Brush Creek Modeling Plan

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December 6, 2013

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Growth and Yield Modeling:

The growth and yield modeling described in this modeling plan is performed using the FORSEE model, and is based on the following:

Plot Data:

The modeling presented in this document is based on a sample design that will include the installation of fixed area plots to measure both live and dead conifers and hardwoods. Standing live carbon will be inventoried based on sample plots installed in the spring of 2014. The inventory plots will be installed systematically across the Brush Creek Project Area as described in the Application for Listing.

Updating the Inventory:

As timber management activities take place on the Brush Creek Project Area or disturbance such as fire or mortality resulting from pathogens or other factors occurs, the cruise plots installed in 2014 will be relocated and remeasured within areas that have been harvested or subject to other disturbance. By 2026, all of the plots installed in 2014 will have been remeasured regardless of whether or not the plot had been harvested or subject to other disturbance. On this basis, Brush Creek will maintain a forest inventory system that will meet the inventory specifications and requirements contained in Appendix A of the Compliance Offset Protocol U.S. Forest Projects, with plots which are no more than 12 years old.

Updating the Project's carbon stocks from year to year will involve the following steps:

1. Any newly installed inventory plots will be incorporated into the inventory estimate.
2. Existing inventory plots will be updated using FORSEE as described in this modeling plan.
3. Updating the forest inventory for harvests or disturbances that have occurred during the previous year through the installation of new plots, or adjustments to previous plot data.
4. Where necessary, the inventory update process may result in restratification of portions of the timber strata.
5. Inventory updates following harvest or disturbance will be re-measured within 12 months of the harvest or disturbance.

Volume Calculations:

Conifer board foot volume calculations presented below utilize the standard FORSEE volume equations coastal conifers. Reported volumes are in board feet Scribner Scale for all conifers 8.5 inches DBH and larger. The FIA volume and biomass equations described in the Application for Listing are used for the calculation of wood products cubic foot volumes presented below.

Biomass Calculations:

Biomass calculations utilized in the modeling are described in detail in the Application for Listing. The Application for Listing details all of the species specific volume and biomass equations utilized which are in compliance with the Compliance Offset Protocol U.S. Forest Projects.

Adjusting the 2014 Inventory Data to the Offset Project Commencement Date:

The cruise data will be adjusted backward from the date plots were measured to the Offset Project Commencement Date. Height and diameter of each tree in the inventory database will be reduced by a percentage, proportional to the part of the year that has elapsed, of the one-year height and diameter growth increment produced by growing the plot data one year forward in FORSEE.

Projecting the 2014 Inventory Data to the end of the Initial Reporting Period:

The 2014 plot data will be grown in FORSEE to estimate the inventory as of the end of the Initial Reporting Period.

Calibration:

The FORSEE model allows the assignment of 'calibration' factors to each species for height, DBH, and crown growth and mortality. Calibration factors may be applied to certain harvest regimes in order to adjust the model output to local conditions.

Missing Volume:

The inventory data upon which the baseline growth and yield analysis is based gathered data on missing volume from trees with broken tops, or from trees that included defects that reduced the tree's net carbon value. FORSEE outputs all growth and yield results in terms of gross volume or biomass.

The carbon stock values presented in the Application for Listing as of the project commencement date, and the end of the initial reporting period are net of the missing volume recorded in the inventory data. In order to represent this missing volume in the baseline analysis, the average percentage of missing standing live carbon stocks as of the Project start date are used to adjust the baseline growth and yield output from FORSEE.

Ingrowth:

Ingrowth in FORSEE is handled through the sprouting of species such as tanoak, madrone, black oak and white oak, and the addition of regeneration to bring the stand up to a minimum Forest Practice point count.

Site Index:

In order to conduct growth modeling for the property, it is necessary to develop an estimate of average 50-year base age site index by species for the Project Area. Douglas-fir and redwood site indices are based on Krumland and Eng 50-year breast height age curves (California Forestry Report No.4, April 2005).

