Section 12
Stormwater Management

The project is comprised of a 59-mile 115-kilovolt generator lead transmission line running through a utility line corridor. The proposed transmission line has been designed to minimize potential impacts to the environment and, as such, the permanent conversion of vegetated areas to impervious surfaces along the corridor will be limited to the transmission line pole structures themselves and new or improved permanent access roads.

Clearing required along the transmission line corridor will be limited to the removal of mature trees and capable species (i.e., trees capable of attaining heights that would cause safety/reliability problems due to their proximity to the conductors), as necessary, to allow placement of pole structures and to ensure adequate clearance between any vegetation and the conductors. The removal of understory vegetation and ground cover will be required only as needed to install a structure, to create access to the corridor, and for puller/tensioner sites.

Restoration activities following construction are designed to restore site contours to pre-construction conditions and to ensure that areas disturbed during construction will be revegetated as discussed in Section 14, Basic Standards Submissions. After construction, the corridor will be allowed to revegetate and will be maintained in an early successional state. The corridor will become dominated by shrubs and a variety of broad and narrow-leaved herbaceous vegetation as is typical of established transmission line corridors. Thus, of the four factors affecting runoff and infiltration (climate, topography, soil characteristics, and vegetative cover types), the only factor affected by the construction of the transmission line right-of-way (ROW) is the vegetative cover type.

Generally, the conversion of a forest cover to a scrub-shrub or early successional cover type within a transmission line corridor may improve the ability of the land to absorb runoff due to the increased density of the root mass associated with the resultant vegetative cover. Specifically, the runoff curve numbers found in *Urban Hydrology for Small Watersheds*, Technical Release 55 (TR-55), in its Table 2-2c, shows similar curve numbers when comparing “woods” to “brush” in C and D soils. Non-forested cover types will generally remain the same as pre-development cover types. Vegetation along the corridor will be trimmed or maintained every four years, which will promote a “brush” type of cover.

Maine GenLead, LLC will primarily utilize existing public roads, abandoned town roads, and available private roads, logging roads and skidder trails for construction access the ROW to the maximum extent possible. In a limited number of cases, a new temporary access road will be required. Permanent access roads to reach the transmission line ROW and construction staging areas are depicted in Exhibit 2 of this application. Access roads were selected to avoid impacts to vegetative cover and protected resources to the greatest extent practicable. Improvements to some of the roads and trails (e.g., trimming overhanging vegetation, minor grading or additional gravel, replacing damaged or nonfunctional culverts, and installing temporary timber mat bridges) may be required due to the size and nature of the equipment that will utilize the road. Any new gravel or grading will be limited to that necessary to maintain a safe, reliable surface and will not result in any new impervious surface or be placed in protected resources such as wetlands. Construction of new access roads and improvements to existing roads will be completed using the proposed Erosion and Sedimentation Control Plan (E&S Plan), included as Appendix 14-1 in Section 14.

A stormwater analysis associated with the permanent access roads is attached in Appendix 12-1. Because the transmission line ROW will remain vegetated, and there are no new permanent access roads being constructed within the ROW, there will be no significant change in stormwater runoff characteristics (peak discharge rates), and therefore no special measures are required to control peak flow from the ROW. Similarly, by adherence to the Maine Department of Environmental Protection (MDEP’s) Chapter 500 Basic Standards requirements, as assured through implementation of the proposed E&S Plan for the project, no special measures are required to control stormwater quality from the ROW. The E&S Plan is based on the practical application of MDEP’s *Maine Erosion and Sediment Control Best Management Practices*, March 2003, and Maine GenLead, LLC’s considerable experience with construction of transmission lines. No further analyses for stormwater from the ROW is required to demonstrate compliance with the Chapter 500 standards.

Appendix 12-1

STORMWATER MANAGEMENT REPORT
MDEP SITE LOCATION OF DEVELOPMENT PERMIT APPLICATION

115kV Transmission Line Construction Access Roads

OAKFIELD to CHESTER, MAINE

NOVEMBER 30, 2010

Prepared for:
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Project No. 657003

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1.0 Project Description

Maine GenLead, LLC proposes the construction of an approximately 60-mile long 115kV electrical transmission line between the towns of Oakfield and Chester in Aroostook and Penobscot Counties. Construction of the transmission line will necessitate the clearing of the transmission line right of way (ROW) and removal of the felled timber via conventional timber harvesting equipment and logging trucks. An assessment of the existing transportation infrastructure into and out of the proposed ROW was conducted by SGC Engineering during the summer of 2010. This assessment resulted in the identification of access roads that were currently suitable for travel by logging equipment, as well as, access roads in need of improvement to support the necessary construction traffic.

The access assessment noted above resulted in the identification of thirty-five (35) access roads totaling approximately 8.1 miles in need of substantial improvements to support logging and construction traffic. Generally, in their current state, these roads are moderately improved "winter-only" roads and skidder roads used for pre-existing timber harvesting operations. The roads identified for improvement were selected based on their proximity to the transmission line ROW, as well as, connectivity to good transportation corridors for timber removal. The inclusion of these roadway improvements within the overall transmission line construction project will result in fewer trips by construction traffic along sections of the transmission line ROW that contain large wetlands, streams and associated poor/erodible soils.

The existing roads themselves vary in width but are generally between 8'-12' wide in their current condition. Some of the roadways have been improved with compacted gravel while others are rudimentary skidder roads suitable only for travel by large-wheeled or tracked harvesting equipment. One consistent characteristic of the existing roads is generally poor surface water drainage. This includes undersized, blocked, and failing culverts, standing water, and deep ruts in places. In their current condition, the access roads would not be suitable for repeated trips by construction traffic as will be necessary for clearing and construction of the proposed 115kV transmission line.

The proposed improvements for the access roads include widening the roads to a consistent 16-foot travel width, installation of properly-sized drainage culverts, and construction of stormwater conveyance ditches where necessary to provide for stable, long-term access roads that can be utilized for construction activities, as well as, future maintenance efforts. As specified by the proposed project plans and construction details, approximately 12"-18" of MDOT Spec 703.12 gravel will be placed and compacted along the roadway alignments. A layer of geotextile fabric will be placed between the native material and imported gravel. In areas of vegetation and organic topsoil, the organic layer will be removed prior to placement of the geotextile fabric to assist in developing a suitable roadway base.

The Transmission Line Construction Access Road Location Plans provide a general overview of the location of the access road improvements in relation to the overall transmission line project and the surrounding roadways. Construction requirements, as well as, stormwater treatment

and erosion control provisions are specified on the Access Road Plan & Profile sheets and the associated construction details.

2.0 Maine Stormwater Statutes and Regulations

The project is subject to the Maine Site Location of Development, Erosion and Sedimentation Control, and Stormwater Management statutes. This report will focus on the methods proposed to comply with the Chapter 500 Stormwater Management Rules administered by the Maine Department of Environmental Protection (MDEP).

All disturbed areas, with the exception of the improved access road travel surface, will be re-vegetated to establish a stabilized cover of grass that will be allowed to revert to natural conditions following a 6-9 month construction period. Therefore, this project will not create areas defined as maintained developed/landscaped area, as defined in Chapter 500 that would be subject to stormwater treatment. The rules and standards in Chapter 500 are considered applicable to only the impervious areas associated with the upgrades to the access roads.

If looked at as a whole, the project would be subject to the Chapter 500 Flooding Standard, as the project includes greater than three acres of impervious area. However, the linear nature and disconnected construction of the access roads will not involve greater than three acres of impervious area in any of the project's sub-watersheds. The new impervious area will represent a minor change in land use when each sub-watershed/access road is reviewed at individually. Section 7.0 and Appendix 12-4 of this report summarize the areas that contribute to the total impervious area throughout the project area.

With regard to Stormwater Quality, the project is subject to Chapter 500 General Standards and Basic Standards. The project proposes impervious area in the Penobscot River, East/West Branch Mattawamkeag River, Mattawamkeag River, and Molunkus Lake watersheds. General and Basic Standards apply in all of the river watersheds, as greater than one acre of new impervious area will be created. For Molunkus Lake, only 17,920 sq-ft of impervious area is created, therefore compliance with Phosphorus Standards is not required. Nevertheless, buffering calculations have been provided for the roadway segment within the Molunkus Lake Watershed to be consistent with those for the river watersheds.

This report presents a stormwater management program and supporting calculations that demonstrates compliance with stormwater quantity and stormwater quality rules administered by the MDEP.

3.0 Stormwater Modeling Methodology

For this study, SGC Engineering, LLC utilized the Rational Method for computing stormwater runoff. The Rational Method calculations were used to determine culvert sizes based on a 25-year storm event. The 25-year rainfall intensity was taken from an Intensity-Duration-Frequency (IDF) Curve. Data for the IDF curve was taken from Appendix A-4, IDF Curve for the

Town of Millinocket, MDEP Stormwater Management for Maine, Volume III. Appendix 12-3 contains the supporting data for all stormwater runoff calculations presented in this report.

