



# Pipeline Tailings Release and Upland Basin Sediment Release Evaluation and Restoration Report

Prepared for  
ArcelorMittal Minorca Mine

September 19, 2014

Table 6  
Upland Basin Shrub and Tree Restoration Detail  
ArcelorMittal Minorca Mine

Sedimentation Area	Location	Species	Wetland Restoration Area (ac)	Cuttings Installed (#)	Shrub Seed Collection Area (ac)	Tree Seedlings Installed
South Lobe	West	Hazelnut	0.77		0.2	NA
South Lobe	Entire	Speckled alder	2.44		0.6	NA
South Lobe	West	Serviceberry		40		NA
South Lobe	East	Willow		760		NA
South Lobe	East	White Cedar				500
South Lobe	East	Balsam fir				170
South Lobe	East	Paper Birch				80
South Lobe	East	Black Spruce				80
South Lobe	West	White Cedar				180
South Lobe	West	Balsam fir				70
South Lobe	West	Red Maple				70
South Lobe	West	Paper Birch				40
<b>Subtotal</b>			<b>3.21</b>	<b>800</b>	<b>0.8</b>	<b>1,200</b>
North Lobe	Entire	Hazelnut	0.05		0.02	
North Lobe	Entire	Speckled alder	0.05		0.02	
North Lobe	Entire	Balsam fir				30
North Lobe	Entire	Quaking Aspen				20
<b>Subtotal</b>			<b>0.10</b>	<b>0</b>	<b>0.04</b>	<b>50</b>

Table 5  
Wetland Shrub and Tree Restoration  
ArcelorMittal Minorca Mine

Release Event	Release Area	Wetland ID	Wetland Restoration Area (ac)	Shrub Density in Wetland Restoration Areas (#/ac)	Restoration Cuttings <sup>1</sup> (#)	Shrub Cutting Species <sup>2</sup>	Shrub Seeding <sup>3</sup>	Tree Density in Wetland Restoration Areas (#/ac)	Restoration Tree Plantings (#)	Tree Planting Species <sup>4</sup>
May 2013	1	A	0	NA	NA	NA	NA	NA	NA	NA
May 2013	2	A	0	NA	NA	NA	NA	NA	NA	NA
May 2013	3	A	0	NA	NA	NA	NA	NA	NA	NA
May 2013	4	A	0	NA	NA	NA	NA	NA	NA	NA
May 2013	5	A	0	NA	NA	NA	NA	NA	NA	NA
May 2013	6	A	0	NA	NA	NA	NA	NA	NA	NA
May 2013		A-Ditch	0.87	NA	NA	NA	NA	NA	NA	NA
May 2013		B	0	NA	NA	NA	NA	NA	NA	NA
Subtotal			0.87	NA	0			NA	0	
July 2013		1	0.64	80	50	W	NA	NA	NA	NA
July 2013		2-Ditch	0	NA	NA	NA	NA	NA	NA	NA
Subtotal			0.64	NA	50			NA	0	
April 2014	North		0.05	0	0	NA	SA, H	250	50	BF, QA
April 2014	South		2.44	320	800	S, W	SA, H	475	1,200	BF, BS, PB, RM, WC
Subtotal			2.49	NA	800			NA	1,250	
<b>Total</b>			<b>4.00</b>	<b>NA</b>	<b>850</b>			<b>NA</b>	<b>1,250</b>	

<sup>1</sup>Cuttings will be collected from serviceberry and willow species from wetlands on ArcelorMittal property and installed in restoration areas

<sup>2</sup>Shrub species to be planted by cuttings: S - serviceberry (*Amelanchier* sp.), W - willow (*Salix* sp.), NA - not applicable

<sup>3</sup>Seed will be collected from existing wetlands on ArcelorMittal property and spread in restoration areas of an equivalent area  
Species: SA - speckled alder (*Alnus incana*), H - hazelnut (*Corylus* sp.), NA - not applicable

<sup>4</sup>Tree species to be planted by seedling: BF - balsam fir (*Abies balsamea*), BS - black spruce (*Picea mariana*), PB - paper birch (*Betula papyrifera*), QA - quaking aspen (*Populus tremuloides*), RM - red maple (*Acer rubrum*), WC - white cedar (*Thuja occidentalis*), NA - not applicable

Table 4  
Field-Verified Wetland Release and Restoration Areas  
ArcelorMittal Minorca Mine

