	$700	$71,000	130%
$25,000	$375	$800	$650	$49,000	116%
$50,000	$375	$800	$650	$50,000	163%

Unlike the small-scale biomass power generation facility business model, there are no federal tax credits available for sawmill processing operations.

Lumber Sales

Lumber sales opportunities are based on production of three primary product lines:

- Rough green lumber: ponderosa pine, white fir and Doug fir
- Rough green lumber: incense cedar
- Dry finished lumber: ponderosa pine

Rough green lumber is product that is available for sale with no secondary processing (e.g., surfacing or drying). Examples of end uses for rough green lumber include corral boards and outdoor structures (e.g., storage sheds). Rough green incense cedar lumber has additional value due to the insect and decay resistant qualities of incense cedar that facilitate use in outdoor siding, decking, and raised planting beds. Discussions with local sawmill operators[31] indicate that there is significant demand for incense cedar lumber.

Dry finished ponderosa pine lumber is product that has been air dried or kiln dried and then surfaced using a planer. Typically sold as one-inch thick boards, this lumber has a variety of uses, including indoor paneling, shelving, or for value-added utilization secondary manufacturing such as wood boxes. Ponderosa pine lumber is the preferred species for these end uses due to ease of manufacturing and visual appearance.

Due to regional competition for lumber products, both rough green and dry finished lumber will likely be sold locally (0 to 60 mile radius). Regional (61 to 150 mile radius) competition is significant due to industrial-scale forest product producers and lumber retailers that have economies of scale that allow them to be the low-cost producers. As the low-cost producers, they are able to market lumber products at relatively low prices.

Secondary Manufacturing

Adding value to lumber products produced on site at the product yard is a significant opportunity that could provide additional revenue and employment. Utilizing finished product produced on site (e.g., dry surfaced ponderosa pine boards) in the manufacture of wood boxes is an example of secondary manufacturing that should be considered. The key to success in secondary manufacturing is production of a product line that targets local and regional customers. Examples of potential local and regional customers that might be interested in a wood box product line include wineries.

In the last several decades there has been a significant increase in the number of acres dedicated to the cultivation of wine grapes in Amador and Calaveras counties. This has resulted in the establishment of over 59 active wineries in these counties.[32] Many of the wineries are packaging varietal wines using wooden boxes as a value-added marketing tool. Figure 18 provides an example of wood box packaging.

[31]Bob Noble, Noble Milling and Firewood.
[32]Winery list courtesy of Amador Vintners and Calaveras Winegrape Alliance.

Figure 18. Wood Box Packaging[33]

In addition to wood boxes, other secondary manufacturing opportunities include wine storage racks, display cases, and shelving. All of these product lines will require additional manufacturing equipment and skilled labor (not included in sawmill proforma calculations). In addition, a product marketing plan, targeting local and regional customers, will be key to long-term success for expansion into secondary manufacturing.

Biomass Fiber to Local Markets

While biomass power generation, lumber production and firewood processing represent the clear opportunities for value-added utilization at the Wilseyville product yard of locally produced logs and biomass, there are a number of alternative markets in the region to consider. Table 20 provides a summary of current value-added markets for the utilization of woody biomass material generated in the TSA. Note that these markets are listed in descending order from higher value (landscape cover) to lower value (biomass fuel).

[33]Image courtesy of askmetafilter.com.

Table 20. Alternative Local Markets for Biomass Fiber

MARKETS	RAW MATERIAL	COMMENTS
Landscape Cover	Bark, chips	Limited local markets.
Compost and Soil Amendment	Tree trimmings, logyard waste, sawdust	Limited local markets.
Composite Panels	Dry shavings, dry bark-free logs	Sierra Pine at Martel accepts dry shavings. Also procuring dry, bark-free softwood logs (no incense cedar).
Animal Bedding	Softwood logs	California Wood Shavings at Jamestown is procuring softwood logs (no incense cedar) up to 42" diameter.
Firewood	Softwood and hardwood logs	Taegers Firewood at El Dorado and California Hot Wood at Oroville are actively purchasing firewood logs.
Biomass Fuel	Forest-sourced biomass, urban wood waste, agricultural byproducts	Closest biomass plants include Buena Vista Biomass Power near Ione, Covanta Energy at Jamestown, Sierra Pacific Industries at Standard.

At this time, local markets for biomass generated at the Wilseyville product yard are limited to biomass fuel for power generation. Typically higher-value markets such as landscape cover and soil amendment are directly tied to housing and commercial construction markets, both of which are currently depressed due to the general state of the economy. When the economy does rebound, there may be opportunities to sell bark or sawdust into these markets.

Unlike landscape cover and soil amendment markets, the local biomass fuel market is currently expanding. Buena Vista Biomass Power is scheduled to begin commercial operations during the first quarter of 2012. As noted earlier, Buena Vista will be accepting fuel in mid January, 2012.[34]

Biomass fuel haul costs are significant ($85/hour), so the most cost effective biomass markets are those located close-in to Wilseyville. Buena Vista Biomass Power is the closest (35 miles), followed by Covanta Energy at Jamestown (50 miles) and Sierra Pacific Industries at Standard (57 miles). Current market pricing for biomass fuel delivered to local power plants ranges from $40 to $42/BDT.

[34]Per John Romena, Director of Fuel Procurement, Buena Vista Biomass Power.

OBSERVATIONS

Results of this feasibility analysis confirm that there are opportunities to add value to forest biomass generated as a byproduct of forest fuels treatment and forest restoration activities in the upper Mokelumne and Calaveras River watersheds. Summarized below are observations related to key findings from this analysis.

Small-Scale Combined Heat and Power

Technologies to convert woody biomass material to thermal and electrical energy have evolved significantly in recent years. Especially impressive has been the improved conversion efficiencies and cost effective operations associated with biomass gasification technologies. The primary obstacle to success is the current wholesale power market value for small-scale renewable power generation. The California Public Utility Commission is currently in the feed-in tariff rulemaking process for small-scale (<3 MW) renewable power generation facilities. If the new feed-in tariff rate structure accounts for the avoided cost benefits to electric ratepayers associated with forest biomass power, a small-scale combined heat and power generation facility at Wilseyville will be economically viable. Economic viability may also be realized if the CHIPS and ACCABU public-private financing strategy is reasonably successful at effectively reducing the required ROE threshold.