4.0 Soil Conditions

The USDA Natural Resources Conservation Service Soil Survey for Aroostook County (Southern Part) and Penobscot County, Maine were utilized for the stormwater quality assessment/buffering calculations included in this report. According to this source, the project area contains HSG types C, C/D, and D. Generally, soils are comprised of gravelly loams in upland areas and silt loams in areas of D soils and/or wetland areas. A table listing the USDA soils is provided in Appendix 12-2. Soil types are also identified on the road plan and profile sheets and accounted for in the Stormwater Quality calculation table Appendix 12-1.

5.0 Pre-Development Drainage Conditions

The areas encompassing the proposed access roads are generally gently sloping. Elevations generally range from 200 feet at the low point near the Penobscot River to 600 feet above sea level. As previously mentioned, the project lies in the East/West Branch Mattawamkeag River, Mattawamkeag River, Penobscot River and Molunkus Lake watersheds. All of the watersheds are ultimately tributary to the Penobscot River that discharges to the Atlantic Ocean. The topography and land cover types are relatively similar for the entire project area. The areas are forested with limited access provided by means of forestry roads as described above. This is reinforced by the 2009 NAIP aerial photography included on the project location plans.

As noted above, in their current condition the roadways are “winter-only” roads that, lacking any major improvements, would require frozen ground to support heavy loads. Drainage is currently managed via an inadequate number of cross culverts or overland flow. Standing water is common. Some culverts have been blocked by beaver activity or are clogged due to lack of maintenance.

6.0 Post-Development Drainage Conditions

The existing alignments of the access roads will be maintained. Existing drainage patterns will be maintained and improved by the use of properly sized and located cross culverts. Stormwater treatment and erosion control BMP’s that meet the Chapter 500 rules and standards will be implemented to minimize impacts to down gradient resources. The project achieves these goals by maintaining existing drainage patterns with the use of cross culverts, level spreaders, and ditch turnouts to redistribute stormwater via sheet flow to vegetated buffers. Frequently redistributing channelized flow to buffers avoids aggregating flow and resulting in increases in peak stormwater runoff rates. This strategy works to evenly distributes stormwater to vegetative buffers and thereby providing effective stormwater quality control.

7.0 Stormwater Quantity Analysis

As noted above, the project will create/upgrade approximately 8.1 miles of roadway with the 35 road segments. Together, this represents approximately 15.75 acres of impervious area. As noted in Section 5.0, there are five major watersheds within the project area. Within these five major watersheds are seventeen (17) sub-watersheds consisting of named streams and brooks that are tributary to the major river segments and Molunkus Lake. Appendix 12-4 includes a table summarizing the distribution of the roadway segments and associated impervious area throughout the five major and seventeen sub-watersheds. As illustrated in Appendix 12-4, no individual sub-watershed contains more than 3 acres of impervious area associated with the access road segments. Also summarized within the table are the total acreages of the individual sub-watersheds and the percentage of the total watershed area that the access road impervious area represents. Please note, for river and stream segments, the watershed area represents only the area between tributaries to that river/stream segment, and not the total major watershed area thereby excluding the up-gradient areas. Watershed areas were obtained from the Maine Office of GIS (*mrdrdvd* data layer) and are based on USGS topographic mapping. In all instances, access road segments represent less than 0.05% of the total sub-watershed area, and in most cases, substantially less.

Whereas the roadway segments do not represent a significant change to the surface cover within each of the watersheds, the approach to stormwater quantity management for the project is to avoid significant modifications to existing drainage patterns by installing cross culverts, ditch turnouts, and level spreaders. These devices return stormwater flow to the same pattern for the post-development condition as the pre-development conditions by dispersing stormwater in sheet flow to down gradient vegetated buffers. Spreading stormwater runoff across wide vegetated areas mitigates any potential down gradient impacts by minimizing channelized stormwater from discharging from the road segments. These measures are further described in Section 8.0.

8.0 Stormwater Quality Analysis

The Chapter 500 Basic Standards and General Standards are considered applicable to the project, as greater than one acre of impervious area is created within each of the river watersheds. The project does present the characteristics of a linear project that requires stormwater treatment of 75% of the new impervious area.

As previously mentioned, only the impervious area associated with the access roads will be considered when performing stormwater treatment calculations. All other areas disturbed during project construction are proposed to be re-vegetated and not mowed, and allowed over time to revert to natural conditions following a 6-9 month construction period. Therefore, there is no landscaped/developed area to factor into the treatment calculations.

The impervious area will be treated exclusively via the use of vegetated buffers. No structural measures are proposed. The vegetated buffer standards specified in Appendix F of Chapter 500:

Stormwater Management Rules were used to comply with the General stormwater treatment standards. Buffers adjacent to the downhill side of a road and ditch turnouts were all applied as the available topographic and vegetative buffer conditions permitted. Vegetative buffer lengths were assigned according to land cover type, slope, and HSG soil types. Buffer locations and identifications are depicted on the project plans. Stormwater quality calculations for each watershed, including the physical characteristics of each buffer utilized, are provided in Appendix 12-1. Included in Appendix 12-7 is a draft Declaration of Restrictions for the proposed forested buffers. All stormwater quality calculations demonstrate compliance with Chapter 500: Stormwater Management Rules and Standards.

The following is a summary of each buffer type as described in Chapter 500 Appendix F that has been applied throughout the project.

1) Ditch turnout buffers are proposed in accordance with the table provided in Ch. 500 Appendix F, part 5. Buffers with HSG C and D soils are assigned within the given slope and length parameters.
2) Buffers adjacent to the downhill side of a road are proposed as frequently as possible, as this is the simplest and most effective means for stormwater treatment. All buffers meet the maximum 20% slope design criteria.

9.0 Culvert Sizing Analysis

In accordance with the Chapter 500 Flooding Standards, all proposed culverts for the project have been sized to convey stormwater runoff from the 25-year storm event without overtopping the access road. High density polyethylene (HDPE) pipe is proposed for all culverts. Each culvert has been sized using the Rational Method to determine the 25-year peak flow and using Manning's equation to confirm pipe flow capacity at a minimum slope between 1% and 4% based on the necessary capacity. Rational Method calculations are provided in Appendix 12-3. All culvert locations are depicted on the road plans. The culvert sizes, length, minimum slopes, and multipliers (i.e. multiple culverts) are provided in a schedule included in the design plans as well as in Appendix 12-3. A minimum culvert diameter of 15" has been used to minimize risk of blockage due to debris buildup.

10.0 Erosion and Sedimentation Control

Numerous erosion control measures are specified on the plans including silt fence, erosion control mix berms, culvert inlet stone check dams, stone construction entrances, stone check dams in drainage ditches, and erosion control matting on embankments. The plans also contain erosion control notes that outline procedures and actions that must be taken during construction in addition to the erosion control measures depicted on the plans. If the erosion control measures are implemented correctly and procedures outlined in the erosion control notes are followed, the project should not result in significant erosion of disturbed areas or transport of sedimentation to down gradient resources. It is the responsibility of the owner and their designated contractor to take actions during construction beyond the erosion control

measures specified on the plans and implement additional erosion control measures as may be dictated by specific site and weather conditions.

Appendix 12-1

Stormwater Quality Treatment Calculations

Appendix 12-1: Stormwater Quality Treatment Calculations

Maine GenLead 115kV Transmission Line Construction Access Roads – Oakfield to Chester, Maine