Release Event	Release Area	Wetland ID	Watershed/ Bank Service Area	Total Release Area (ac)	Wetland Release Area <sup>1</sup> (ac)	Wetland Restoration Area (ac)	Wetland Area to be Mitigated (ac)	Recovering Wetland Release Area <sup>2</sup> (ac)
May 2013	1	A	Rainy River/2	0.095	0.09	0	0	0.09
May 2013	2	A	Rainy River/2	0.31	0.28	0	0	0.28
May 2013	3	A	Rainy River/2	0.2	0.184	0	0	0.184
May 2013	4	A	Rainy River/2	0.5	0.49	0	0	0.49
May 2013	5	A	Rainy River/2	0.016	0.013	0	0	0.013
May 2013	6	A	Rainy River/2	0.0025	0.0002	0	0	0.0002
May 2013		A-Ditch	Rainy River/2	0.89	0.87	0.87	0	0
May 2013		B	Rainy River/2	0.74	0.71	0	0	0.71
Subtotal				2.75	2.64	0.87	0	1.77
July 2013		1	St. Louis River/1	1.65	0.88	0.64	0	0.24
July 2013		2-Ditch	Rainy River/2	0.83	0	0	0	0
Subtotal				2.48	0.88	0.64	0	0.24
April 2014	North		Rainy River/2	2.31	2.17	0.05	0	2.12
April 2014	South		Rainy River/2	9.47	9.47	2.44	2.82	4.21
Subtotal				11.78	11.64	2.49	2.82	6.33
<b>Total</b>				<b>17.01</b>	<b>15.16</b>	<b>4.00</b>	<b>2.82</b>	<b>8.34</b>

<sup>1</sup>Extent of measureable tailings within delineated wetland

<sup>2</sup>Natural recovery progressing to maintain wetland functions

Table 3  
Wetland Evaluation Data Point Inventory  
April 2014 Upland Tailings Basin  
ArcelorMittal Minorca Mine

Incident	Habitat ID	Plot ID	Area	Photo ID	Initial Tailings Thickness (in)	2014 Tailings Thickness (in)	Herbaceous					Shrub					Tree					Total Invasive and Non-Native Cover (%)	Tailings Cover <sup>3</sup>	Soil Surface Characteristics <sup>4</sup>	Soil Stability <sup>5</sup>	Penetrom. Reading (TPF) <sup>6</sup>	Water Depth (in)		
							Species	Species Cover (%)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)							Nativity <sup>1</sup>	Health <sup>2</sup>
Upl Basin - South	South Lobe	US-2-4	S	4461-65	<1	0.25	<i>Typha latifolia</i>	15	86	N	Unaffected	<i>Alnus incana</i>	50	60	64	N	Unaffected	<i>Fraxinus nigra</i>	2	11	2	N	Unaffected	15	Sporadic	Rough	Soft	< 0.25	0
							<i>Typha angustifolia</i>	15		I																			
							<i>Calamagrostis canadensis</i>	15		N																			
							<i>Athyrium filix-femina</i>	10		N																			
							<i>Impatiens capensis</i>	5		N																			
							<i>Caltha palustris</i>	5		N																			
							<i>Equisetum sylvaticum</i>	5		N																			
							<i>Rubus pubescens</i>	5		N																			
							<i>Galium asprellum</i>	5		N																			
							<i>Eupatorium maculatum</i>	2		N																			
							<i>Iris versicolor</i>	2		N																			
							<i>Carex hystericina</i>	2		N																			
							Upl Basin - South	South Lobe		US-3-1		S	4446-50			<1		0.5-2	<i>Rubus pubescens</i>										
<i>Fraxinus nigra</i>	10	N																											
<i>Caltha palustris</i>	10	N																											
<i>Petasites palmatus</i>	10	N																											
<i>Equisetum arvense</i>	5	N																											
<i>Galium asprellum</i>	5	N																											
<i>Thalictrum dasycarpum</i>	2	N																											
<i>Athyrium filix-femina</i>	2	N																											
<i>Carex gracillima</i>	2	N																											
<i>Carex lacustris</i>	5	N																											
<i>Alnus incana</i>	5	N																											
<i>Viburnum trilobum</i>	5	N																											
<i>Acer rubrum</i>	1	N																											
Upl Basin - South	South Lobe	US-3-2	S	4451-55	4	8-12	<i>Alnus incana</i>	50	18	N	Good	<i>Alnus incana</i>	50	142	62	N	Unaffected	<i>Fraxinus nigra</i>	10	4	12	N	Unaffected	0	Uniform	Rough	Firm	< 0.25	2-4
							<i>Fraxinus nigra</i>	5		N																			
							<i>Viburnum trilobum</i>	5		N																			
							<i>Acer rubrum</i>	2		N																			
							<i>Lycopus americanus</i>	2		N																			
							<i>Calamagrostis canadensis</i>	2		N																			
							<i>Carex lacustris</i>	2		N																			
Upl Basin - South	South Lobe	US-3-3	S	4456-60	2	2-10	<i>Carex lacustris</i>	25	70	N	Unaffected	<i>Corylus cornuta</i>	5	53	12	N	Unaffected	<i>Fraxinus nigra</i>	30	29	31	N	Unaffected	0	Uniform	Rough	Firm	< 0.25	2
							<i>Equisetum sylvaticum</i>	10		N																			
							<i>Caltha palustris</i>	10		N																			
							<i>Athyrium filix-femina</i>	10		N																			
							<i>Calamagrostis canadensis</i>	5		N																			
							<i>Galium asprellum</i>	2		N																			
							<i>Onoclea sensibilis</i>	2		N																			
							<i>Actea rubra</i>	2		N																			
							<i>Rubus idaeus</i>	2		N																			
							<i>Eupatorium maculatum</i>	2		N																			
							<i>Alnus incana</i>	20		N																			
							<i>Acer rubrum</i>	10		N																			
							<i>Fraxinus nigra</i>	30		N																			
<i>Abies balsamea</i>	10	N																											
Upl Basin - South	South Lobe	US-4-1	S	4436-40	<1	2-6	<i>Onoclea sensibilis</i>	25	75	N	Good	<i>Alnus incana</i>	20	60	30	N	Unaffected	<i>Fraxinus nigra</i>	30	13	40	N	Unaffected	0	Sporadic	Rough	Firm	< 0.25	4
							<i>Impatiens capensis</i>	15		N																			
							<i>Caltha palustris</i>	15		N																			
							<i>Rubus idaeus</i>	5		N																			
							<i>Calamagrostis canadensis</i>	5		N																			
							<i>Athyrium filix-femina</i>	5		N																			
							<i>Galium asprellum</i>	5		N																			