The entire Project Area is estimated to be low to high site class III timberland based upon knowledge of the property and professional experience. Following the 2014 inventory, site index will be derived from data collected as part of the forest inventory. Plot data on site index values will be overlain with soil survey polygons to calculate the average redwood and Douglas-fir site index values for each soil type. The average site index by soil type data will then be used to calculate an average site index for each stand type found on the Brush Creek Project.

Project Acreage:

The Brush Creek Improved Forest Management Project (the "Brush Creek Project") is comprised of approximately 2,000 acres of timberland. The topographic map included in Attachment E of the Project Application shows the entire Brush Creek property boundary and the Project Area boundary represents the timbered portion of the property.

Baseline Modeling:

The baseline modeling will utilize the above-described 2014 plot dataset, and an unevenaged management harvesting strategy employing selection and transition combined with small group openings not exceeding 2.5 acres in size. For stands with a large hardwood component, the baseline modeling

assumes an aggressive treatment of hardwood species in order to release existing conifer regeneration, and convert areas dominated by hardwoods to conifer occupation.

As of December, 2013 there are no approved Timber Harvest Plans (THPs) on the Project Area.

Baseline Harvest Strategy:

The baseline harvest strategy relies on the application of a series of harvest regimes across the Project Area timber stands. The regimes are modeled for each stand, and a group-selection harvest strategy results in the eventual harvest in small groups of those areas of the property located outside of WLPZs and no-harvest reserve areas within an 80-year period. Table 3a below describes the harvest regimes applied across the Brush Creek timber stands. The final baseline growth and yield analysis is determined by applying a percentage of each regime to each timber stand type.

The silvicultural prescriptions incorporated into the regimes are designed to best accommodate local timber stand conditions, while complying with the Forest Practice Rules. To accomplish this, a harvest strategy has been developed that evaluates each stand's stocking status in square feet of basal area per acre and point count stocking. Tables 3a-3c below illustrate the silviculture decision matrix upon which the growth and yield modeling is based. Harvesting under selection-transition, utilizes a BDq harvest strategy.

The "Bdq" formula is commonly used to describe the stand structure of uneven-aged forest stands and has been described extensively in the scientific literature. BDq refers to the stand structure with, in order of relative importance: B, the residual basal area; D, the maximum retained diameter class; and q, the ratio of the number of trees in adjacent (one inch) diameter classes.

Table 3a: Harvest Regime Descriptions

Regime Name	Harvest Scenario Description
R1	Simulates group selection in the first period as a clearcut, grows the stand for 30 years without harvest, then harvests as selection for each decade until stand age of 80 years at which time the stand is clearcut.
R2	Performs a transition harvest in the first period, then simulates group selection in the second period as a clearcut, grows the stand for 30 years without harvest, then harvests as selection for each decade until stand age of 80 years at which time the stand is clearcut.
R3	Performs a transition harvest in the first and second periods, then simulates group selection in the third period as a clearcut, grows the stand for 30 years without harvest, then harvests as selection for each decade until stand age of 80 years at which time the stand is clearcut.
R4	Performs a transition harvest in the first and second periods, selection in the third period then simulates group selection in the fourth period as a clearcut, grows the stand for 30 years without harvest, then harvests as selection for each decade until stand age of 80 years at which time the stand is clearcut.
R5	Performs a transition harvest in the first and second periods, selection in the third period through the fourth period, then simulates group selection in the fifth period as a clearcut, grows the stand for 30 years without harvest, then harvests as selection for each decade until stand age of 80 years at which time the stand is clearcut.
R6	Performs a transition harvest in the first and second periods, selection in the third period through the fifth period, then simulates group selection in the sixth period as a clearcut, grows the stand for 30 years without harvest, then harvests as selection for each decade until stand age of 80 years at which time the stand is clearcut.
R7	Performs a transition harvest in the first and second periods, selection in the third period through the sixth period, then simulates group selection in the seventh period as a clearcut, grows the stand for 30 years without harvest, then harvests as selection for each decade until stand age of 80 years at which time the stand is clearcut.
R8	Performs a transition harvest in the first and second periods, selection in the third period through the seventh period, then simulates group selection in the eighth period as a clearcut, grows the stand for 30 years without harvest, then harvests as selection for each decade until stand age of 80 years at which time the stand is clearcut.
R9	No-harvest prescription applied to watercourse core zones and NSO activity centers. Assumes a basal area calibration of 0.75 for all species.
R10	WLPZ harvest prescription. Performs selection harvest every decade while retaining higher conifer and hardwood stocks per acre.