Firewood Processing

There are well-developed local and regional firewood markets that a commercial-scale firewood processing facility at Wilseyville could cost effectively serve. The capital cost associated with a firewood processing operation is manageable and return on equity calculations are favorable. Key drivers for success include raw material expense (cost of firewood logs) and the market value for firewood sold into local and regional markets. There may be an opportunity to sell packaged firewood (bundled and palletized) into regional and external markets. This will require a well-defined and targeted marketing plan and additional packaging equipment.

Small-Scale Sawmill

A small-scale sawmill located at Wilseyville will have ready access to sawlogs generated within the TSA. Strategically located between large-scale commercial sawmills, the Wilseyville yard has a transport cost advantage that will allow the facility to source sawlogs at cost effective prices. Wilseyville sawmill operations revenue is a function of local lumber sales. Lumber sales will depend on competitive pricing of finished product, both rough green lumber and dry finished lumber. There may be an opportunity to develop a secondary manufacturing product line focused on value-added production of wood boxes and display cases for end markets such as local and regional wineries. Secondary manufacturing will require additional processing equipment. A marketing plan should be considered to address

lumber sales and secondary manufacturing sales opportunities. Due to the highly competitive regional lumber markets, the sawmill product marketing plan should target local sales.

Biomass Fiber to Local Markets

Local commercial markets for biomass fiber are limited to existing and planned biomass power generation facilities. The newly refurbished Buena Vista Biomass Power facility is located closest to the Wilseyville product yard and should be considered as a potential long-term customer.

Product Yard Infrastructure Improvement

In order for the product yard to serve value-added enterprises, there will be a need to improve existing infrastructure. Table 21 provides a list of infrastructure improvements required to facilitate operation of a small-scale biomass power facility, firewood processing operation, sawmill operation and urban wood waste receiving yard.

Table 21. Product Yard Infrastructure Improvement Recommendations

IMPROVEMENT	RANGE OF COSTS	COMMENTS
Electrical Service	$40,000 to $60,000	Quote from PG&E to extend commercial service from CCWD pump house 1,500' to the product yard.
Infrastructure Engineering (w/out Heat & Power co-gen)	$85,000 to $100,000	Quote from Weatherby, Reynolds and Fritson Engineering and Design.[35]
Infrastructure Engineering (for Heat & Power co-gen)	$220,000 to $250,000	
Paved Road	$275,000 to $325,000	2,500' of two lane paved road from Blizzard Mine Road into product yard.
Commercial Building	$100,000 to $125,000	40'x60' cement pad and commercial grade building for lumber processing, secondary manufacturing and finished product storage.
Water Supply and Storage	$100,000 to $150,000	Fire safety and dust abatement.
Total	**$820,000 to $1,010,000**	

NEXT STEPS

This feasibility study found that a small-scale biomass power generation facility, firewood processing operation and small-scale sawmill sited at the Wilseyville product yard is an optimized arrangement utilizing locally available feedstocks and local talent (forest restoration and fuels treatment contractors) in support of a sustainable forest restoration economy.

[35]Provided by Rick Breeze-Martin, Project Manager, CHIPS.

Outlined below are important next steps for CHIPS and the ACCABU to consider.

- Present the ACCABU, ACCG and other stakeholders with the findings of this study analysis and outline plans for next steps.
- Develop and implement a communications plan to educate local stakeholders, elected officials, county, state and federal agency staff, and the general public on the societal benefits provided as a result of siting sustainable, small-scale value-added enterprises at Wilseyville.
- Develop and implement a strategic plan to source grants/loan guarantees from targeted private foundations, federal and state agencies.
- Seek out and engage potential private/public sector partnerships.
- Confirm strategic private/public partnership arrangement with a term sheet and memorandum of understanding.
- Review options for additional use of thermal energy (e.g., greenhouse for native plants, food drying processes, etc.).
- Conduct preliminary discussions with electrical utilities (target PG&E first) regarding potential for a power sales agreement.
- Update detailed financial analysis based on discussions with utilities.
- Secure private foundation, state/federal grant support to offset a portion of expenses (primarily capital expenses).
- Prepare environmental permitting plan for development of the product yard.
- Prepare a feedstock (e.g. sawlogs, firewood logs, small diameter logs, biomass fuel) procurement plan.
- Conduct technology assessment/selection and preliminary design.
- Update detailed financial analysis based on latest data.
- Issue Request for Quotes from select technology vendors.
- Issue Request for Quotes from select engineering and construction firms.
- Update detailed financial analysis based on latest data.
- Select and contract with technology/engineering and construction firm.
- Engineer, construct, and start up.

POTENTIAL GRANT FUNDING RESOURCES

TSS and The Grant Farm staff [36] conducted a literature search for grant and loan support value-added projects. The Grant Farm is currently under contract with the Sierra Nevada Conservancy to provide advice and support, including grant-writing services. Outlined below are the results.

Rural Energy for America Program (REAP)
Administered by the USDA Rural Business-Cooperative Service, this program replaced the Renewable Energy Systems and Energy Efficiency Improvements program in the 2002 farm

[36]Shawn Garvey, CEO, The Grant Farm.

bill. The program provides grants and loans for a variety of rural energy projects, including efficiency improvements and renewable energy projects. Assistance is limited to small businesses, farmers and ranchers with projects located in a rural community. REAP grants and guarantees can be used individually or in combination. Together the grants and loan guarantees can finance up to 75% of a project's cost. Grants alone can finance up to 25% of the project cost, not to exceed $500,000 for renewables and $250,000 for efficiency.

Rural Business Enterprise Grant Program (RBEG)
Administered by USDA Rural Development the RBEG program provides grants for rural projects that finance and facilitate development of small and emerging rural businesses help fund distance learning networks, and help fund employment related adult education programs. To assist with business development, RBEGs may fund a broad array of activities. There is no maximum level of grant funding. However, smaller projects are given higher priority. Generally grants range $10,000 up to $500,000.

Rural Economic Development Loan And Grant (REDLG)
Administered by USDA Rural Development the REDLG program provides funding to rural projects through local utility organizations. Under the REDLoan program, USDA provides zero interest loans to local utilities which they, in turn, pass through to local businesses (ultimate recipients) for projects that will create and retain employment in rural areas. The ultimate recipients repay the lending utility directly. The utility is responsible for repayment to the Agency. Under the RED Grant program, USDA provides grant funds to local utility organizations which use the funding to establish revolving loan funds. Loans are made from the revolving loan fund to projects that will create or retain rural jobs. When the revolving loan fund is terminated, the grant is repaid to the Agency.