<sup>1</sup>Nativity  
I - Introduced (non-native)  
N - Native

<sup>2</sup>Vegetation Health  
Fair - Dead plants, diminished vegetative cover  
Good - Some stress noted in color or vigor  
Unaffected - vegetation healthy and similar to unaffected areas of wetland

<sup>3</sup>Tailings Cover  
Uniform - contiguous layer of tailings covering soil surface  
Sporadic - tailings only filling hollows or depressions, not contiguous

<sup>4</sup>Surface Roughness  
Smooth - undulations < 3 inches  
Rough - undulations >3 inches

<sup>5</sup>Soil Stability  
Firm - predominantly mineral soil  
Soft - predominantly organic soil or waterlogged mineral soil

<sup>6</sup>TPF - tons per foot

Table 3  
Wetland Evaluation Data Point Inventory  
April 2014 Upland Tailings Basin  
ArcelorMittal Minorca Mine

Incident	Habitat ID	Plot ID	Area	Photo ID	Initial Tailings Thickness (in)	2014 Tailings Thickness (in)	Herbaceous					Shrub					Tree					Total Invasive and Non-Native Cover (%)	Tailings Cover <sup>3</sup>	Soil Surface Characteristics <sup>4</sup>	Soil Stability <sup>5</sup>	Penetrom. Reading (TPF) <sup>6</sup>	Water Depth (in)		
							Species	Species Cover (%)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)							Nativity <sup>1</sup>	Health <sup>2</sup>
Upl Basin - North	North Lobe	UN-1-1	N	4416-20	<1	0.1	<i>Rubus pubescens</i>	20	79	N	Unaffected	<i>Alnus incana</i>	20	92	40	N	Unaffected	<i>Fraxinus nigra</i>	2	8	4	N	Unaffected	0	Sporadic	Rough	Firm	NA	None
							<i>Cornus canadensis</i>	10		<i>Abies balsamea</i>		10	<i>Abies balsamea</i>			2													
							<i>Aralia nudicaulis</i>	10																					
							<i>Ribes hirtellum</i>	10																					
							<i>Carex gracillima</i>	5																					
							<i>Athyrium filix-femina</i>	5																					
							<i>Rubus idaeus</i>	5																					
							<i>Petasites palmatus</i>	5																					
							<i>Onoclea sensibilis</i>	5																					
							<i>Caltha palustris</i>	2																					
							<i>Galium asprellum</i>	2																					
Upl Basin - North	North Lobe	UN-1-2	N	4421-25	1	0.5	<i>Impatiens capensis</i>	20	86	N	Unaffected	<i>Alnus incana</i>	50	128	63	N	Unaffected	<i>Abies balsamea</i>	5	3	5	N	Unaffected	0	Sporadic	Rough	Soft	< 0.25	2
							<i>Rubus pubescens</i>	15		<i>Salix bebbiana</i>		10																	
							<i>Rubus idaeus</i>	10		<i>Fraxinus nigra</i>		2																	
							<i>Ribes hirtellum</i>	10		<i>Betula allegheniensis</i>		1																	
							<i>Athyrium filix-femina</i>	10																					
							<i>Equisetum arvense</i>	10																					
							<i>Cornus canadensis</i>	5																					
							<i>Galium asprellum</i>	5																					
							<i>Actaea rubra</i>	1																					
							<i>Fraxinus nigra</i>	5																					
							<i>Osmunda claytonia</i>	2																					
Upl Basin - North	North Lobe	UN-1-3	N	4426-30	6	15	<i>Cirsium arvense</i>	1	10	I	Fair	<i>Corylus cornuta</i>	30	160	65	N	Unaffected	<i>Abies balsamea</i>	25	8	35	N	Unaffected	0	Uniform	Rough	Firm	NA	None
							<i>Aralia nudicaulis</i>	1		<i>Alnus incana</i>		20	<i>Populus tremuloides</i>			10													
							<i>Diervilla lonicera</i>	1		<i>Fraxinus nigra</i>		10																	
										<i>Populus tremuloides</i>		5																	
Upl Basin - North	North Lobe	UN-1-4	N	4431-35	12	16	<i>Scirpus pedicellaris</i>	1	1	N	Fair		0	0	0	NA		0	0	NA	0	Uniform	Smooth	Firm	< 0.5	None			
Upl Basin - South	South Lobe	US-1-1	S	4480-84	2	2-8	<i>Typha angustifolia</i>	25	49	I	Fair	<i>Alnus incana</i>	30	105	52	N	Good			0	0		NA	25	Sporadic	Rough	Soft	< 0.25	0
							<i>Calamagrostis canadensis</i>	10		<i>Fraxinus nigra</i>		10																	
							<i>Rubus pubescens</i>	5		<i>Abies balsamea</i>		5																	
							<i>Ribes hirtellum</i>	5		<i>Salix discolor</i>		5																	
							<i>Onoclea sensibilis</i>	2		<i>Betula papyrifera</i>		2																	
							<i>Lycopus americanus</i>	2																					