Road ID	Roadway Segment Treated (Stations)	Buffer Location (Looking Upstation) R=right side road L=left side road	Road Length (ft) Total/Treated	Road Width (ft)	BMP TYPE	BMP ID	Level Spreader Length (ft)	USDA Soil	Soil HSG	Buffer Slope (%)	Buffer Length (ft)	Impervious Area (sq-ft)	Impervious Area Treated (sq-ft)	Treatment Percentage
Penobscot River Watersheds														
Sargent Brook to Medunkeunk Stream														
AR-33-34			**180**	**16**								**2,880**		
	0+00 TO 1+80	L	180		DM	1	20	BuB	D	2-8	150		2,880	100.00%
											Sub-Watershed Total	**2,880**	**2,880**	**100.00%**
Ebhorse Stream														
AR-49-50			**435**	**16**								**6,960**		
	0+00 TO 2+47	L	247		BF	1	-	BoA	D	0-3	35		3,952	56.78%
	3+67 TO 4+35	L	68		BF	2	-	BoA	D	0-3	35		1,088	15.63%
AR-58-59			**605**	**16**								**9,680**		
	0+82 TO 3+20	R	238		BF	1	-	TvB	C	8-15	35		3,808	39.34%
	3+20 TO 4+70	R	150		BF	2	-	BuB	D	2-8	35		2,400	24.79%
	4+70 TO 6+05	R	135		BF	3	-	TvB	C	8-15	35		2,160	22.31%
AR-64-65			**680**	**16**								**10,880**		
	1+15 TO 6+80	R	565		BF	1	-	BuB	D	2-8	35		9,040	83.09%
											Sub-Watershed Total	**27,520**	**22,448**	**81.57%**
Meadow Brook														
AR-120-121			**2,530**	**16**								**40,480**		
	0+00 TO 4+00	R	400		DF	1	20	PrC	C	5	100		6,400	15.81%
	4+00 TO 8+00	R	400		DF	2	20	PrC	C	4	100		6,400	15.81%
	8+00 TO 10+00	R	200		DF	3	20	PrC	C	4	60		3,200	7.91%
	10+00 TO 12+00	R	200		DF	4	20	MrB	D	6	100		3,200	7.91%
	12+00 TO 14+00	R	200		DF	5	20	MrB	D	5	100		3,200	7.91%
	17+80 TO 20+20	R	240		BF	6	-	MrB	D	6	35		3,840	9.49%
	20+20 TO 22+20	R	200		DF	7	20	MrB/BoA	D	5	100		3,200	7.91%
AR-144-145			**855**	**16**								**13,680**		
	0+00 TO 4+00	R	400		DF	1	20	HvB	C	2.5	100		6,400	46.78%
	4+00 TO 7+00	R	300		DF	2	20	HvB	C	3.5	75		4,800	35.09%
											Sub-Watershed Total	**54,160**	**40,640**	**75.04%**

BMP Type:

BM=Meadow Buffer Adjacent to Road

BF=Forested Buffer Adjacent to Road

DM=Meadow Ditch Turnout Buffer

DF=Forested Ditch Turnout Buffer

Appendix 12-1: Stormwater Quality Treatment Calculations

Maine GenLead 115kV Transmission Line Construction Access Roads – Oakfield to Chester, Maine

Road ID	Roadway Segment Treated (Stations)	Buffer Location (Looking Upstation) R=right side road L=left side road	Road Length (ft) Total/Treated	Road Width (ft)	BMP TYPE	BMP ID	Level Spreader Length (ft)	USDA Soil	Soil HSG	Buffer Slope (%)	Buffer Length (ft)	Impervious Area (sq-ft)	Impervious Area Treated (sq-ft)	Treatment Percentage
Eagle Stream														
AR-152-153			**1,150**	**16**								**18,400**		
	0+00 TO 4+00	L	400		DF	1	20	PrC	C	7	100		6,400	34.78%
	4+00 TO 7+00	L	300		DF	2	20	PrC	C	7	75		4,800	26.09%
	9+25 TO 10+50	L	125		BF	3	-	MrB	D	7	35		2,000	10.87%
AR-162-163			**1,940**	**16**								**31,040**		
	0+00 TO 75+00	R	75		BM	1	-	MrB	D	1	50		1,200	3.87%
	4+00 TO 6+00	R	200		DF	2	20	MrB	D	1	100		3,200	10.31%
	6+00 TO 8+00	R	200		BF	3	-	MrB	D	1	35		3,200	10.31%
	8+00 TO 10+00	R	200		DF	4	20	MrB	D	1.5	100		3,200	10.31%
	10+00 TO 12+00	R	200		DF	5	20	MrB	D	1.5	100		3,200	10.31%
	12+00 TO 14+00	R	200		DF	6	20	MrB	D	1.5	100		3,200	10.31%
	14+00 TO 16+00	R	200		DF	7	20	MrB	D	1.5	100		3,200	10.31%
	18+70 TO 19+40	R	70		DF	8	20	CnB	B	8	60		1,120	3.61%
AR-178-179			**460**	**16**								**7,360**		
	0+00 TO 2+00	L	200		DM	1	20	MrB	D	5	150		3,200	43.48%
	2+00 TO 4+60	L	260		BM	2	-	MrB	D	3	50		4,160	56.52%
											Sub-Watershed Total	**56,800**	**42,080**	**74.08%**
Penobscot River (Direct)														
AR-196-197			**490**	**16**								**7,840**		
	0+00 TO 1+00	L	100		DF	1	20	PrC	C	13	72		1,600	20.41%
	2+00 TO 3+20	L	120		DF	2	20	PrC	C	14	72		1,920	24.49%
	4+00 TO 4-90	L	90		DF	3	20	PrC	C	4	60		1,440	18.37%
											Sub-Watershed Total	**7,840**	**4,960**	**63.27%**
Bog Brook to Mattaseunk Stream														
AR-224-225			**615**	**16**								**9,840**		
	0+00 TO 2+00	L	200		DF	1	20	PrB	C	10	72		3,200	32.52%
	3+25 TO 6+15	L	290		BM	2	-	PrB/MoA	C/D	10	35		4,640	47.15%
											Sub-Watershed Total	**9,840**	**7,840**	**79.67%**
											Penobscot River Watershed Total	***159,040***	***120,848***	***75.99%***

BMP Type:
BM=Meadow Buffer Adjacent to Road
BF=Forested Buffer Adjacent to Road
DM=Meadow Ditch Turnout Buffer
DF=Forested Ditch Turnout Buffer

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Maine GenLead 115kV Transmission Line Construction Access Roads – Oakfield to Chester, Maine

Road ID	Roadway Segment Treated (Stations)	Buffer Location (Looking Upstation) R=right side road L=left side road	Road Length (ft) Total/Treated	Road Width (ft)	BMP TYPE	BMP ID	Level Spreader Length (ft)	USDA Soil	Soil HSG	Buffer Slope (%)	Buffer Length (ft)	Impervious Area (sq-ft)	Impervious Area Treated (sq-ft)	Treatment Percentage
Molunkus Lake Watershed														
AR-260-261			**1,120**	**16**								**17,920**		
	0+50 TO 10+00	L	950		BF	1	-	ThB	C/D	5-10	35		15,200	84.82%
											Molunkus Lake Watershed Total	***17,920***	***15,200***	***84.82%***
Mattawamkeag River Watersheds														
Molunkus Stream														
AR-233-234			**345**	**16**								**5,520**		
	0+00 TO 1+35	L	135		BM	1	-	MoA/HvB	C/D	1	50		2,160	39.13%
	1+35 TO 2+10	L	75		BF	2	-	HvB	C	5	35		1,200	21.74%
	2+35 TO 3+45	L	110		BM	3		HvB	C	5	50		1,760	31.88%
AR-240-241			**3,970**	**16**								**63,520**		
	0+00 TO 1+00	L	100		BM	1	-	HvB	C	7	50		1,600	2.52%
	1+00 TO 4+00	L	400		BF	2	-	HvB	C	7	35		6,400	10.08%
	5+00 TO 8+00	L	300		BF	3	-	HvB	C	4	35		4,800	7.56%
	10+30 TO 13+00	L	270		DF	4	20	PrC	C	6	75		4,320	6.80%
	14+00 TO 18+00	L	400		BF	5	-	PrC/MoA	C/D	10	35		6,400	10.08%
	24+00 TO 26+00	L	200		DF	6	20	MoA	D	3	100		3,200	5.04%
	26+00 TO 28+00	L	200		DF	7	20	MoA	D	3	100		3,200	5.04%
	28+00 TO 30+00	R	200		BF	8	-	PrC	C	6	35		3,200	5.04%
	30+50 TO 34+50	R	400		DF	9	20	PrC	C	11	120		6,400	10.08%
	34+50 TO 37+00	L	250		BF	10	-	PrC	C	5	35		4,000	6.30%
	37+00 TO 39+70	L	270		BM	11	-	PrC	C	11-18	50		4,320	6.80%
AR-246-247			**1,900**	**16**								**30,400**		
	0+00 TO 14+25	L	1,425		BF/BM	1	-	HoB/MrB	C/D	5-10	50		22,800	75.00%
AR-291-292			**130**	**16**								**2,080**		
	-	-	-		-		-	-	-	-	-		0	0.00%
											Sub-Watershed Total	**101,520**	**75,760**	**74.63%**

BMP Type:

BM=Meadow Buffer Adjacent to Road

BF=Forested Buffer Adjacent to Road

DM=Meadow Ditch Turnout Buffer

DF=Forested Ditch Turnout Buffer

Appendix 12-1: Stormwater Quality Treatment Calculations

Maine GenLead 115kV Transmission Line Construction Access Roads – Oakfield to Chester, Maine