Rural Business Opportunity Grants (RBOG)
Administered by USDA Rural Development the RBOG program promotes sustainable economic development in rural communities with exceptional needs through provision of training and technical assistance for business development, entrepreneurs, and economic development officials and to assist with economic development planning. The maximum grant for a project serving a single states is $50,000. The maximum grant for a project serving two or more states is $150,000.

Business And Industry Guaranteed Loans
Administered by USDA, the purpose of the Business and Industry Guaranteed Loan Program is to improve, develop, or finance business, industry, and employment and improve the economic and environmental climate in rural communities. This purpose is achieved by bolstering the existing private credit structure through the guarantee of quality loans which will provide lasting community benefits. A borrower must be engaged in or proposing to engage in a business that will:

- Provide employment;
- Improve the economic or environmental climate;
- Promote the conservation, development, and use of water for aquaculture; or
- Reduce reliance on nonrenewable energy resources by encouraging the development and construction of solar energy systems and other renewable energy systems.

Department of Commerce/ Economic Adjustment Assistance
Provides a wide range of technical, planning, and public works and infrastructure assistance in regions experiencing adverse economic changes that may occur suddenly or over time (e.g., strategy development, infrastructure construction, revolving loan fund capitalization). (CFDA No. 11.307)

Department of Energy (DOE) / Energy Efficiency and Conservation Block Grant (EECBG) Program
The Energy Efficiency and Conservation Block Grant (EECBG) Program represents a priority to deploy the cheapest, cleanest, and most reliable energy technologies we have—energy efficiency and conservation—across the country. The Program, authorized in Title V, Subtitle E of the Energy Independence and Security Act (EISA) and signed into law on December 19, 2007, is modeled after the Community Development Block Grant program administered by the Department of Housing and Urban Development (HUD). It is intended to assist U.S. cities, counties, states, territories, and Indian tribes to develop, promote, implement, and manage energy efficiency and conservation projects and programs designed to:

- Reduce fossil fuel emissions;
- Reduce the total energy use of the eligible entities;
- Improve energy efficiency in the transportation, building, and other appropriate sectors; and
- Create and retain jobs.

Through formula and competitive grants, the Program empowers local communities to make strategic investments to meet the nation's long-term goals for energy independence and leadership on climate change

California Housing and Community Development (HCD) / Community Development Block Grant (CDBG) Program
The primary federal objective of the CDBG program is the development of viable communities by providing decent housing and a suitable living environment and by expanding economic opportunities, principally for persons of low and moderate income. "Persons of low and moderate income" or the "targeted income group" (TIG) are defined as families, households, and individuals whose incomes do not exceed 80 percent of the county median income, with adjustments for family or household size.

California Community Services and Development / Community Services Block Grant (CSBG)
Legislation provided for the CSBG program in the federal Omnibus Budget Reconciliation Act of 1981 to help eliminate the causes and ameliorate the conditions of poverty. Currently each state receives an allocation of funds to distribute to community service providers who provide a variety of services to clients who meet the income guidelines. Services to eligible clients must contribute to the achievement of one or more of the six goals developed by the National CSBG Monitoring and Assessment Task Force.

- Low-income people become more self-sufficient;
- The conditions in which low-income people live are improved;

- Low-income people own a stake in their community;
- Partnerships among supporters and providers of services to low-income people are achieved;
- Agencies increase their capacity to achieve results;
- Low-income people achieve their potential by strengthening family and other supportive systems.

California Economic Development Lending Institute (CEDLI)
CEDLI, the California Economic Development Lending Initiative, is a multibank community development corporation established in 1995 to invest capital in small businesses and nonprofit community organizations throughout California in both urban and rural communities. We are committed to increasing access to capital for small businesses and community organizations to allow them to grow, create jobs and to facilitate community economic development.

Wells Fargo Regional Foundation / Community Development Program
Wells Fargo looks for projects that keep communities strong, diverse, and vibrant. In California, Wells Fargo makes grants in Community economic development to support the improvement of low- and moderate-income communities through programs that:

- Create and sustain affordable housing
- Promote economic development by financing small businesses or farms
- Provide job training and workforce development
- Revitalize and stabilize communities

Woody Biomass Utilization Grants
Administered by the USFS, the Woody Biomass Utilization Grant program (WBU) is a nationally competitive grant program that supports wood energy projects requiring engineering services. The projects use woody biomass material removed from forest restoration activities, such as wildfire hazardous fuel treatments, insect and disease mitigation, forest management due to catastrophic weather events, and/or thinning overstocked stands. The woody biomass must be consumed in a bioenergy facility that uses commercially proven technologies to produce thermal, electrical or liquid/gaseous bioenergy. Maximum grant is $250,000.

Biomass Research and Development Initiative
Administered by the US Department of Agriculture and the US Department of Energy. Both agencies produce joint solicitations each year to provide financial assistance in addressing research and development of biomass-based products, bioenergy, biofuels, and related processes. Approximate funding per project is $7,500,000.

Business and Energy Guaranteed Loans
Administered through the US Department of Agriculture. To improve, develop, or finance business, industry, and employment and improve the economic and environmental climate in rural communities.

Public Interest Energy Research (PIER)
Administered by the California Energy Commission, the PIER program provides funding in support of research, development and deployment of innovative business models and

technologies. Primarily focused on research that forward the development of renewable energy in California, including community scale (<10 MW) project deployment.

Healthy Forests Grant Program
Administered by the Sierra Nevada Conservancy, the Healthy Forests Grant Program provides grant funding in support of projects that preserve or improve Sierra Nevada conifer and mixed conifer ecosystems. A primary focus is the reduction of risks and impacts of large catastrophic wildfires and preserving ecosystem functions in forests and meadows. Funding for this program is provided by Proposition 84 allocation and is available through fiscal year 2013. Funding in fiscal year 2012 - 2013 is focused on ranching and agricultural lands.

APPENDIX A – STEERING COMMITTEE MEETING NOTES

WOODY BIOMASS SOURCES and VALUE ADDED USES FEASIBILITY STUDY
Pre-Work Conference Meeting with the Steering Committee
MEETING NOTES

Meeting Date/Time: 4:30.m. to 6:30 p.m., Thursday, May 5, 2011
Location: CHIPS office at 291-A Main St., West Point, CA
Biomass Study Steering Committee in Attendance: Bob Noble, Kevin Hansen, Robert Smith, John Emerson, Chris Wright, Mark Stanley (call-in), Rick Breeze-Martin

TSS Consultants: Tad Mason and Fred Tornatore (call-in)

Rick started the meeting at 4:30pm.
All agenda items were addressed. Outlined below are meeting notes.