Upl Basin - South	South Lobe	US-1-2	S	4485-89	8	4-8	<i>Typha angustifolia</i>	65	72	I	Good	<i>Salix discolor</i>	2	4	4	N	Good	<i>Fraxinus nigra</i>	15	9	27	N	Good	70	Uniform	Rough	Firm	< 0.25	4
							<i>Phalaris arundinacea</i>	5		<i>Abies balsamea</i>		2	<i>Thuja occidentalis</i>			10													
							<i>Mentha arvensis</i>	1					<i>Abies balsamea</i>			2													
							<i>Rubus pubescens</i>	1																					
Upl Basin - South	South Lobe	US-1-3	S	4490-94	18	12-18	<i>Typha latifolia</i>	10	22	N	Fair	<i>Salix petiolaris</i>	15	31	34	N	Good	<i>Fraxinus nigra</i>	5	7	5	N	Good	5	Uniform	Rough	Firm	< 0.25	2
							<i>Typha angustifolia</i>	5		<i>Salix discolor</i>		10																	
							<i>Fraxinus nigra</i>	5		<i>Abies balsamea</i>		5																	
							<i>Aralia nudicaulis</i>	1		<i>Betula papyrifera</i>		2																	
							<i>Eupatorium maculatum</i>	1		<i>Picea mariana</i>		2																	
										<i>Fraxinus nigra</i>		30																	
Upl Basin - South	South Lobe	US-1-4	S	4495-5000	4	7-10	<i>Typha latifolia</i>	15	45	N	Fair	<i>Salix bebbiana</i>	10	200	48	N	Unaffected	<i>Betula papyrifera</i>	1	1	1	N	Unaffected	15	Uniform	Rough	Soft	< 0.25	0
							<i>Typha angustifolia</i>	15		<i>Alnus incana</i>		5																	
							<i>Equisetum arvense</i>	10		<i>Picea mariana</i>		2																	
							<i>Rubus pubescens</i>	2		<i>Betula papyrifera</i>		1																	
							<i>Lycopus americanus</i>	1																					
							<i>Rubus idaeus</i>	1																					
							<i>Solidago gigantea</i>	1																					
							<i>Equisetum arvense</i>	20																					
							<i>Typha angustifolia</i>	20																					
							<i>Scirpus pedicellaris</i>	15																					
Upl Basin - South	South Lobe	US-1-5	S	4501-05	<1	0	<i>Phalaris arundinacea</i>	10	81	I	Unaffected	<i>Salix pedicellaris</i>	15	122	26	N	Unaffected	<i>Betula papyrifera</i>	1	2	1	N	Unaffected	30	None	Rough	Soft	< 0.25	-4
							<i>Glyceria grandis</i>	5		<i>Salix discolor</i>		5																	
							<i>Calamagrostis canadensis</i>	5		<i>Betula papyrifera</i>		2																	
							<i>Rubus idaeus</i>	2		<i>Larix laricina</i>		2																	
							<i>Rubus pubescens</i>	2		<i>Corylus cornuta</i>		1																	
							<i>Thuja occidentalis</i>	1		<i>Abies balsamea</i>		1																	
							<i>Eupatorium maculatum</i>	1																					
							<i>Rubus pubescens</i>	5																					
							<i>Calamagrostis canadensis</i>	5																					
							<i>Impatiens capensis</i>	5																					
							<i>Fraxinus nigra</i>	5																					
Upl Basin - South	South Lobe	US-2-1	S	4476-79	2	2-8	<i>Caltha palustris</i>	5	31	N	Good	<i>Alnus incana</i>	25	80	60	N	Unaffected	<i>Thuja occidentalis</i>	15	17	33	N	Unaffected	0	Sporadic	Rough	Soft	< 0.25	0
							<i>Onoclea sensibilis</i>	2		<i>Corylus cornuta</i>		15	<i>Fraxinus nigra</i>			10													
							<i>Rubus idaeus</i>	2		<i>Fraxinus nigra</i>		15	<i>Abies balsamea</i>			5													
							<i>Equisetum sylvaticum</i>	2		<i>Acer rubrum</i>		5	<i>Fraxinus nigra</i>			2													
													<i>Betula papyrifera</i>			1													
Upl Basin - South	South Lobe	US-2-2	S	4471-75	8	2-12	<i>Equisetum sylvaticum</i>	3	5	N	Good	<i>Alnus incana</i>	15	76	25	N	Good	<i>Thuja occidentalis</i>	20	13	26	N	Unaffected	0	Uniform	Rough	Soft	0.25	2
							<i>Calamagrostis canadensis</i>	1		<i>Corylus cornuta</i>		5	<i>Fraxinus nigra</i>			5													
							<i>Rubus pubescens</i>	1		<i>Fraxinus nigra</i>		5	<i>Abies balsamea</i>			1													
Upl Basin - South	South Lobe	US-2-3	S	4466-70	12	8-16	<i>Petasites palmatus</i>	1	3	N	Fair	<i>Alnus incana</i>	40	136	50	N	Fair	<i>Fraxinus nigra</i>	5	14	7	N	Fair	0	Uniform	Rough	Soft	< 0.25	2
							<i>Lycopus americanus</i>	1		<i>Fraxinus nigra</i>		5	<i>Betula papyrifera</i>			2													
							<i>Corylus americana</i>	1		<i>Abies balsamea</i>		2																	
										<i>Betula papyrifera</i>		2																	
										<i>Amelanchier humilis</i>		1																	