General Harvest Constraints:

Harvest on the Brush Creek property is constrained by several factors. Firstly, the California Forest Practice Rules (FPR) create a minimum set of silvicultural standards below which harvest cannot occur.

Legal requirements include all laws, regulations, and legally-binding commitments applicable to the Project Area at the time of the project's initiation that could affect standing live carbon stocks. The Brush Creek Project is subject to the Z'berg- Nejedly Forest Practice Act of 1973 (FPA) and the corresponding Forest Practice Rules (FPR).

The rules that specifically effect the determination of baseline are those that include limits to silviculture activities. This includes the requirements for minimum basal area retention, rotation ages, harvest adjacency restrictions, watercourse buffer widths and sustained yield requirements.

The pertinent rules include the following:

- 14 CCR 913.11(a): Maximum Sustained Production of High Quality Timber Products;
- 913.2: minimum basal area retention standards for Unevenaged Regeneration Methods;
- 913.2 (a)(2)(B): Group selection harvest limitations;
- 913.2 (b)(6): Minimum post-harvest residual basal area retention standards;
- 913.3; minimum basal area retention standards for Intermediate Treatments;
- 913.4 (b): standards for rehabilitation of Understocked Areas;
- 913.1 (c): standards for Seed Tree Seed Step;
- 916.9: details harvest limitations for Watercourse and Lake Protection Zones around Class 1, 2 and 3 streams;

The methods by which the Forest Practice Rule constraints listed above as well as other legally binding constraints are incorporated into the baseline harvest scenario are described in the following sections.

Constraints Analysis

Northern Spotted Owl:

Should NSO activity centers be associated with the Brush Creek Project Area. Harvest activity will be restricted using the following parameters:

- Within 1000' of the activity center – No Harvest
- Retain 150 ac. of Foraging habitat outside the 1000-ft buffer, but within 0.5 miles of the activity center – Utilize primarily unevenaged selection silviculture with small groups.

Class I and II no Harvest Zone:

Harvesting is restricted in class I or II core zones. In some instances, NSO no-harvest areas may be coincident with these watercourse core-zones. These constraints will be modeled by calculating the acreage by timber stand, and applying a 100-year no-harvest regime with average carbon stocks leveling off at 160 Mg C per acre after the seventh decade. It is assumed that NSO activity centers would migrate over time, and that some level of minimal harvest would be allowed after the seventh decade. The yield stream from this reduced harvest is weighted by the constrained acreage and combined with the baseline harvest regime weighted by the unconstrained acreage to determine the final baseline carbon stocks through the 100-year analysis period.

Harvesting WLPZ Areas:

The WLPZ acreage associated with class I and II watercourses will be harvested using the selection silvicultural prescription. Harvest levels within the WLPZ are designed to meet FPR standards for shade canopy retention. FPR requirements for the retention of the largest trees, and restrictions on harvests within the channel zone are addressed given the basal area retention standards applied in the model.

Non-Commercial Treatments:

Portions of Brush Creek's timberlands exist in a condition that does not permit current commercial timber harvest. These stands have a large component of unmerchantable timber, such as hardwoods. Stands with the heaviest hardwood component will be targeted for a "Release" treatment during the first decade of the planning period. For stands with lesser amounts of hardwood competition, or those stands where the hardwood component is too small to treat economically, no treatment is modeled in the

baseline growth and yield analysis; however, the Miller Trust may at its discretion undertake stand improvement treatments in these non-commercial stands. Non-commercial treatments may include hardwood reduction treatments and pre-commercial thinning of conifers.