- TSS (Tad Mason) provided an overview of the company and recent work completed and currently underway in the central and northern Sierra Nevada.
- At the request of meeting participants, Tad provided an update on the Buena Vista Biomass Power facility with the most current information that he knew. Anticipated that BV should be in commercial service by November 2011.
- Rick provided an update on the Cornerstone Collaborative Forest Landscape Restoration Project. USFS Washington Office staff asked two specific questions regarding the Cornerstone CFLR proposal. This indicate interest by the USFS CFLRP proposal reviewers. Plan to meet with Region 5 staff on 5/13 to discuss Cornerstone Project.
- Rick reviewed primary reasons for the Wilseyville Feasibility Study:
    - Jobs
    - Defensible communities (as a result of fuels treatment)
    - Reduced fuels treatment costs (due to value-added uses for woody biomass material removed during fuels treatment activities)
- Rick also reviewed other key drivers for this project:
    - Local talent base (resource management, fuels treatment, logging) is deep
    - Community based effort moving forward to create a local diverse woody biomass utilization infrastructure.
    - Collaborative effort to develop diverse value-added options for biomass utilization for local small scale business ventures
- ACCG selected the target study area using an "all lands" approach (wildfire knows no political boundaries). Target study area is

generally bounded by:
    - Crest of the Sierra Nevada on the east
    - Hwy 49 on the west
    - Hwy 88 to the north
    - Hwy 4 to the south
- Regarding the Wilseyville 20 acre collection yard site:
    - Chris mentioned that there has been a soil survey completed that may help target areas on the site that need clean up.
    - Bob noted that there is some arsenic in the region, but this is naturally occurring and not a cause for concern.
    - Reviewed site attributes:
        - Has historically been used as a sawmill
        - Some infrastructure in place (roads, level ground, drainage system)
        - Easy access off county roads
        - Centrally located to existing and planned fuels treatment activities
    - Reviewed needed infrastructure:
        - Fire safety system (above ground water storage with gravity feed)

- Kevin will contact Jim Carroll, the area Fire Chief to find out what the fire safety system requirements are for the Wilseyville site.

- Rick will check with the Calaveras County Water District (CCWD) about:
    - Land lease costs for the Wilseyville site
    - Current power rates paid by the CCWD
- Currently the Wilseyville site is zoned "public service". It may need to be re-zoned to accommodate a production yard. May need an EIR to accomplish this. Chris suggested a categorical exclusion could be considered in place of a full EIR (and still be CEQA compliant).
- Next Meeting is June 7. Meet at CHIPS office at 4:30 with field visits earlier in the day:
    - Conduct site review, tour Lily Gap and Hwy 88 projects
    - Meet with USFS/BLM staff to discuss planned activities in the target study area?
    - Conduct Phase I meeting with Steering Committee

WOODY BIOMASS SOURCES and VALUE ADDED USES FEASIBILITY STUDY
Task 3 Meeting with the Steering Committee

Meeting Date/Time: 4:30.m. to 6:55 p.m., Monday, July 18, 2011
Location: CHIPS office at 291-A Main St., West Point, CA
Biomass Study Steering Committee in Attendance: Bob Noble, Robert Smith, John Hofmann, Rick Breeze-Martin; with Chris Post of CalFire also in attendance
TSS Consultants: Tad Mason with Gareth Mayhead

Meeting Notes

Rick started the meeting at 4:30 p.m.
Outlined below are meeting notes.

- Rick opened the meeting at 4:30 p.m. and gave a quick overview of the meeting purpose to review the study Task 3 document and get a status of tasks 4 and 5.
- Tad provided an overview of the product yard permitting review conducted by Fred Tornatore (TSS Consultants). The site is zoned Public Service and may require a Conditional Use Permit, to allow for commercial enterprises. However, this will depend substantially on how the new Planning Director interprets and frames the site revitalization and proposed uses to the Planning Commission. Rick is to follow-up with the new Planning Director after they are hired with background on our intentions, and he is to get what studies Pat McGrivy may have from the effort at developing a community park. Nothing can move forward until the CCWD Board of Directors approves the project in concept and permits it to move forward with direction to CCWD staff. Air permits secured from the Calaveras County Air Pollution Control District will be required if a lumber or firewood kiln are installed on site.
- Bob reported out that Jim Carroll, West Point area Fire Chief, indicated that for the proposed product yard he would want to see a 2,500 to 5,000 gallon tank with the ability to pull water for his fire fighting vehicles. Chris indicated it is to be in compliance with section 4291 of the CalFire fire code and he gave a brief overview.
- Tad gave a page by page overview of the Task 3 document: "WOODY BIOMASS FEEDSTOCK AVAILABILITY AND COST ANALYSIS" and the group discussed it from several angles. Suggestions were made such as clarifying in the document that as a matter of course in such studies it's projections were built on the trends from the past few years, and that time will determine if a shift away from forest work focused on saw log markets to one focused on the woody biomass involved in forest restoration may change future outcomes. Tad is going to incorporate clarifying comments such as this from the discussion as and when

appropriate in the final documents.

- Tad and Gareth provided an update and overview of the decision matrix they are developing for wood biomass value added ventures. The group discussed the revised matrix and suggested some additions such as hog fuel / chips as a basic feedstock for multiple value added activities and thus an important item to list, and pine needles as a plentiful material that might be useful. Also, the point was made that from a community fire point of view chipping brush and small cull trees is likely to provide more feedstock at different qualities than the Buena Vista power plant can absorb. Considering adding as many value added activities as possible using chipped raw material from fire fuel reduction was encouraged.
- This lead to a discussion about what specific value added uses from the long list would be studied in more detail. After lengthy and useful discussion, with some arm twisting here and there the following four ventures were chosen for study by TSS Consultants.
    - Small Saw Mill and Kiln
    - Firewood and Kiln
    - Posts and Poles
    - Hog Fuel / chips for power and heat generation (clarification was that this not include just any or all value added options using this feedstock, but focus on the two biomass power plants nearby and product yard co-generation).
- Tad gave a brief overview of the remaining study schedule and agreed to try and complete the draft study in mid - September.
- Meeting adjourned at 6:55 p.m.