Table 2  
Wetland Evaluation Data Point Inventory  
July 2013 Tailings Pipeline Release  
ArcelorMittal Minorca Mine

Incident	Habitat ID	Plot ID	Area	Photo ID	Initial Tailings Thickness (in)	2014 Tailings Thickness (in)	Herbaceous					Shrub					Tree					Total Invasive and Non-Native Cover (%)	Tailings Cover <sup>3</sup>	Soil Surface Characteristics <sup>4</sup>	Soil Stability <sup>5</sup>	Penetrom. Reading (TPF) <sup>6</sup>	Water Depth (in)		
							Species	Species Cover (%)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100 m2)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)							Nativity <sup>1</sup>	Health <sup>2</sup>
July 2013	Upland	J-5-2	1	3025-30	6	4	<i>Equisetum sylvaticum</i>	20	44	N	Fair	<i>Populus tremuloides</i>	10	93	24	N	Good	<i>Populus tremuloides</i>	60	13	75	N	Good	2	Uniform	Smooth	Firm	2	>-18
							<i>Diervilla lonicera</i>	10		<i>Cornus alba</i>		5	<i>Populus balsamifera</i>			10		<i>Betula papyrifera</i>	5										
							<i>Acer rubrum</i>	5		<i>Populus balsamifera</i>		5	<i>Ulmus americana</i>			2													
							<i>Solidago canadensis</i>	5		<i>Ulmus americana</i>		2	<i>Abies balsamea</i>			2													
							<i>Rubus idaeus</i>	2																					
							<i>Cirsium arvense</i>	2		I																			
							<i>Cornus racemosa</i>	10		N																			
July 2013	Upland Ditch	J-6-1	2	2995-3006	14	28	<i>Cirsium arvense</i>	5	28	I	Fair	<i>Populus balsamifera</i>	10	23	25	N	Good	<i>Populus balsamifera</i>	15	14	30	N	Good	11	Uniform	Smooth	Firm	1.75	>-48
							<i>Grass 2</i>	5		<i>Populus tremuloides</i>		10	<i>Populus tremuloides</i>			15													
							<i>Tanacetum vulgare</i>	2		I																			
							<i>Solidago canadensis</i>	2		N																			
							<i>Lotus corniculatus</i>	2		I																			
							<i>Bromus inermis</i>	2		I																			
							<i>Eurybia macrophylla</i>	30		N																			
July 2013	Upland Ditch	J-6-2	2	3007-12	4	70	<i>Solidago canadensis</i>	20	70	N	Good	<i>Alnus incana</i>	25	34	30	N	Good	<i>Betula papyrifera</i>	20	8	30	N	Good	0	Uniform	Smooth	Firm	1.25	>-40
							<i>Rubus idaeus</i>	5		<i>Populus balsamifera</i>		5	<i>Populus balsamifera</i>			10													
							<i>Cornus alba</i>	5																					
							<i>Abies balsamea</i>	5																					
							<i>Equisetum arvense</i>	5																					
							<i>Eurybia macrophylla</i>	20		N																			
							<i>Athyrium filix-femina</i>	20		N																			
July 2013	Upland Ditch	J-6-3	2	3013-18	2	79	<i>Aralia nudicaulis</i>	10	79	N	Good	<i>Salix discolor</i>	5	16	12	N	Good	<i>Populus tremuloides</i>	25	5	25	N	Good	7	Uniform	Smooth	Firm	1.5	>-27
							<i>Solidago canadensis</i>	10		<i>Betula allegheniensis</i>		2																	
							<i>Diervilla lonicera</i>	10		<i>Abies balsamea</i>		2																	
							<i>Poa pratensis</i>	5		<i>Betula papyrifera</i>		2																	
							<i>Rubus pubescens</i>	2		<i>Populus balsamifera</i>		1																	
							<i>Trifolium pratense</i>	2																					