Road ID	Roadway Segment Treated (Stations)	Buffer Location (Looking Upstation) R=right side road L=left side road	Road Length (ft) Total/Treated	Road Width (ft)	BMP TYPE	BMP ID	Level Spreader Length (ft)	USDA Soil	Soil HSG	Buffer Slope (%)	Buffer Length (ft)	Impervious Area (sq-ft)	Impervious Area Treated (sq-ft)	Treatment Percentage
Macwahoc Stream to Molunkus Stream														
AR-301-302			**490**	**16**								**7,840**		
	0+50 TO 4+50	L	400		BF	1	-	TsC	C/D	4	35		6,400	81.63%
AR-318-319			**1,220**	**16**								**19,520**		
	0+65 TO 2+75	L	210		BF	1	-	PrB	C	6	35		3,360	17.21%
	3+50 TO 4+80	L	130		DF	2	20	PrB	C	6	60		2,080	10.66%
	4+80 TO 8+00	R	320		DF	3	20	HvC	C	4	75		5,120	26.23%
	9+50 TO 11+00	R	150		DF	4	20	HvC	C	4	60		2,400	12.30%
	11+00 TO 12+20	R	120		DM	5	20	HvC/PrB	C	5	100		1,920	9.84%
AR-324-325			**2,585**	**16**								**41,360**		
	3+00 TO 4+25	R	125		DF	1	20	MrB	D	2	100		2,000	4.84%
	4+25 TO 6+25	R	200		DF	2	20	PrC	C	5	60		3,200	7.74%
	6+25 TO 8+25	R	200		DF	3	20	PrC	C	5	60		3,200	7.74%
	10+50 TO 12+30	R	180		DF	4	20	PrC	C	5	60		2,880	6.96%
	12+30 TO 16+50	R	420		BF/BM	5	-	MrB	D	5	50		6,720	16.25%
	18+50 TO 19+60	L	110		DF	6	20	HoB	C	8	60		1,760	4.26%
	19+60 TO 22+00	L	240		BM	7	-	HoB	C	6	50		3,840	9.28%
	23+50 TO 25+85	L	235		BM	8	-	MrB	D	4	50		3,760	9.09%
AR-350-351			**1,190**	**16**								**19,040**		
	0+25 TO 3+40	L	315		BM	1	-	HoB	C	5	50		5,040	26.47%
	5+00 TO 8+50	L	350		BF	2	-	HoB	C	5	35		5,600	29.41%
	8+50 TO 11+90	L	340		BM	3	-	HoB	C	5	50		5,440	28.57%
											Sub-Watershed Total	**87,760**	**64,720**	**73.75%**

BMP Type:

BM=Meadow Buffer Adjacent to Road

BF=Forested Buffer Adjacent to Road

DM=Meadow Ditch Turnout Buffer

DF=Forested Ditch Turnout Buffer

Appendix 12-1: Stormwater Quality Treatment Calculations

Maine GenLead 115kV Transmission Line Construction Access Roads – Oakfield to Chester, Maine

Road ID	Roadway Segment Treated (Stations)	Buffer Location (Looking Upstation) R=right side road L=left side road	Road Length (ft) Total/Treated	Road Width (ft)	BMP TYPE	BMP ID	Level Spreader Length (ft)	USDA Soil	Soil HSG	Buffer Slope (%)	Buffer Length (ft)	Impervious Area (sq-ft)	Impervious Area Treated (sq-ft)	Treatment Percentage
Wytopitlock Stream														
AR-353-354			**1,215**	**16**								**19,440**		
	0+25 TO 7+00	R	675		BF	1	-	PvB	C	5	35		10,800	55.56%
	8+00 TO 9+75	R	175		BF	2	-	PvB	C	5	35		2,800	14.40%
	9+75 TO 12+15	R	240		BM	3	-	PvB	C	5	50		3,840	19.75%
AR-386-387			**5,395**	**16**								**86,320**		
	0+50 TO 7+00	R	650		BF	1	-	PgB	C	14	35		10,400	12.05%
	7+50 TO 9+00	R	150		BM	2	-	PgB	C	14	50		2,400	2.78%
	9+00 TO 10+00	R	100		BF	3	-	PgB	C	8	35		1,600	1.85%
	10+00 TO 14+00	R	400		DF	4	20	PvC	C	6	100		6,400	7.41%
	14+00 TO 17+50	R	350		DF	5	20	PvC	C	8	100		5,600	6.49%
	17+50 TO 19+50	R	200		DF	6	20	MoA	D	6	100		3,200	3.71%
	23+00 TO 24+75	R	175		DF	7	20	MoA	D	6	100		2,800	3.24%
	24+75 TO 26+75	R	200		DF	8	20	PgB	C	10	72		3,200	3.71%
	33+50 TO 48+00	R	1,450		BF	9	-	PgB/PvB	C	15	35		23,200	26.88%
	48+50 TO 51+00 0+00 TO 1+00 (AR-388-389)	L	350		DF	10	20	PvB	C	6	100		5,600	6.49%
	51+00 TO 53+00	L	200		DM	11	20	PvB	C	6	100		3,200	3.71%
AR-388-389			**680**	**16**								**10,880**		
	1+00 TO 3+00	R	200		DF	1	20	PvB	C	5	60		3,200	29.41%
											Sub-Watershed Total	**116,640**	**88,240**	**75.65%**
Finn Brook														
AR-399-400			**1,375**	**16**								**22,000**		
	0+00 TO 3+00	L	300		BM	1	-	HoB	C	4	50		4,800	21.82%
	3+00 TO 5+75	L	275		BF	2	-	HoB	C	4	35		4,400	20.00%
	5+75 TO 8+70	L	295		BM	3	-	HoB	C	4	50		4,720	21.45%
	9+50 TO 10+00	L	50		BM	4	-	HoB	C	4	50		800	3.64%
	10+00 TO 13+50	L	350		BF	5	-	HoB	C	4	35		5,600	25.45%
AR-421-422			**720**	**16**								**11,520**		
	1+00 TO 2+75	L	175		BM	1	-	MoA	D	4	50		2,800	24.31%
	5+50 TO 7+20	L	170		BM	2	-	HvB	C	3	50		2,720	23.61%
											Sub-Watershed Total	**33,520**	**25,840**	**77.09%**

BMP Type:

BM=Meadow Buffer Adjacent to Road

BF=Forested Buffer Adjacent to Road

DM=Meadow Ditch Turnout Buffer

DF=Forested Ditch Turnout Buffer

Appendix 12-1: Stormwater Quality Treatment Calculations

Maine GenLead 115kV Transmission Line Construction Access Roads – Oakfield to Chester, Maine

Road ID	Roadway Segment Treated (Stations)	Buffer Location (Looking Upstation) R=right side road L=left side road	Road Length (ft) Total/Treated	Road Width (ft)	BMP TYPE	BMP ID	Level Spreader Length (ft)	USDA Soil	Soil HSG	Buffer Slope (%)	Buffer Length (ft)	Impervious Area (sq-ft)	Impervious Area Treated (sq-ft)	Treatment Percentage
Smith Brook														
AR-425-426			**695**	**16**								**11,120**		
	0+50 TO 2+00	R	150		BM	1	-	HoB	C	5	50		2,400	21.58%
	2+00 TO 4+25	R	225		BF	2	-	HoB	C	1	35		3,600	32.37%
	5+25 TO 6+95	R	170		BM	3	-	HoB/MoA	C/D	2`	50		2,720	24.46%
											Sub-Watershed Total	**11,120**	**8,720**	**78.42%**
											Mattawamkeag River Watershed Total	***350,560***	***263,280***	***75.10%***
West Branch Mattawamkeag River Watersheds														
Alder Brook														
AR-517-518			**590**	**16**								**9,440**		
	0+00 TO 4+00	L	400		DF	1	20	PgC	C	7	100		6,400	67.80%
	4+00 TO 5+90	L	190		DF	2	20	PgC	C	7	60		3,040	32.20%
											Sub-Watershed Total	**9,440**	**9,440**	**100.00%**
West Branch Mattawamkeag (direct)														
AR-521-522			**620**	**16**								**9,920**		
	0+00 TO 4+00	L	400		BF	1	-	PgC	C	5	35		6,400	64.52%
AR-529-530			**1,525**	**16**								**24,400**		
	1+00 TO 2+00	L	100		DF	1	20	PgC	C	4	60		1,600	6.56%
	2+00 TO 4+00	L	200		BF	2	-	PgC	C	4	35		3,200	13.11%
	4+00 TO 8+00	L	400		DF	3	20	PgC	C	5	100		6,400	26.23%
	9+00 TO 10+75	L	175		DF	4	20	PgC	C	5	60		2,800	11.48%
	12+25 TO 14+50	L	225		DM	5	20	PgC	C	7	100		3,600	14.75%
											Sub-Watershed Total	**34,320**	**24,000**	**69.93%**
											West Branch Mattawamkeag River Watershed Total	***43,760***	***33,440***	***76.42%***
East Branch Mattawamkeag River Watersheds														
East Branch Mattawamkeag (direct)														
AR-550-551			**465**	**16**								**7,440**		
	1+00 TO 2+50	R	150		BF	1	-	PvB	C	3	35		2,400	32.26%
	3+25 TO 4+65	R	140		DF	2	20	PvB	C	3	60		2,240	30.11%
AR-597-598			**1,820**	**16**								**29,120**		
	0+00 TO 3+00	R	300		BM	1	-	PvB/MoA	C/D	5	50		4,800	16.48%
	3+50 TO 5+00	R	150		DM	2	20	PvB	C	8	100		2,400	8.24%
	5+00 TO 14+00	R	900		BF	3	-	PvB	C	4-10	35		14,400	49.45%
	16+50 TO 17+50	L	100		BM	4	-	PvB	C	4	50		1,600	5.49%
											Sub-Watershed Total	**36,560**	**27,840**	**76.15%**