WOODY BIOMASS SOURCES and VALUE ADDED USES FEASIBILITY STUDY
Project Update Meeting with the Steering Committee

Meeting Date/Time: 4:00 p.m. to 5:30 p.m., Wednesday, October 5, 2011
Location: Veterans Hall, West Point, CA
Biomass Study Steering Committee in Attendance: Bob Noble, Robert Smith, John Hofmann, Rick Breeze-Martin, John Emerson, Chris Wright, and Arvada Fischer.
TSS Consultants: Tad Mason with Gareth Mayhead

Meeting Notes

Rick Breeze-Martin facilitated and opened the meeting at 4:05 p.m. Rick provided an overview of the meeting purpose, and reviewed the meeting agenda.

- Product Yard Update on CCWD & Planning - 5 to 10 minutes

Rick reported that the Calaveras County Water District (CCWD) Board of Directors approved the sale of the property with some conditions that must be addressed (e.g., securing a valuation appraisal for the property, and conducting a land survey). Property transfer may take place as soon as Spring/Summer 2012.

He also reported out on an initial meeting with the new County Planning Director who will be setting up a meeting to include and coordinate with County Public Works and Environmental Health regarding County requirements and approvals. Rick is to provide a brief project concept and larger maps for the meeting with County Department Directors.

- TSS overview of draft Feasibility Study Uses section – 10 to 15 minutes

Tad Mason gave an overview of the key issues for each of the four value added uses being studied (e.g. scale of operations, markets profiles, financial pro forma, etc.) for the product yard:

- On site Co-Generation of Heat and Power (focusing on using small gasification plant technology);
- Firewood and Kiln operation;
- Chips for fuel, etc. (focusing on chipped material to the Power Plants at Buena Vista and/or UltraPower, and co-gen small plant on product yard); and,
- Sawmill and Kiln.

- Committee Discussion and input to the TSS Overview – 35 to 40 minutes

The Committee members discussed and asked questions of each value added use presented by Tad and provided input for consideration or confirmation regarding draft estimates.

Input items provided by the Committee included, but was not limited to prices and availability of raw feedstock, employee salaries and benefits, lease costs / improvements needed, etc. Tad took notes of the different comments and input points provided during the draft review of the study. Tad confirmed plans for TSS to deliver a draft feasibility report by 12/31/11.

- Meeting adjourned at 5:30 p.m.

APPENDIX B – CORRESPONDENCE FROM CALAVERAS COUNTY PLANNING DEPARTMENT

County of Calaveras
Department of Planning

Rebecca L. Willis, AICP ~ Planning Director
Phone (209) 754-6394 Fax (209) 754-6540
***website:* www.co.calaveras.ca.us**

October 20, 2011

Rick Breeze-Martin
Breeze-Martin Consulting
19625 Cedar Road
Sonora, CA 95370

Re: CHIPS Biomass Product Yard
Blizzard Mine Road, Wilseyville, APN 12-011-011

Dear Mr. Breeze-Martin,

Thank you for providing a preliminary layout plan and a project description for the proposed biomass product yard in Wilseyville. The subject property is in the Public Service (PS) Zone and is owned by CCWD. The purpose of this letter is to provide an analysis and determination if the use is allowed within the Public Service Zone.

The purpose of the PS Zone is to classify lands that are used for public purposes, public utilities, and for public agencies. The subject parcel is used primarily by CCWD for its treatment pond and spray field. CCWD's facilities will remain intact and operational as part of this proposal. Calaveras Healthy Impact Products Solutions (CHIPS) would establish the biomass product yard on a portion of CCWD's parcel, which is an approximate 20 to 30 acre site east of the spray field and south of the treatment pond. CCWD would either lease the 20-30 acres to CHIPS, or would obtain a lot split to sell the surplus land to CHIPS.

Wilseyville is located in the Blue Mountain Region of Calaveras County. The region is characterized by heavily timbered foothills and low-elevation mountains interspersed with steep river gorges. There is a prevalence of fire-prone, overgrown forests in the area. Numerous public agencies are involved in forest management, fire prevention, and disposal of forest slash and wood waste. Common forest practices include open pile burning or hauling wood waste to disposal facilities that are often far away from the source. Some public and private land holdings perform less than adequate management of forest fuel due to high costs or lack of resources. The burning, hauling, or lack of maintenance is a concern affecting the public.

CHIPS would work in partnership with numerous public, quasi-public, and non-profit agencies to provide a better solution for forest fuel, also known as biomass. Many public agencies will benefit from the location of the biomass product yard in the vicinity. For example, the facility will benefit fire agencies by providing a more economical way

Government Center
891 Mountain Ranch Road San Andreas, CA 95249-9709

for land owners to remove overgrowth that now makes forests prone to catastrophic wildfire. The facility will benefit the Calaveras County Public Works Department by diverting wood waste that would otherwise be processed at the Wilseyville transfer station, which will reduce the County's operating costs for this public service. CHIPS would partner with public agencies to provide a service and cost-effective solution to forest fuel issues, including the US Forest Service, US Bureau of Land Management, CalFire, Ebbetts Pass Forest Watch, California Department of Fish and Game, and the Calaveras County Department of Public Works. Therefore, the biomass product yard would ***serve a public purpose*** and would be used ***in partnership with*** and ***for public agencies***. This is consistent with the Public Service Zone.

Section 17.48.020 of the Public Service Zone allows the following as permitted uses:

- All public uses, buildings facilities, structures, offices, maintenance yards or storage facilities. The biomass product yard includes a site office/restroom and storage, chipping, sorting of wood, similar to the operation currently conducted at the County's transfer station site.

- Accepted farming practices. The biomass product yard contains components consistent with accepted farming, agricultural, and timber practices in the Blue Mountain Region, including composting, greenhouse and native plant nursery, sawmill, and conversion of small timber to marketable products (post, poles, fencing, firewood).

Based on the above information, I have determined the CHIPS biomass product storage yard would qualify as a permitted use in the Public Service Zone.

If you have any questions, please feel free to call me at (209) 764-6394.