Standing Dead

The Brush Creek Project Area has not recently undergone any salvage harvesting. Therefore, all that must be demonstrated is that the greater of one metric ton of carbon per acre or 1% of standing live carbon stocks is present in standing dead wood, or that progress towards these targets is ongoing. Following the inventory, calculations will be made for standing live carbon stocks and percent of standing live carbon stocks in standing dead wood. The project will maintain the aforementioned standing dead wood target throughout the project life. Mortality, as modeled by FORSEE, may be used to project additions to the standing dead carbon pool. Changes in the level of standing dead present on the Project Area over the 100-year baseline analysis period are expected to be minimal.

Silvicultural Prescriptions

The following tables show the Draft silvicultural constraints designed to demonstrate conformance with the requirements of the Forest Practice Rules.

Table 4a: Silvicultural Prescriptions used by the Brush Creek

Prescription		Description
Uneven-Aged Management		
	Single Tree Selection	The goal of this prescription is to create and maintain, multistoried, uneven-aged stands with varied diameter classes.
	Single Tree Selection (WLPZ)	The goal of this prescription is to create and maintain dense, multistoried, uneven-aged stands with varied diameter classes.
	Group Selection	The goal of this prescription is to create and maintain, multistoried, uneven-aged stands with varied diameter classes. Groups are up to 2.5 acres in size.
	Transition	The goal of this prescription is to develop uneven-aged stands from stands that have an even-aged or irregular stand structure. Trees are harvested individually, or in small groups up to 2.5 acres in size.
	Commercial Thinning	To promote timber growth and improve forest health through the harvest of trees in a manner that results in a stand capable of being managed using single tree or group selection.
Even-Aged Management		
	Rehabilitation	The goal of this prescription is to regenerate stands that are primarily experiencing excessive hardwood competition, and that also do not meet minimum stocking standards. Successive harvests will utilize uneven-aged silviculture.
	Hardwood Release	The goal of this prescription is to improve growth in stands that are primarily experiencing excessive hardwood competition, and that are also well stocked with conifer seedlings. Successive harvests will utilize uneven-aged silviculture.

Table 4b: Pre-harvest Stand Conditions by Silvicultural Prescription

[SUBJECT TO ADJUSTMENT IN THE FINAL OPDR]

Prescription		Pre-Harvest Conifer Basal Area (Square Feet per Acre)		Other Pre-Harvest Considerations
		Lower Limit	Upper Limit	
Uneven-Aged Management				
	Single Tree Selection	75	None	
	Single Tree Selection (WLPZ)	140	None	
	Group Selection	75	None	
	Transition	50	75	
Even-Aged Management				
	Rehabilitation	0	50	Less than 300 point count
	Hardwood Release	0	50	

Table 4c: Post-harvest Stocking by Silvicultural Prescription

[SUBJECT TO ADJUSTMENT IN THE FINAL OPDR]

Prescription	Stocking Considerations	Conifer Basal Area Retention (sq. ft. per acre)	Hardwood Basal Area Retention (sq. ft. per acre)	Time to Next Treatment
Uneven-Aged Management				
Single Tree Selection	All age, evenly distributed	>75	7	At Least 10 Years
Single Tree Selection Low Stocking (WLPZ)	All age, evenly distributed	140	30	At Least 10 Years
Group Selection	Less than 20% of stand in group openings	>75	7	At Least 10 Years
Transition	Less than 20% of stand in group openings, at least 15 sq. ft. >12" DBH	>50	7	Selection within 10-20 Years
Commercial Thinning	Equal to or Greater average stand diameter than pre-harvest stand	>100 if QMD >14" and 100 4"+ trees if QMD <14"	7	Selection within 10-20 Years
Even-Aged Management				
Rehabilitation	Retain/recruit 2-3 snags per acre	>8 where conifer >8 pre-harvest	7	Selection within 30-40 Years
Hardwood Release	No Commercial Conifer Harvest	No Commercial Conifer Harvest	7	Selection within 20-40 Years

Growth and Yield Analysis:

The baseline growth and yield analysis was modeled using the FORSEE model utilizing the above described harvest strategy. Table 5a shows the results of the growth and yield analysis in terms of conifer yields, while table 5b shows the results in terms of tonnes of live carbon for all species. Table 6 shows the results in terms of average basal area per acre over the 100 year planning horizon.