BMP Type:

BM=Meadow Buffer Adjacent to Road

BF=Forested Buffer Adjacent to Road

DM=Meadow Ditch Turnout Buffer

DF=Forested Ditch Turnout Buffer

Appendix 12-1: Stormwater Quality Treatment Calculations

Maine GenLead 115kV Transmission Line Construction Access Roads – Oakfield to Chester, Maine

Road ID	Roadway Segment Treated (Stations)	Buffer Location (Looking Upstation) R=right side road L=left side road	Road Length (ft) Total/Treated	Road Width (ft)	BMP TYPE	BMP ID	Level Spreader Length (ft)	USDA Soil	Soil HSG	Buffer Slope (%)	Buffer Length (ft)	Impervious Area (sq-ft)	Impervious Area Treated (sq-ft)	Treatment Percentage
Skitacook Stream														
AR-620-621			**575**	**16**								**9,200**		
	0+50 TO 3+50	R	300		BF	1	-	ThC/MoA	C/D	4-15	35		4,800	52.17%
	4+00 TO 5+00	R	100		BF	2	-	MoA	D	10	35		1,600	17.39%
	5+00 TO 5+75	R	75		BM	3	-	MoA	D	5	50		1,200	13.04%
AR-648-649			**2,370**	**16**								**37,920**		
	0+50 TO 8+75	R	825		BF	1	-	PvC	C	10	35		13,200	34.81%
	9+25 TO 10+00	R	75		BF	2	-	PvC/MoA	C/D	10	35		1,200	3.16%
	11+25 TO 17+00	R	575		BF	3	-	PvC	C	10	35		9,200	24.26%
	18+75 TO 23.25	R	450		BF	4	-	PvC/MoA	C/D	10	35		7,200	18.99%
											Sub-Watershed Total	**47,120**	**38,400**	**81.49%**
Little Beaver Brook														
AR-656-657			**1,230**	**16**								**19,680**		
	4+50 TO 6+50	L	200		DF	1	20	PvC	C	2	60		3,200	**16.26%**
	6+50 TO 12+00	L	550		BF	2	-	PvC	C	6	35		8,800	**44.72%**
											Sub-Watershed Total	**19,680**	**12,000**	**60.98%**
											East Branch Mattawamkeag River Watershed Total	***83,680***	***66,240***	***79.16%***

BMP Type:

BM=Meadow Buffer Adjacent to Road

BF=Forested Buffer Adjacent to Road

DM=Meadow Ditch Turnout Buffer

DF=Forested Ditch Turnout Buffer

Appendix 12-2

USDA Soil Listing

Road ID	Soil ID	Soil Name	Slope	HSG
Penobscot County Soils				
AR-33-34	SfE	Stetson-Suffield Complex	15-45	B
AR-49-50	BoA	Biddeford Silt Loam	0-3	D
AR-64-65	BuB	Buxton Silt Loam	2-8	D
	TvB	Thorndike Very Stony Silt Loam	8-15	C
AR-120-121	PrC	Plaisted Very Stony Loam	5-15	C
	MrB	Monarda and Burnham Very Stony Silt Loam	0-8	D
	BoA	Biddeford Silt Loam	0-3	D
AR-144-145	PrC	Plaisted Very Stony Loam	5-15	C
	HvB	Howland Very Stony Loam	0-8	C
AR-152-153	PrC	Plaisted Very Stony Loam	5-15	C
	MrB	Monarda and Burnham Very Stony Silt Loam	0-8	D
AR-162-163	MrB	Monarda and Burnham Very Stony Silt Loam	0-8	D
	RaB	Red Hook and Atherton Silt Loam	0-8	C
	CnB	Colton Gravelly Sandy Loam	2-8	B
AR-178-179	MrB	Monarda and Burnham Very Stony Silt Loam	0-8	D
AR-196-197	PrC	Plaisted Very Stony Loam	5-15	C
Aroostook County Soils				
AR-224-225	PrB	Plaisted Very Stony Loam	0-8	C
	MoA	Monarda and Burnham Silt Loam	0-2	D
AR-233-234	MoA	Monarda and Burnham Silt Loam	0-2	D
	HvB	Howland Very Stony Loam	0-8	C
AR-240-241	HvB	Howland Very Stony Loam	0-8	C
	PrC	Plaisted Very Stony Loam	8-15	C
	MoA	Monarda and Burnham Silt Loam	0-2	D
AR-246-247	HoB	Howland Gravelly Loam	2-8	C
	MrB	Monarda and Burnham Very Stony Silt Loam	0-8	D
AR-260-261	ThB	Thorndike Shaly Silt Loam	0-8	C/D
	TsB	Thorndike and Howland Soils	0-8	C/D
AR-291-292	HvB	Howland Very Stony Loam	0-8	C
AR-301-302	TsC	Thorndike and Howland Soils	8-15	C/D
AR-318-319	PrB	Plaisted Very Stony Loam	0-8	C
	HvC	Howland Very Stony Loam	8-15	C
AR-324-325	PrC	Plaisted Very Stony Loam	8-15	C
	MrB	Monarda and Burnham Very Stony Silt Loam	0-8	D
	HoB	Howland Gravelly Loam	2-8	C
AR-350-351	HoB	Howland Gravelly Loam	2-8	C
AR-353-354	PvB	Plaisted and Howland Very Stony Loam	0-8	C
AR-386-387	PvB	Plaisted and Howland Very Stony Loam	0-8	C
	PgB	Plaisted Gravelly Loam	0-8	C
	PgC	Plaisted Gravelly Loam	8-15	C
	PvC	Plaisted and Howland Very Stony Loam	8-15	C
	MoA	Monarda and Burnham Silt Loam	0-2	D

Road ID	Soil ID	Soil Name	Slope	HSG
AR-388-389	PvB	Plaisted and Howland Very Stony Loam	0-8	C
	MoA	Monarda and Burnham Silt Loam	0-2	D
AR-399-400	HoB	Howland Gravelly Loam	2-8	C
AR-421-422	MoA	Monarda and Burnham Silt Loam	0-2	D
	HvB	Howland Very Stony Loam	0-8	C
AR-425-426	HoB	Howland Gravelly Loam	2-8	C
	MoA	Monarda and Burnham Silt Loam	0-2	D
AR-517-518	PgC	Plaisted Gravelly Loam	8-15	C
AR-521-522	PgC	Plaisted Gravelly Loam	8-15	C
AR-529-530	PgC	Plaisted Gravelly Loam	8-15	C
AR-550-551	PvB	Plaisted and Howland Very Stony Loam	0-8	C
AR-597-598	MoA	Monarda and Burnham Silt Loam	0-2	D
	PvB	Plaisted and Howland Very Stony Loam	0-8	C
AR-620-621	ThC	Thorndike Shaly Silt Loam	8-15	C/D
	MoB	Monarda and Burnham Silt Loam	2-8	D
AR-648-649	PvC	Plaisted and Howland Very Stony Loam	8-15	C
	MrB	Monarda and Burnham Very Stony Silt Loam	0-8	D
	MoA	Monarda and Burnham Silt Loam	0-2	D
AR-656-657	PrC	Plaisted Very Stony Loam	8-15	C
	MoA	Monarda and Burnham Silt Loam	0-2	D
	PvC	Plaisted and Howland Very Stony Loam	8-15	C

Appendix 12-3

Culvert Sizing Calculations and Schedule

CULVERT SIZING TABLE

Mannings Equation Q (cfs)= $\frac{kAR^{2/3}S^{1/2}}{n}$ k= **1.486** (US Units) R= **A/P**
n= **0.013** HDPE Pipe S= **slope (ft/ft)**
A= **Pipe Area (full), ft^2**
P= **Wetted Perimeter (full), ft**

Rational Method Q (cfs)= **C*I*A** C= **0.3** (Moderately Sloped Timberland, C/D Soils)
I= **5.8** (Rainfall Intensity, Inches/hr, Millonockett, ME)
A= **Area, acres**