Sincerely,

Rebecca Willis
Planning Director
Calaveras County

Cc: Joone Lopez, CCWD
Supervisor Steve Wilensky, District 2

APPENDIX C – PHOENIX ENERGY TECHNOLOGY OVERVIEW

PHOENIX ENERGY™

Basic Process Description

The Phoenix Biomass Energy system converts wood and agricultural waste biomass into a natural gas substitute ("syngas") through the process of thermo-chemical conversion ("gasification"). This syngas is then used to fuel a specially modified natural gas genset that produces renewable electricity and heat. A byproduct of the gasification process, called "biochar", is a wood char that has sequestered carbon in solid form (~74% fixed carbon) and is used as a beneficial soil amendment.

The biomass conversion process is a thermo-chemical one that 'cooks' biomass in an oxygen starved environment. By depriving the fuel of sufficient oxygen, the wood biomass does not burn, but rather gives off a hydrogen rich syngas. As the biomass gives off the syngas, it is transformed into bio-char and ash of approximately 1-5% of the volume of biomass fuel. The syngas is then captured, cleaned and cooled before being sent as fuel to the genset. The gensets we utilize come from variety of nationally known vendors such as Cummins, Caterpillar, and GE. This ensures that there are readily available spare parts and maintenance technicians available locally. Further, we have incorporated an on-site water treatment as part of our core model, re-using much of the water for cooling and filtration process, to maintain a small footprint. Finally, our largest by-product, the biohcar, is sold to a variety of potential users.

One unique aspect of our system is that the footprint is very small – less than half an acre to generate 1 megawatt; versus wind systems that need 1-2 acres per MW, or solar which needs 8-10 acres per MW. Along with our module design, this small footprint allows our solution to be deployed close to the biomass feedstock.

Fuel Preparation

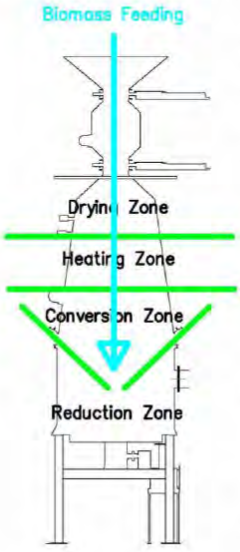


Figure 1

Fuel storage and handling is finalized with your company or host's personnel prior to site work being carried out. There are several design options to choose from, which complement a site's material flow. Currently, we believe a walking floor trailer and/or a combination conveyor fed hopper provide the most flexible solutions. Biomass fuel from your facility will be delivered via conveyer (or front-end loader,) to the fuel hopper. Once in the Phoenix Energy hopper, our automated system uses a robust transloading platform and fuel metering sensors to continuously feed the conversion unit in small batches as needed.

Biomass Conversion

The biomass conversion chamber (figure 1) is essentially a chamber where various complex thermo-chemical processes take place. As the material flows downward through the reactor, the biomass gets dried, heated, converted into gas and reduced into bio-char and ash.

Although there is a considerable overlap, each process can be considered to occupy a separate zone, where fundamentally different chemical and thermal reactions take place. The fuel must pass through all of these zones to be completely converted.

The downdraft conversion unit, employed by Phoenix Energy, is under negative air drawn by a high-pressure blower. The essential characteristic of the downdraft design is that the tars given off in the heating zone are drawn through the conversion zone, where they will be broken down or oxidized. When this happens, the energy they contain is usefully recovered with the mixture of gases in the exit stream being relatively clean, and ready for further processing. Expected total gas contaminant concentration prior to filtration is up to 100 times lower than what is often seen in updraft and fluid-bed systems.

Gas Cleansing

After the syngas has been extracted from the conversion chamber it is cooled and cleaned by a series of scrubbers and filters. First, the gas passes through a venturi scrubber, which is known to remove particulate in the sub-micrometer range. The gas is then passed through a series of four filters. The first is a coarse filter to coalesce residual liquids. The second is a rejuvenating active sawdust filter, the third is a similar passive filter, and the fourth is a fabric bag filter. The filter media are sawdust and biomass chips so instead of using expensive synthetic filters that need to be thrown away, the used filter media can be simply placed back into the fuel hopper and consumed.

Figure 2 – The P250 biomass conversion chamber (red) and filtering system (blue)

Power Generation

Phoenix Energy units are based on a spark-ignited engine genset. Depending on the size chosen, the engines are capable of providing 500 or 1,000KW operating on syngas. Phoenix Energy will customize the selected genset to allow syngas carburetion for this engine and provide standard paralleling switchgear for electrical output.

At present we believe the CAT 3516 or the Cummins 1710 offer the most attractive engine options for your firm, however we can work with *any* natural gas genset. First and foremost there is a large secondary market for CAT and Cummins engines and the service coverage in the US is very good. These engines also have unique features enabling good fuel economy, better emissions, high durability, and extended oil / filter change periods. They run on variety of gaseous fuels like natural gas, bio-gas, sewage gas, LPG etc. Engines are available in both types of aspirations, naturally aspirated and turbocharged, after-cooled

Figure 3 – A P500 installation in California

versions. Both CAT and Cummins engines have been designed to combine compact size, low emission levels and excellent performance characteristics of high-speed technology with the medium speed benefits of water-cooled exhaust valve seats, steel-crown pistons & combustion control.

Bio-char & ash handling, and Low Water usage

Bio-char & ash are removed from the conversion chamber using a dry extraction process designed around a water cooled auger at the base of the gasifier. Scrubbed particulate in the form of ash is extracted at the base of the cyclone. A closed water loop is used for both cooling and process water. On-site water treatment, utilizing biochar and sand filters allows for recirculation of both water loops reducing water usage to a minimum. In fact, at certain times of the year the system is actually water accretive as moisture is removed from the biomass and captured in the process water loop. Water levels are maintained in separate storage tanks for each loop and pumped through both the cooling and filtration process. The automated filter is typical for river sludge treatment and separates the solids from the re-circulated water. The biochar , is a "capture & store" byproduct that is separated out, using a special mechanical separator, for resale as a soil amendment or ADC, sequestering carbon in solid form while in the ground for up to 1,000 years! While we don't include these biochar sales in our conservative base financial forecast, we do believe that carbon credits related to biochar may become a valuable revenue source in the near future. Water leaving the filter is passed through a final stationary filter prior to heat exchange. The scrubbing water is absorbing heat from the syngas and must be cooled in a cooling tower prior to returning to the closed-loop scrubber.