Table 5a: Average per Acre Conifer Growth and Yield through the Planning Horizon (Scribner Board Feet per Acre)

Elapsed Time (year)	Beginning Inventory (board feet)	Average Decadal Growth (board feet)	Average Decadal Harvest (board feet)	Ending Inventory (board feet)
10				
20				
30				
40				
50				
60				
70				
80				
90				
100				

[Following completion of the final baseline scenario in the OPDR, this table will be populated.]

Table 5b: Average per Acre Total Live Carbon Growth and Yield through the Planning Horizon (Mg C per Acre)

Elapsed Time (year)	Beginning Inventory (Mg Carbon)	Average Decadal Growth (Mg Carbon)	Average Decadal Harvest (Mg Carbon)	Ending Inventory (Mg Carbon)
10				
20				
30				
40				
50				
60				
70				
80				
90				
100				

[Following completion of the final baseline scenario in the OPDR, this table will be populated.]

Table 6: Average Basal Area per Acre through the Planning Horizon

Elapsed Time (years)	0	10	20	30	40	50	60	70	80	90	100
Conifer											
Hardwood											
Total											

[Following completion of the final baseline scenario in the OPDR, this table will be populated.]

Table 7 presents the percentage of each silvicultural regime applied to the various timber stands for the entire baseline modeling analysis.

Table 7: Application of Silvicultural Regimes through the 100-year Planning Horizon

	Regime Name										
Stand	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Grand Total

[Following completion of the final baseline scenario in the OPDR, this table will be populated.]

Table 8 below shows the modeled standing live carbon stocks over the 100-year baseline analysis period, the projected standing dead carbon pool, and the resulting average baseline carbon stocks on a per acre basis. These figures are plotted in Figure 1 as well.

Baseline Carbon Stocks

The baseline modeling scenario defined in this document follows the guidelines presented in section 6.2 of the Compliance Offset Protocol U.S. Forest Projects, October 20, 2011.

Key components of the calculated baseline are as follows:

1. Initial Project live carbon stocks are above Common Practice.
2. The Project is not subject to the High Stocking Reference calculation.
3. Initial live carbon stocks have been modeled subject to all legal and financial constraints for a 100-year period.
4. The average carbon stocks of the 100-year baseline growth and yield modeling scenario have been calculated.