Road ID	Culvert ID	Tributary Area		Calculated Runoff, Rational Method (cfs)	Length (ft)	Diameter (in) (15" Min)	# of Culverts **	Min Slope (ft/ft)	Mannings Culvert Capacity (cfs)
		sq-ft	acres						
AR-49-50									
	C-1	41,153	0.945	1.64	30	15	1	0.01	6.46
	C-2	102,840	2.361	4.11	30	15	1	0.01	6.46
AR-58-59									
	C-3	44,740	1.027	1.79	30	15	1	0.01	6.46
	C-4	24,130	0.554	0.96	30	15	1	0.01	6.46
AR-120-121									
	C-5	15,300	0.351	0.61	30	15	1	0.01	6.46
	C-6	738,600	16.956	29.50	32	24	1	0.02	31.99
AR-152-153									
	C-7	133,026	3.054	5.31	30	15	1	0.01	6.46
	C-8	1,098,250	25.212	43.87	32	24	1	0.04	45.24
AR-162-163									
	C-9	1,025,400	23.540	40.96	32	24	1	0.03	39.18
	C-10	6,257,000	143.641	249.94	36	36	2	0.04	266.79
	C-11	26,100	0.599	1.04	30	15	1	0.01	6.46
AR-196-197									
	C-12	57,275	1.315	2.29	30	15	1	0.01	6.46
	C-13	98,480	2.261	3.93	30	15	1	0.01	6.46
AR-233-234									
	C-14	164,120	3.768	6.56	30	15	1	0.01	6.46
AR-240-241									
	C-15	956,700	21.963	38.22	32	24	1	0.03	39.18
	C-16	84,400	1.938	3.37	30	15	1	0.01	6.46
	C-17	1,277,600	29.330	51.03	34	30	1	0.02	58.01
	C-18	68,925	1.582	2.75	30	15	1	0.01	6.46
AR-246-247									
	C-19	237,300	5.448	9.48	30	18	1	0.01	10.50
	C-20	634,700	14.571	25.35	32	24	1	0.02	31.99
	C-21	339,400	7.792	13.56	30	18	1	0.02	14.86
	C-22	383,100	8.795	15.30	30	18	1	0.03	18.19
AR-260-261									
	C-23	150,150	3.447	6.00	30	15	1	0.01	6.46
	C-24	302,000	6.933	12.06	30	18	1	0.02	14.86
	C-25	116,200	2.668	4.64	30	15	1	0.01	6.46
AR-318-319									
	C-26	421,900	9.685	16.85	30	18	1	0.03	18.19
	C-27	53,750	1.234	2.15	30	15	1	0.01	6.46
AR-324-325									
	C-28	61,700	1.416	2.46	30	15	1	0.01	6.46
	C-29	208,180	4.779	8.32	30	15	1	0.02	9.14
	C-30	593,600	13.627	23.71	32	24	1	0.02	31.99
	C-31	3,471,400	79.692	138.66	36	36	1	0.04	133.40
	C-32	9,412,900	216.090	376.00	40	48	2	0.02	406.28

** Use Manufactured Headwall and Endwall
for Multiple Culvert Installations

Road ID	Culvert ID	Tributary Area		Calculated Runoff, Rational Method (cfs)	Length (ft)	Diameter (in) (15" Min)	# of Culverts **	Min Slope (ft/ft)	Mannings Culvert Capacity (cfs)
		sq-ft	acres						
AR-350-351									
	C-33	48,000	1.102	1.92	30	15	1	0.01	6.46
	C-34	550,000	12.626	21.97	32	24	1	0.01	22.62
AR-353-354									
	C-35	277,600	6.373	11.09	30	18	1	0.02	14.86
	C-36	391,900	8.997	15.65	30	18	1	0.02	14.86
AR-386-387									
	C-38	640,200	14.697	25.57	32	24	1	0.02	31.99
	C-39	234,300	5.379	9.36	30	15	1	0.03	11.19
	C-40	850,700	19.529	33.98	32	24	1	0.02	31.99
	C-41	123,250	2.829	4.92	30	15	1	0.01	6.46
	C-42	55,900	1.283	2.23	30	15	1	0.01	6.46
	C-43	38,000	0.872	1.52	30	15	1	0.01	6.46
	C-44	24,300	0.558	0.97	30	15	1	0.01	6.46
AR-388-389									
	C-45	4,629,000	106.267	184.90	36	36	2	0.02	188.65
AR-399-400									
	C-46	188,400	4.325	7.53	30	15	1	0.02	9.14
	C-47	853,300	19.589	34.08	32	24	1	0.03	39.18
AR-421-422									
	C-48	170,300	3.910	6.80	30	15	1	0.01	6.46
	C-49	857,400	19.683	34.25	32	24	1	0.03	39.18
	C-49-A	161,700	3.712	6.46	30	15	1	0.01	6.46
AR-425-426									
	C-50	220,000	5.051	8.79	30	18	1	0.01	10.50
AR-521-522									
	C-51	10,300	0.236	0.41	30	15	1	0.01	6.46
	C-52	209,000	4.798	8.35	30	18	1	0.01	10.50
AR-529-530									
	C-53	320,000	7.346	12.78	30	18	1	0.02	14.86
	C-54	129,300	2.968	5.16	30	15	1	0.01	6.46
	C-55	128,000	2.938	5.11	30	15	1	0.01	6.46
AR-550-551									
	C-56	35,800	0.822	1.43	30	15	1	0.01	6.46
AR-597-598									
	C-57	263,500	6.049	10.53	30	18	1	0.01	10.50
AR-620-621									
	C-58	6,000	0.138	0.24	30	15	1	0.01	6.46
	C-59	268,500	6.164	10.73	30	18	1	0.01	10.50
AR-648-649									
	C-60	568,000	13.039	22.69	45	24	1	0.01	22.62
	C-61	2,261,800	51.924	90.35	36	36	1	0.02	94.33
	C-62	605,500	13.900	24.19	32	24	1	0.02	31.99
AR-656-657									
	C-63	13,855,400	318.076	553.45	40	48	4	0.01	574.57
	C-64	28,200	0.647	1.13	30	15	1	0.01	6.46

** Use Manufactured Headwall and Endwall
for Multiple Culvert Installations

Appendix 12-4

Watershed/Impervious Area Summary

Road ID	Total Watershed Area (ac)	Road Length (ft)	Road Width (ft)	Impervious Area (sq-ft)	Impervious Area (acres)	Percent of Watershed Area
Penobscot River Watersheds						
Sargent Brook to Medunkeunk Stream						
AR-33-34	460	180	16	2,880	0.07	0.014%
			Sub-Watershed Total	**2,880**	**0.07**	**0.014%**
Ebhorse Stream						
AR-49-50	13,160	435	16	6,960	0.16	0.001%
AR-58-59		605	16	9,680	0.22	0.002%
AR-64-65		680	16	10,880	0.25	0.002%
			Sub-Watershed Total	**27,520**	**0.63**	**0.005%**
Meadow Brook						
AR-120-121	5,565	2,530	16	40,480	0.93	0.017%
AR-144-145		855	16	13,680	0.31	0.006%
			Sub-Watershed Total	**54,160**	**1.24**	**0.022%**
Eagle Stream						
AR-152-153	3,100	1,150	16	18,400	0.42	0.014%
AR-162-163		1,940	16	31,040	0.71	0.023%
AR-178-179		460	16	7,360	0.17	0.005%
			Sub-Watershed Total	**56,800**	**1.30**	**0.042%**
Penobscot River (Direct)						
AR-196-197	3,755	490	16	7,840	0.18	0.005%
			Sub-Watershed Total	**7,840**	**0.18**	**0.005%**
Bog Brook to Mattaseunk Stream						
AR-224-225	2,677	615	16	9,840	0.23	0.008%
			Sub-Watershed Total	**9,840**	**0.23**	**0.008%**
			Penobscot River Watershed Total	***159,040***	***3.65***	***n/a***
Baxter Brook to Molunkus Lake Watershed						
AR-260-261	1,410	1,120	16	17,920	0.41	0.029%
			Molunkus Lake Watershed Total	***17,920***	***0.41***	***n/a***
Mattawamkeag River Watersheds						
Molunkus Stream						
AR-233-234	29,225	345	16	5,520	0.13	0.000%
AR-240-241		3,970	16	63,520	1.46	0.005%
AR-246-247		1,900	16	30,400	0.70	0.002%
AR-291-292		130	16	2,080	0.05	0.000%
			Sub-Watershed Total	**101,520**	**2.33**	**0.008%**
Macwahoc Stream to Molunkus Stream						
AR-301-302	17,521	490	16	7,840	0.18	0.001%
AR-318-319		1,220	16	19,520	0.45	0.003%
AR-324-325		2,585	16	41,360	0.95	0.005%
AR-350-351		1,190	16	19,040	0.44	0.002%
			Sub-Watershed Total	**87,760**	**2.01**	**0.011%**