APPENDIX D – PLACER COUNTY AIR POLLUTION CONTROL DISTRICT INITIATIVE

CPUC FEED IN TARIFF RULEMAKING AND THE OPPORTUNITY TO SUPPORT COMMUNITY SCALE BIOPOWER
FREQUENTLY ASKED QUESTIONS

Introduction

California law is now requiring that investor-owned utilities (IOU's such as PG&E, SCE and SDG&E) offer a standard feed in tariff (FIT) rate for renewable energy generation facilities with a capacity of three megawatts (MW) or less. CPUC has requested comments on the FIT pricing. The October 13, 2011, CPUC staff proposal suggests FIT pricing be based on the results of the Nov. 15, 2011 renewable auction mechanism (RAM) price. If the RAM price is used as the basis for the FIT rate, then the CPUC has considered the use of "rate adders" by which some additional cost would be charged to the ratepayer with the expectation that the additional cost would eventually be recovered, or even a potential financial benefit would be realized, by the ratepayer over time. This benefit to the ratepayer is an essential part of the process.

What is the Difference Between Ratepayer and Taxpayer?

IOU retail ratepayers are made up of individuals that pay IOU's for services delivered (typically to ratepayer's residence) in the form of electrical energy and natural gas (depending on the service territory). Taxpayers are individuals that pay taxes based on local, state and federal tax schedules. In most cases the IOU ratepayers are also taxpayers. Benefits accrued to the ratepayers in many cases benefit the taxpayers. As mentioned above the rate adder needs to directly benefit the ratepayer. The fact that there is a generalized taxpayer benefit does not undermine or negate the fact that ratepayers are the primary beneficiary.

What is the Locational Adder?

The CPUC staff is recommending that a "locational adder" energy payment be considered for those renewable power generators (under three MW in size) that are sited in high-value locations that will generate power during peak demand periods. Delivered value to the ratepayers could include avoided transmission/distribution costs and avoided line loss. The IOU's have identified "hotspots" where they could use additional generation during peak demand periods. By locating small renewable generation facilities in these hotspots, the IOU's do not need to install additional generation facilities or upgrade the transmission/distribution system to deliver added power thus delivering cost savings to the IOU ratepayers.

What is the "Wildfire Hazard Reduction Adder"?

The Placer County Air Pollution Control District is proposing that an adder (as mentioned above) be considered for certain biopower facilities. This public safety adder would be available to small (under three MW) community-scale forest biopower facilities strategically

located in high hazard wildfire zones. This adder would monetize the value of wildfire mitigation and improved watersheds afforded by strategic forest/range restoration efforts facilitated through development of small biopower projects within IOU service territories.

The wildfire hazard reduction adder (WHRA) will be financially critical to the successful deployment of small community-scale forest biopower facilities, due to the relatively high costs associated with collection, processing and removal of hazardous fuels (small trees and brush). Removal of high hazard fuels will reduce the incidence of catastrophic wildfire and facilitate defensible communities (public safety), healthy forests, healthy watersheds, wildlife habitat protection, bio-diversity, and preservation of recreational opportunities. As landscapes are treated and acres impacted by wildfire are reduced,[37] the costs associated with wildfire (landscape restoration, fire suppression, IOU's cost settlements)[38] and borne by IOU ratepayers will be reduced. In addition, the high cost of homeowner insurance premiums and recently state mandated fire-suppression fees[39] should drop over time as wildfire hazards are reduced and fire threats mitigated.

The amount charged to the ratepayers for the WHRA would be approximately $.15/month, amounting to approximately $20,476,500 on an annual basis, while the estimated annual cost savings associated with prevention of wildfire is approximately $20,705,000. Comparing these two amounts illustrates how the ratepayer will realize a net gain over the long term. More specifics about these amounts, and the other non-monetary benefits of the WHRA, are discussed in further detail below.

How Many Acres are Impacted, and What are the Annual costs of Wildfire in California?
California has a long history of catastrophic wildfire. In the past five years (2006 through 2010), an average of 913,973 acres[40] per year have been impacted by wildfire. The economic costs to support wildfire suppression and landscape restoration (after wildfire events) are significant. Fire suppression and landscape restoration costs incurred by the three largest fire agencies in the state (CALFIRE, US Forest Service, and the Bureau of Land Management) amounted to an average of $1.201 billion dollars per year for the past five years (2006 through 2010).[41]

How can Investment in Hazardous Fuels Treatment Activities Reduce Costs Associated with Wildfire?
Strategic placement of fuels treatment activities are effective in modifying wildfire behavior, resulting in fire size reduction and mitigation of fire suppression costs.[42,43] Deployment of small biopower generation facilities in strategic high wildfire hazard zones will facilitate

[37]USDA Forest Service, Pacific Southwest Research Station. 2009. *Biomass to Energy: Forest Management for Wildfire Reduction, Energy Production, and Other Benefits.* California Energy Commission, Public Interest Energy Research (PIER) Program. CEC-500-2009-080.
[38]IOU cost settlements are typically a result of power line caused wildfires that result in significant fire suppression and damage recovery compensation.
[39]California Board of Forestry November 9, 2011 ruling that levies a fee on private landowners with structures located in the 31 million acres of state responsibility area.
[40]Data provided by CALFIRE and US Forest Service.
[41]Wildfire suppression and landscape restoration figures provided by CALFIRE, US Forest Service and BLM staff.
[42]USDA Forest Service, "A Summary of Fuel Treatment Effectiveness in the Herger-Feinstein Quincy Library Group Pilot Project Area," publication #R5-TP-031, December 2010.
[43]USDA Forest Service, Pacific Southwest Research Station. 2009. *Biomass to Energy: Forest Management for Wildfire Reduction, Energy Production, and Other Benefits.* California Energy Commission, Public Interest Energy Research (PIER) Program. CEC-500-2009-080.

proactive fuels treatment. Small biopower generation facilities would provide a ready market for biomass material (small trees and brush) generated as a result of fuels reduction activities thus offsetting most of the costs associated with collection, processing and removal. Experience from existing biomass power generation facilities in California indicates that if new, small biopower generation facilities were installed with a combined generation capacity of 50 MW, it would result in the treatment of approximately 30,770 acres per year.[44] Proactive fuels treatment activities reduce accumulations of hazardous fuels thus mitigating wildfire behavior and protecting communities.[45]

How are Avoided Costs to the IOU's Ratepayers Calculated?