<sup>1</sup>Nativity  
I - Introduced (non-native)  
N - Native  
<sup>2</sup>Vegetation Health  
Fair - Dead plants, diminished vegetative cover  
Good - Some stress noted in color or vigor  
Unaffected - vegetation healthy and similar to unaffected areas of wetland  
<sup>3</sup>Tailings Cover  
Uniform - contiguous layer of tailings covering soil surface  
Sporadic - tailings only filling hollows or depressions, not contiguous  
<sup>4</sup>Surface Roughness  
Smooth - undulations < 3 inches  
Rough - undulations >3 inches  
<sup>5</sup>Soil Stability  
Firm - predominantly mineral soil  
Soft - predominantly organic soil or waterlogged mineral soil  
<sup>6</sup>TPF - tons per foot

Table 2  
Wetland Evaluation Data Point Inventory  
July 2013 Tailings Pipeline Release  
ArcelorMittal Minorca Mine

Incident	Habitat ID	Plot ID	Area	Photo ID	Initial Tailings Thickness (in)	2014 Tailings Thickness (in)	Herbaceous					Shrub					Tree					Total Invasive and Non-Native Cover (%)	Tailings Cover <sup>3</sup>	Soil Surface Characteristics <sup>4</sup>	Soil Stability <sup>5</sup>	Penetrom. Reading (TPF) <sup>6</sup>	Water Depth (in)		
							Species	Species Cover (%)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)							Nativity <sup>1</sup>	Health <sup>2</sup>
July 2013	Wetland 1	J-1-1	1	3102-09		0	<i>Typha angustifolia</i>	60	65	I	Unaffected			0	0		NA			0	0		NA	65	NA	Smooth	Soft	0.25	24
July 2013	Wetland 1	J-1-2	1	3113-3120	1	1	<i>Phalaris arundinacea</i>	5	47	I	Good	<i>Salix discolor</i>	15	25	30	N	Unaffected			0	0		NA	45	Uniform	Smooth	Soft	0.25	18
July 2013	Wetland 1	J-2-1	1	3093-3101		2	<i>Phalaris arundinacea</i>	5	92	I	Good	<i>Salix interior</i>	2	1	2	N	Unaffected			0	0		NA	90	Uniform	Smooth	Soft	NA	12
July 2013	Wetland 1	J-2-2	1	3085-88		5	<i>Typha angustifolia</i>	60	73	I	Good			0	0		Unaffected			0	0		NA	70	Uniform	Smooth	Soft	NA	18
July 2013	Wetland 1	J-2-3	1	3078-84		4	<i>Phalaris arundinacea</i>	20	65	I	Unaffected	<i>Salix discolor</i>	2	2	2	N	Unaffected	<i>Populus balsamifera</i>	2	2	4	N	Unaffected	60	Uniform	Smooth	Soft	< 0.25	12
July 2013	Wetland 1	J-3-1	1	3071-77		0	<i>Equisetum arvense</i>	15	89	N	Unaffected	<i>Salix discolor</i>	20	177	55	N	Unaffected	<i>Populus tremuloides</i>	1	6	3	N	Unaffected	17	None	Smooth	Firm	0.25	-17
July 2013	Upland	J-3-2	1	3063-70		1	<i>Phalaris arundinacea</i>	20	77	I	Unaffected	<i>Populus balsamifera</i>	15	93	40	N	Unaffected	<i>Populus tremuloides</i>	20	7	25	N	Unaffected	25	Uniform	Smooth	Firm	1.5	>-20
July 2013	Upland	J-3-3	1	3056-62		0	<i>Fraxinus nigra</i>	50	152	N	Unaffected	<i>Corylus cornuta</i>	10	63	20	N	Unaffected	<i>Populus tremuloides</i>	50	19	65	N	Unaffected	0	None	Smooth	Firm	0.8	>-9
July 2013	Upland	J-4-1	1	3037-42		0	<i>Equisetum sylvaticum</i>	30	76	N	Unaffected	<i>Populus balsamifera</i>	30	230	90	N	Unaffected	<i>Populus balsamifera</i>	10	2	10	N	Unaffected	22	Uniform	Smooth	Firm	1.5	>-22
July 2013	Upland	J-4-2	1	3044-49		3	<i>Equisetum sylvaticum</i>	40	89	N	Good	<i>Populus balsamifera</i>	15	290	65	N	Good			0	0		Good	10	Uniform	Smooth	Firm	1.5	>-26
July 2013	Upland	J-4-3	1	3050-55		7	<i>Fraxinus nigra</i>	30	86	N	Good	<i>Populus tremuloides</i>	5	80	22	N	Good	<i>Populus tremuloides</i>	35	16	53	N	Good	12	Uniform	Smooth	Firm	1.5	>-15
July 2013	Upland	J-5-1	1	3031-36		3	<i>Equisetum sylvaticum</i>	40	100	N	Unaffected	<i>Populus tremuloides</i>	20	236	65	N	Unaffected			0	0		NA	24	Uniform	Smooth	Firm	1.3	>-21