Road ID	Total Watershed Area (ac)	Road Length (ft)	Road Width (ft)	Impervious Area (sq-ft)	Impervious Area (acres)	Percent of Watershed Area
Wytopitlock Stream						
AR-353-354	15,391	1,215	16	19,440	0.45	0.003%
AR-386-387		5,395	16	86,320	1.98	0.013%
AR-388-389		680	16	10,880	0.25	0.002%
			Sub-Watershed Total	**116,640**	**2.68**	**0.017%**
Finn Brook						
AR-399-400	7,265	1,375	16	22,000	0.51	0.007%
AR-421-422		720	16	11,520	0.26	0.004%
			Sub-Watershed Total	**33,520**	**0.77**	**0.011%**
Smith Brook						
AR-425-426	8,741	695	16	11,120	0.26	0.003%
			Sub-Watershed Total	**11,120**	**0.26**	**0.003%**
			Mattawamkeag River Watershed Total	***350,560***	***8.05***	***n/a***
West Branch Mattawamkeag River Watersheds						
Alder Brook						
AR-517-518	10,720	590	16	9,440	0.22	0.002%
			Sub-Watershed Total	**9,440**	**0.22**	**0.002%**
West Branch Mattawamkeag (direct)						
AR-521-522	10,027	620	16	9,920	0.23	0.002%
AR-529-530		1,525	16	24,400	0.56	0.006%
			Sub-Watershed Total	**34,320**	0.79	**0.008%**
			West Branch Mattawamkeag River Watershed Total	***43,760***	***1.00***	***n/a***
East Branch Mattawamkeag River Watersheds						
East Branch Mattawamkeag (direct)						
AR-550-551	13,050	465	16	7,440	0.17	0.001%
AR-597-598		1,820	16	29,120	0.67	0.005%
			Sub-Watershed Total	**36,560**	**0.84**	**0.006%**
Skitacook Stream						
AR-620-621	5,772	575	16	9,200	0.21	0.004%
AR-648-649		2,370	16	37,920	0.87	0.015%
			Sub-Watershed Total	**47,120**	**1.08**	**0.019%**
Little Beaver Brook						
AR-656-657	2,992	1,230	16	19,680	0.45	0.015%
			Sub-Watershed Total	**19,680**	**0.45**	**0.015%**
			East Branch Mattawamkeag River Watershed Total	***103,360***	***2.37***	***n/a***
			Project Total	***674,640***	***15.49***	***n/a***

Appendix 12-5

Stormwater Maintenance Plans, Inspection Log &

Maintenance Contract

Stormwater Facilities Inspection and Maintenance Plan
115kV Transmission Line Access Roads
Oakfield, Maine to Chester, Maine

Owner:
Maine GenLead, LLC
c/o First Wind
79 Lincoln Street, Suite 500
Boston, MA 02111

The stormwater management facilities proposed for this project comply with Maine DEP's Chapter 500 Stormwater Management Regulations by providing measures to treat stormwater runoff from impervious surface associated with construction access roads.

Inspection and maintenance of the stormwater management devices is necessary to prevent erosion of disturbed areas, mitigate erosion of roadways, and remove pollutants from stormwater runoff. Stormwater management structures implemented at this project that require routine inspection are described in the following outline.

A. List of Stormwater Management Measures to be inspected and maintained.

a. Roadside ditches and ditch turnouts
b. Drainage swales
c. Culverts with rip rap inlet and outlet protection
d. No disturbance vegetated buffers
e. Stabilized fill or embankment slopes

B. Inspection and Maintenance Tasks – Tasks specific to each measure listed above.

a. Gravel roads
    i. Visually inspect all impervious surfaces for areas of channelized flow that may cause rilling or transport of sediment laden stormwater to surrounding areas.
    ii. Repair areas of channelized flow on road and site surfaces with compacted gravel road base material.
    iii. Stabilize adjacent side slopes with rip rap where channelized flow has discharged from road or site surface areas.
b. Roadside ditches and ditch turn outs
    i. Visually inspect all roadside drainage ditches and ditch turn outs for significant erosion, accumulated debris, or damage that impairs proper function.
    ii. Remove accumulated debris and sediment to restore proper function
c. Culverts with rip rap inlet and outlet protection

i. Visually inspect all culverts for accumulated debris at inlets/outlets and sedimentation within the culvert pipe.
ii. Clear inlets and outlets of culverts to restore proper ability to convey stormwater.
iii. Verify rip rap protection at inlet and outlet is dissipating stormwater energy. Replace, add, or relocate rip rap as necessary.

d. Ditch turnout level spreaders
    i. Visually inspect all level spreaders where concentrated stormwater flows are dispersed to surrounding vegetated buffers as sheet flow.
    ii. Remove sediment from sump when it accumulates to be more than 50% of the level spreader volume.
    iii. Spread or place sediment at an area of the site where it will not erode into surrounding areas.
    iv. Remove any debris or vegetation that may inhibit level spreader from effectively conveying stormwater in sheet flow to adjacent vegetated buffer area.
e. No disturbance vegetated buffers
    i. Visually inspect all vegetated buffers down gradient from ditch turnouts, level spreaders, or areas where stormwater is conveyed as sheet flow from impervious areas.
    ii. Identify any areas of concentrated flow where sedimentation has occurred and repair the associated up gradient structure.
    iii. Do not trim, cut or remove debris from vegetated areas unless to restore the function of the vegetated buffer.
f. Stabilized fill or embankment slopes
    i. Visually inspect slopes for rilling or channelization of stormwater flows entering from the top of cut slopes or exiting from the bottom of fill slopes.
    ii. Inspect slopes for structural integrity to insure erosive stormwater flows are not compromising slope stability.
    iii. Place rip rap, repair or replant vegetated areas, or install additional measures at areas of concentrated stormwater flow to maintain slope stability.

C. Inspection and Maintenance Task Frequency

a. Initial site stabilization period
    i. Perform all inspection and maintenance tasks bi-weekly and after significant rainfall events, until all disturbed areas have achieved an adequate coverage of vegetation.
    ii. Immediately repair and stabilize all areas where erosion is occurring and sediment laden stormwater is being discharged to undisturbed areas.
b. General Maintenance
    i. Perform all inspection and maintenance tasks monthly from March through November of each year

ii. A visual inspection of all tasks is adequate provided immediate emergency measures are not required.
iii. Note structures or other culverts on attached inspection form that will require attention during annual maintenance activities.

c. Annual Maintenance
   i. Perform once during the spring and fall of each year, depending on seasonal snow cover and snowmelt conditions respectively.
   ii. Remove accumulated debris from all roadside ditches, culverts, ditch turn outs, and level spreaders.
   iii. Review all monthly general maintenance inspection forms, identify and repair any minor erosion issues noted.

d. Emergency Maintenance
   i. To be performed immediately as observed during initial site stabilization period or during a routine monthly general maintenance inspection.
   ii. The following events or failures of stormwater management facilities shall be repaired and restored immediately: slope failures, road washouts, clogging of culverts with debris, discharge of sediment laden stormwater to wetlands, streams, an abutting property, or an identified significant wildlife area. Any other failure of a stormwater management structure that significantly inhibits the intended function.

D. Responsible Parties

a. Evergreen Wind Power II, LLC is the owner and responsible for the maintenance of the stormwater management facilities associated with this project. They will have the power to contract with a third party to implement this inspection and maintenance plan.

Maine GenLead, LLC
c/o First Wind
79 Lincoln Street, Suite 500
Boston, MA 02111

b. SGC Engineering, LLC is responsible for the design of the erosion control measures and stormwater management measures proposed for this project.

SGC Engineering, LLC
501 County Road
Westbrook, Maine 04092
Phone: (207) 347-8100

115kV Transmission Line Access Roads
AROOSTOOK/PENOBSCOT COUNTIES, OAKFIELD, MAINE TO CHESTER, MAINE

STORMWATER FACILITIES INSPECTION & MAINTENANCE LOG

Refer to Stormwater Maintenance Plan for required maintenance and inspection activities; frequency of inspections for general maintenance, annual maintenance, and emergency maintenance; and responsibility for implementing the Stormwater Maintenance Plan.

In general, all stormwater facilities shall be inspected visually on a monthly basis. Annual maintenance of accumulated debris and sediment in all stormwater facilities should occur in the spring and fall of each year. Emergency maintenance of a significant failure of a stormwater facility shall be implemented immediately.

DATE	FACILITY	ACTION	INSPECTOR	COMMENT

Stormwater Facilities Maintenance Contract
Maine GenLead 115kV Transmission Line

This Contract is between:

_____

Representative of Maine GenLead, LLC Date

and,

_____

Contractor Date

and is for the purpose of completing work defined on the Scope of Work (attached) associated with inspecting and maintaining the stormwater facilities within the limits of the Oakfield wind power project to the specifications and conditions established by the approved plans and permits referenced by the scope of work.