While not all of the $1.201 billion per year in fire suppression and landscape restoration costs are paid directly by IOU's ratepayers, these very significant costs are borne by the taxpayers, which include almost all ratepayers. Assuming that 75 percent of California ratepayers are served by the IOU's, then wildfire related costs to the IOU's ratepayers amount to about $900,750,000 ($1.201B * 75%) per year. Using the five-year acres burned average of 913,973 acres per year, the annual wildfire cost to the IOU's ratepayers is $985/acre ($900,750,000/913,973 acres) for each acre burned.

A recent study[46] sponsored by the California Energy Commission and conducted by the US Forest Service (Pacific Southwest Research Station) found a net reduction in burned acres as a direct result of strategic placement of fuels treatment projects across a northern California study area comprised of 2.7 million acres. On a per decade basis, burned acre reduction over the 40 year modeling period ranged from 11% to 36% with an average per decade reduction of 23.5%. Using a median 2.3% per year reduction in burned acres results in a net reduction of 21,021 acres (913,973 * 2.3%) burned per year. A net reduction of 21,021 acres impacted by wildfire results in an annual avoided cost savings to the IOU's ratepayers of $20,705,000 (21,021 acres * $985). This avoided cost value to the IOU's ratepayers amounts to a WHRA of $.055/kWh assuming 50 MW of installed biopower operating at 85% capacity. Table 1 summarizes the calculations used to generate the WHRA cost back to the IOU ratepayers.

How is the Wildfire Hazard Reduction Adder Price Calculated?

The basis for the WHRA is an amount of 5.5 cents per kWh because this amount will help small biomass facilities by providing enough income to support collection, processing and removal of high hazard fuels (small trees and brush). This will allow for jobs to be more stable, and it is an amount that can stimulate more investment, facilitate project financing, and justify entry into contracts with federal agencies and private landowners to support fuels treatment activities. All of these beneficial activities occur within the IOU's service territories, often within watersheds that provide sustainable water resources for existing hydropower assets, domestic and agricultural water supplies and significant recreational opportunities. Reducing the incidence of catastrophic wildfire will be especially critical within California's at risk watersheds as climate change impacts snow loads and extends the wildfire season. The

[44]Acreage treated figure assumes a total of 400,000 bone dry tons of forest biomass utilized to generate 50 MW and that 13 bone dry tons per acre are recovered from fuels treatment activities.
[45]US Forest Service presentation - How Fuels Treatment Saved Homes from the 2011 Wallow Fire.
[46]USDA Forest Service, Pacific Southwest Research Station. 2009. *Biomass to Energy: Forest Management for Wildfire Reduction, Energy Production, and Other Benefits.* California Energy Commission, Public Interest Energy Research (PIER) Program. CEC-500-2009-080.

upstream watersheds provide a plethora of societal benefits that are at significant risk and the best method to restore and protect these watersheds is through strategic removal of unnatural concentration of hazardous fuels (small trees and brush).

Table 1. Incremental Cost to IOU Ratepayer for the WHRA

Total Kilowatt Capacity (50MW = 50,000 kW)	50,000 kW
Operating Hours/Year (85% capacity)	7,446 hours/Year
Total Kilowatt Hours Generated and Sold	372,300,000 kWh
Wildfire Hazard Reduction Adder	$.055/kWh
Total Annual Cost of WHRA	$20,476,500
Number of IOU Retail Ratepayers	11,600,000
Incremental Cost per Ratepayer/Month	**$.15/Month**

What is the Net Cost to the IOU's Ratepayer?
Assuming that the WHRA is set at $.055/kWh and facilities with a combined output of 50 MW of community-scale biopower projects are deployed across all three IOU service territories, the net cost to the IOU ratepayer will amount to approximately $.15/month. See Table 1 (above) for details.

How Can the Ratepayers Realize a Financial Benefit Commensurate with the WHRA Net Cost Over Time?
IOU ratepayers are often burdened with additional fees or costs associated with continued wildfire cost settlements and fire insurance premiums. For example San Diego Gas & Electric (SDG&E) is currently in settlement discussions to address damages incurred by private property owners due to the 2007 Witch Creek, Guejito and Rice Canyon fires. Started by SDG&E power lines, these fires destroyed over 1,300 homes and caused the death of two residents. Estimated cost to settle claims could be as high as $900 million.[47] In addition, SDG&E representatives have noted that the equipment recovery costs associated with the 2007 wildfires will cause ratepayer's power rates to increase $.35 to $.75 per month.[48]

The WHRA cost to the IOU's ratepayers of $.15/month is clearly the more cost effective investment, one that facilitates the proactive treatment of hazardous fuels. Treatment of high wildfire hazard landscapes will reduce the incidence of catastrophic wildfire, driving down wildfire cost settlements, fire insurance premiums (for both the IOU's and the ratepayers) and equipment recovery costs.
If wildfire incidents are reduced, there will most certainly be a tangible financial benefit to the

[47]May 7, 2009 news report on 10News.com.
[48]November 2, 2010 KPBS news report by Peggy Pico.

ratepayers as the costs for wildfire settlements, equipment recovery and fire insurance premiums would not be incurred by the IOU's. There is a high likelihood that while the ratepayer is paying 15 cents per month more for the WHRA public safety adder, the IOU cost savings from the reduction in wildfire will result in net savings (due to wildfire cost reduction) that would more than make up for WHRA cost. Over time, as more landscapes are treated and the incidence of wildfire mitigated, there will be a net savings to the IOU's and to the ratepayers.

How does the Public Utility Regulatory Policy Act (PURPA) Relate to the WHRA?
Pursuant to PURPA, energy purchase rates must be just and reasonable to the ratepayer and not discriminatory to the IOU's. There are a number of FERC decisions that elaborate on this conclusion. The WHRA provides long term cost benefits through wildfire reductions while also providing for jobs, healthy forests and water quality enhancements that occur within the ratepayer's region (IOU service territories). There is no-net financial loss over time, as well as numerous non-monetary benefits to the ratepayers which supports the federal law requirements relating to energy purchase rates.

Are There Any Limitations to the use of the WHRA in the Relevant State Law?
Section 399.20 of the Public Utilities Code was amended by AB 32 to take into account costs, *including but not limited to* various costs associated with environmental compliance costs, including those associated with green house gas emissions. The benefits of reducing wildfire from an air pollution control perspective are clear. The fewer acres burned in catastrophic wildfires, the fewer the green house gas emissions generated (e.g., CO_2, methane). Use of the WHRA is consistent with the intent of AB 32 and the changes made to the public utilities code.