Table 1  
Wetland Evaluation Data Point Inventory  
May 2013 Tailings Pipeline Release  
ArcelorMittal Minorca Mine

Incident	Habitat ID	Plot ID	Area	Photo ID	Initial Tailings Thickness (in)	2014 Tailings Thickness (in)	Herbaceous					Shrub					Tree					Total Invasive and Non-Native Cover (%)	Tailings Cover <sup>3</sup>	Soil Surface Characteristics <sup>4</sup>	Soil Stability <sup>5</sup>	Penetrom. Reading (TPF) <sup>6</sup>	Water Depth (in)																										
							Species	Species Cover (%)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)							Nativity <sup>1</sup>	Health <sup>2</sup>																								
May 2013	Wetland B	M-6-4	B	3131-3135		2	<i>Equisetum arvense</i>	20	88	N	Unaffected	<i>Alnus incana</i>	30	62	40	N	Unaffected	<i>Betula papyrifera</i>	2	1	2	N	Unaffected	0	Sporadic	Rough	Firm	1	2-6" in stream																								
							<i>Impatiens capensis</i>	10				10																																									
							<i>Lycopus americanus</i>	10				10																																									
							<i>Leersia oryzoides</i>	10				10																																									
							<i>Alnus incana</i>	5				5																																									
							<i>Solidago canadensis</i>	5				5																																									
							<i>Carex comosa</i>	5				5																																									
							<i>Onoclea sensibilis</i>	5				5																																									
							<i>Rubus idaeus</i>	5				5																																									
							<i>Juncus effusus</i>	5				5																																									
							<i>Aralia nudicaulis</i>	2				2																																									
							<i>Rubus pubescens</i>	2				2																																									
							<i>Vaccinium angustifolium</i>	2				2																																									
<i>Iris versicolor</i>	2		2																																																		
May 2013	Wetland A Ditch	M-6-5	A	3265-69		16	<i>Typha angustifolia</i>	60	60	I	Unaffected																																										
May 2013	Wetland A Ditch	M-6-6	A	3278-84		0	<i>Typha angustifolia</i>	30	55	N	Unaffected	<i>Salix discolor</i>	5	28	5	N	Unaffected																																				
							<i>Equisetum arvense</i>	20																																													
							<i>Phalaris arundinacea</i>	5																																													
May 2013	Wetland A Ditch	M-6-7	A	3298-3304		4	<i>Typha angustifolia</i>	50	77	N	Unaffected			0	0	N	NA																																				
							<i>Typha latifolia</i>	15																																													
							<i>Equisetum arvense</i>	10																																													
							<i>Cirsium arvense</i>	2																																													
							<i>Typha angustifolia</i>	30																																													
May 2013	Wetland A Ditch	M-6-8	A	3330-35		19	<i>Typha angustifolia</i>	10	48	N	Unaffected			0	0	N	NA																																				
							<i>Equisetum arvense</i>	10																																													
							<i>Typha latifolia</i>	5																																													
							<i>Carex comosa</i>	2																																													
							<i>Glyceria grandis</i>	1																																													
May 2013	Wetland A Ditch	M-6-9	A	3320-26		10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Uniform	Smooth	Soft	< 0.25	4																									
May 2013	Wetland A Ditch	M-6-10	A	None		30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Uniform	Smooth	Soft	< 0.25	4																									