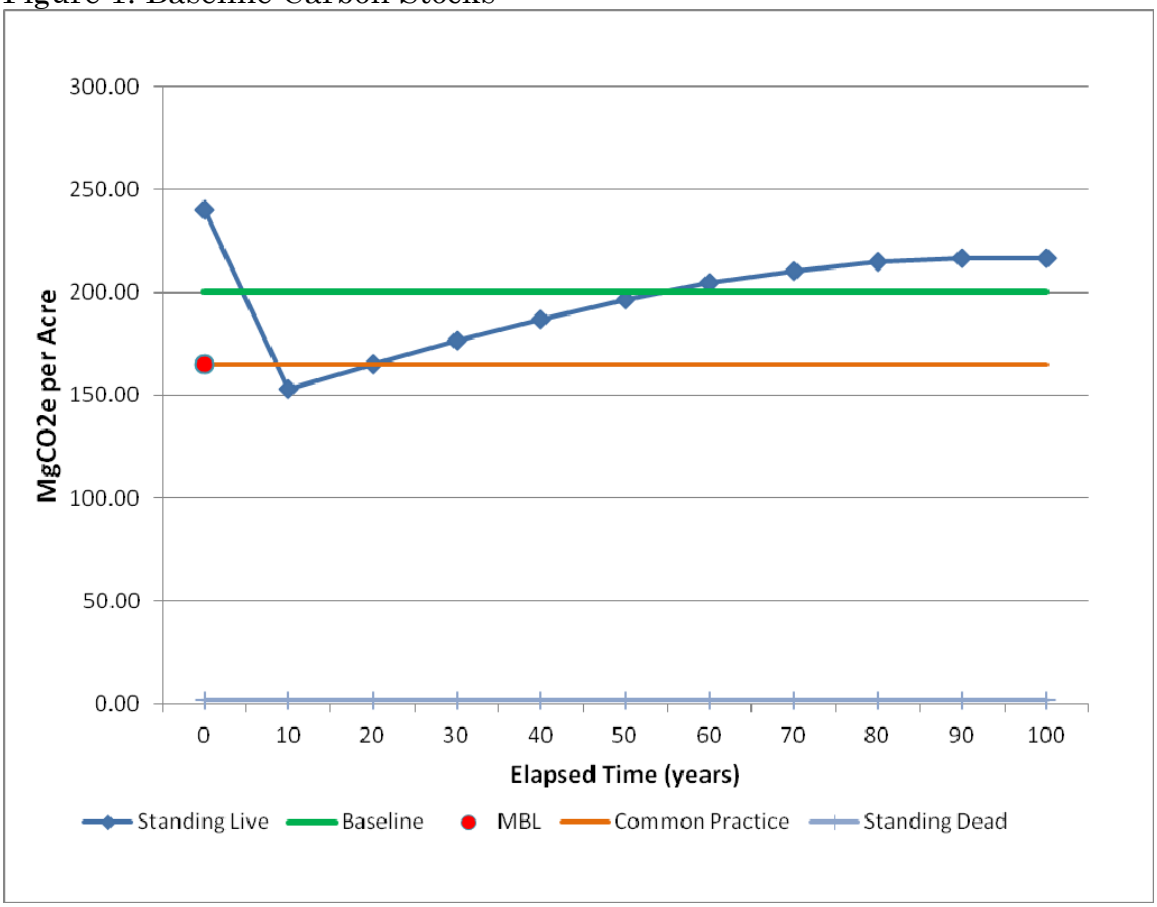
5. The average stocks of standing dead carbon over the 100-year period have been calculated.
6. The average production of In-Use carbon, landfill carbon, and harvested carbon prior to delivery to a mill have been calculated from the 100-year baseline growth and yield scenario.

Table 8: Average Baseline Carbon Stocks per acre Generated by the Baseline Harvest Scenario (Mg CO2e per Acre).

Elapsed Time	Standing Live Carbon Pool IFM-1	Standing Live Above Ground	Standing Live Below Ground	Standing Dead Carbon Pool IFM-3	Baseline
0	240.00	200.00	40.00	2.00	200.27
10	152.76	127.30	25.46	2.00	200.27
20	164.98	137.48	27.50	2.00	200.27
30	176.53	147.11	29.42	2.00	200.27
40	187.12	155.93	31.19	2.00	200.27
50	196.48	163.73	32.75	2.00	200.27
60	204.34	170.28	34.06	2.00	200.27
70	210.47	175.39	35.08	2.00	200.27
80	214.68	178.90	35.78	2.00	200.27
90	216.82	180.69	36.14	2.00	200.27
100	216.82	180.69	36.14	2.00	200.27
Average	198.27	165.23	33.05	2.00	200.27

[Following completion of the final baseline scenario in the OPDR, this table will be populated.]

Figure 1: Baseline Carbon Stocks



[Following completion of the final baseline scenario in the OPDR, this figure will be updated.]

Wood Products

The baseline growth and yield modeling produces a flow of wood products over the 100-year planning period. Table 9 below shows the average wood products generated over the 100-year period. Three average wood products numbers are presented: average wood products In-use, average wood products stored in landfills, and the average amount of carbon in standing live carbon stocks prior to delivery to a mill.

Table 9: Average Wood Products Carbon per acre Generated by the Baseline Harvest Scenario.

Woods Products	Mg C/ acre	Total Mg CO2e
Average Annual Carbon 100-year In-Use		
Average Annual Carbon 100-year Landfill		
Average Annual Carbon in Harvested Trees Prior to Delivery to the Mill		

[Following completion of the final baseline scenario in the OPDR, this table will be populated.]