This work shall be performed for the period of time and for the compensation noted below:

Effective contract time period: _____ to _____

Agreed to compensation: _____ (words)

$_____ (figures)

Appendix 12-6

Housekeeping Plan

Stormwater & Erosion Control Construction Phase Housekeeping Plan
115kV Transmission Line Access Roads
Oakfield, Maine to Chester, Maine

Owner:
Maine GenLead, LLC
c/o First Wind
79 Lincoln Street, Suite 500
Boston, MA 02111

During construction phase of the proposed 115kV Transmission Line Access Roads project, the site contractor will be responsible for:

Spill prevention:
Controls must be used to prevent pollutants from being discharged from materials on site. Storage of hazardous materials should be isolated from areas of stormwater runoff to prevent any discharge of pollutants from the materials. Silt fencing shall be placed around the storage area of any material that can be a hazard to the environment. Any spill of hazardous liquid will be dealt with as first priority, and will conform to the rules set forth in the "Maine hazardous waste management rules" for disposing of spilled material and the material used to clean the site.

Groundwater protection:
During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in area of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography, and other relevant factors accumulates runoff that infiltrated into the soil. The use of soil filters and grease traps installed in catch basins will be effective means of secondary containment to prevent discharge of these hazardous materials into the groundwater.

Fugitive sediment and dust:
Operations during wet months that experience tracking of mud off the site onto public roads should provide for sweeping of road areas at least once a seek and prior to significant storm events. Where chronic mud tracing occurs, a stabilized construction entrance should be provided. Operations during dry months, that experience fugitive dust problems, should wet down the access roads once a week or more frequently as needed.

Debris and other materials:
Litter and other construction debris should be excluded from drainage areas and shall be cleaned out prior to major storm events to prevent any significant damage to the system or to groundwater conditions. Construction and post construction activities should comply with applicable rules and provisions related to solid, universal, and hazardous waste including the

Maine solid waste and hazardous waste management rules; Maine hazardous waste management rules; Maine oil conveyance and storage rules; and Maine pesticide requirements.

Trench or foundation de-watering:
Trench de-watering is the removal of water from trenches, foundations, coffer dams, and other areas within the construction area the retain water after excavation. In most cases, the collected water is heavily silted and hinders correct and safe construction practices. The collected water must be removed from the ponded areas, through either gravity or pumping, and must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Allowing water to flow over disturbed areas of the site must be avoided to reduce sediment runoff from these vulnerable areas.

Appendix 12-7

Forested Buffer Declaration of Restrictions

DECLARATION OF RESTRICTIONS
(Forested Buffer, Limited Disturbance)

THIS DECLARATION OF RESTRICTIONS is made this ____day of _____, 2009, by **Maine GenLead, LLC**, a Delaware limited liability company having a mailing address at c/o First Wind Energy, LLC, 79 Lincoln St, Suite 500, Boston, MA 02111 (herein referred to as the "Declarant"), pursuant to a permit received from the Maine Department of Environmental Protection under the Stormwater Management Law, to preserve a buffer area on a parcel of land near

_____,_____ .
(road name) (known feature and/or town)

WHEREAS, the Declarant is the developer of a certain 115kV Transmission Line Access Road project being constructed on lands located in _____, ***(Aroostook or Penobscot)*** County, Maine) (the "Project") in accordance with Site Location Order # _____ (the "Order");

WHEREAS, the Declarant is the tenant under that certain Land Lease Agreement dated _____, a memorandum of which being recorded at the ***(Aroostook or Penobscot)*** County Registry of Deeds in Book _____, Page _____ (the "Lease"), pursuant to which Lease the Declarant controls certain real property situated in _____, Maine described in a deed from_____ to _____dated _____, 20____, and recorded in Book ____ Page ____ at the ***(Aroostook or Penobscot)*** County Registry of Deeds, herein referred to as the "property"; and

WHEREAS, pursuant to Condition ___ of the Order, Declarant desires to place certain restrictions, under the terms and conditions herein, over a portion of said real property (hereinafter referred to as the "Restricted Buffer") described as follows: (Note: Insert description of restricted buffer area location here)

WHEREAS, pursuant to the Stormwater Management Law, 38 M.R.S.A. Section 420-D and Chapter 500 of rules promulgated by the Maine Board of Environmental Protection ("Stormwater Management Rules"), Declarant has agreed to impose certain restrictions on the Restricted Buffer Area as more particularly set forth herein and has agreed that these restrictions may be enforced by the Maine Department of Environmental Protection or any successor (hereinafter the "MDEP"),

NOW, THEREFORE, the Declarant hereby declares that the Restricted Buffer Area is and shall be held, transferred, sold, conveyed, occupied and maintained subject to the conditions and restrictions set forth herein during the term hereof. The Restrictions shall run with the Restricted Buffer Area and shall be binding on all parties having any right, title or interest in and to the Restricted Buffer Area, or any portion thereof, and their heirs, personal representatives, successors, and assigns. Any present or future owner or occupant of the Restricted Buffer Area or any portion thereof, by the acceptance of a deed of conveyance of all or part of the Covenant Area or an instrument conveying any interest therein, whether or not the deed or instrument shall so express, shall be deemed to have accepted the Restricted Buffer Area subject to the Restrictions and shall agree to be bound by, to comply with and to be subject to each and every one of the Restrictions hereinafter set forth.

1. Restrictions on Restricted Buffer Area. Unless the owner or occupant of the Restricted Buffer Area, or any successors or assigns, obtains the prior written approval of the MDEP, the

Restricted Buffer Area must remain undeveloped for the term of this Declaration. To maintain the ability of the Restricted Buffer Area to filter and absorb stormwater, and to maintain compliance with the Stormwater Management Law and the permit issued thereunder to the Declarant, the use of the Restricted Buffer Area is hereinafter limited as follows.

a. No soil, loam, peat, sand, gravel, concrete, rock or other mineral substance, refuse, trash, vehicle bodies or parts, rubbish, debris, junk waste, pollutants or other fill material may be placed, stored or dumped on the Restricted Buffer Area, nor may the topography of the area be altered or manipulated in any way;

b. Any removal of trees or other vegetation within the Restricted Buffer Area must be limited to the following definition of general forest use:

   (i) The land must be maintained in essentially forest cover with undisturbed soil, duff layer and ground cover vegetation, and understory vegetation. Timber may be harvested on a selective basis provided that no more than 40% of the volume is harvested within any 10 year period.

c. No building or other temporary or permanent structure may be constructed, placed or permitted to remain on the Restricted Buffer Area, except for a sign, utility pole or fence;

d. No trucks, cars, dirt bikes, ATVs, bulldozers, backhoes, or other motorized vehicles or mechanical equipment may be permitted on the Restricted Buffer Area;

e. Any level lip spreader directing flow to the Restricted Buffer Area must be regularly inspected and adequately maintained to preserve the function of the level spreader.

Any activity on or use of the Restricted Buffer Area during the term of this Declaration that is inconsistent with the purpose of these Restrictions is prohibited. Any future alterations or changes in use of the Restricted Buffer Area during the term of this Declaration must receive prior approval in writing from the MDEP. The MDEP may approve such alterations and changes in use if such alterations and uses do not impede the stormwater control and treatment capability of the Restricted Buffer Area or if adequate and appropriate alternative means of stormwater control and treatment are provided.

2. Enforcement. The MDEP may enforce any of the Restrictions set forth in Section 1 above.

3. Term; Binding Effect. The term of this Declaration shall expire upon the decommissioning of the Project as described in the Order. The restrictions set forth herein shall be binding on any present or future owner or occupant of the Restricted Buffer Area during the term hereof. If the Restricted Buffer Area is at any time owned or leased by more than one owner/occupant, each owner/occupant shall be bound by the foregoing restrictions to the extent that any of the Restricted Buffer Area is included within such owner/occupant's property.

4. Amendment. Any provision contained in this Declaration may be amended or revoked only by the recording of a written instrument or instruments specifying the amendment or the revocation signed by the owner or owners of the Restricted Buffer Area and by the MDEP.

5. Effective Provisions of Declaration. Each provision of this Declaration, and any agreement, promise, covenant and undertaking to comply with each provision of this Declaration, shall

be deemed a land use restriction running with the land as a burden and upon the title to the Restricted Buffer Area.

6. Severability. Invalidity or unenforceability of any provision of this Declaration in whole or in part shall not affect the validity or enforceability of any other provision or any valid and enforceable part of a provision of this Declaration.

7. Governing Law. This Declaration shall be governed by and interpreted in accordance with the laws of the State of Maine.

Maine GenLead, LLC
By:_____
(NAME)

STATE OF MAINE_____ County, _____, 20__.
(County) (date)

Personally appeared before me the above named _____, _____ of Maine GenLead, LLC, who swore to the truth of the foregoing to the best of (his/her) knowledge, information and belief and acknowledged the foregoing instrument to be (his/her) free act and deed and the free act and deed of said company.

_____
Notary Public

_____