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N - Native  
<sup>2</sup>Vegetation Health  
Fair - Dead plants, diminished vegetative cover  
Good - Some stress noted in color or vigor  
Unaffected - vegetation healthy and similar to unaffected areas of wetland  
<sup>3</sup>Tailings Cover  
Uniform - contiguous layer of tailings covering soil surface  
Sporadic - tailings only filling hollows or depressions, not contiguous  
<sup>4</sup>Surface Roughness  
Smooth - undulations < 3 inches  
Rough - undulations >3 inches  
<sup>5</sup>Soil Stability  
Firm - predominantly mineral soil  
Soft - predominantly organic soil or waterlogged mineral soil  
<sup>6</sup>TPF - tons per foot

Table 1  
Wetland Evaluation Data Point Inventory  
May 2013 Tailings Pipeline Release  
ArcelorMittal Minorca Mine

Incident	Habitat ID	Plot ID	Area	Photo ID	Initial Tailings Thickness (in)	2014 Tailings Thickness (in)	Herbaceous					Shrub					Tree					Total Invasive and Non-Native Cover (%)	Tailings Cover <sup>3</sup>	Soil Surface Characteristics <sup>4</sup>	Soil Stability <sup>5</sup>	Penetrom. Reading (TPF) <sup>6</sup>	Water Depth (in)			
							Species	Species Cover (%)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)	Nativity <sup>1</sup>	Health <sup>2</sup>	Species	Species Cover (%)	Species Density (#/100m2)	Total Cover (%)							Nativity <sup>1</sup>	Health <sup>2</sup>	
May 2013	Wetland A	M-4-3	4	3350-54		3	<i>Typha angustifolia</i> <i>Calamagrostis canadensis</i>	35 30	65	I N	Unaffected	<i>Alnus incana</i> <i>Salix discolor</i> <i>Salix eriocephala</i>	20 10 5	71	35	N N N	Unaffected			0	0		NA	35	Sporadic	Rough	Soft	<0.25	0	
May 2013	Wetland A	M-4-4	4	3339-43		4	<i>Equisetum arvense</i> <i>Typha latifolia</i> <i>Phragmites australis</i> <i>Solidago gigantea</i> <i>Lactuca serriola</i>	30 25 10 5 5	75	N N N N I	Unaffected	<i>Alnus incana</i> <i>Populus balsamifera</i> <i>Salix lucida</i> <i>Salix eriocephala</i> <i>Salix planifolia</i>	20 15 10 5 5	153	55	N N N N N	Unaffected	<i>Populus balsamifera</i>	10		1	10		Unaffected	5	Uniform	Smooth	Firm	0.75	0
May 2013	Wetland A	M-4-5	4	3344-49		9	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Uniform	Smooth	Soft	<0.25	0.00		
May 2013	Wetland A	M-4-6	4	3435-43		5	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Sporadic	Rough	Soft	<0.25	2-4" in hollows		
May 2013	Wetland A	M-4-7	4	3428-33		1	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Sporadic	Rough	Soft	<0.25	0		
May 2013	Wetland A	M-4-8	4	3421-26		2	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Uniform	Smooth	Firm	NA	0		
May 2013	Wetland A	M-4-9	4	3416-20		2	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Uniform	Smooth	Firm	NA	0		
May 2013	Wetland A	M-4-10	4	3375-79		4	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Sporadic	Rough	Soft	<0.25	0		
May 2013	Wetland A	M-4-11	4	3395-3400		2	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Sporadic	Rough	Firm	NA	0		
May 2013	Wetland A	M-4-12	4	3387-92		1	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Sporadic	Rough	Firm	1	0		
May 2013	Wetland A	M-4-13	4	3414-15		2	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Uniform	Smooth	Firm	NA	0		
May 2013	Wetland A	M-4-14	4	3407-12		1	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Uniform	Smooth	Firm	0.5	0		
May 2013	Wetland A	M-4-15	4	3401-06	3	1	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Uniform	Smooth	Firm	0.5	0		
May 2013	Wetland A	M-4-16	4	3380-86	trace	6	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Sporadic	Rough	Soft	<0.25	0		
May 2013	Wetland A	M-5-1	5	4319-23		0	<i>Equisetum arvense</i> <i>Solidago gigantea</i> <i>Hieracium caespitosum</i> <i>Phragmites australis</i> <i>Galium asprellum</i>	50 15 10 10 1	86	N I N N N	Unaffected	<i>Alnus incana</i> <i>Populus balsamifera</i> <i>Salix bebbiana</i> <i>Salix eriocephala</i>	40 20 5 2	126	67	N N N N	Unaffected			0	0		NA	10	None	Smooth	Firm	1	>-30	
May 2013	Wetland A	M-5-2	5	4314-18		6	<i>Typha angustifolia</i> <i>Lactuca serriola</i> <i>Equisetum fluviatile</i> <i>Equisetum hyemale</i> <i>Salix eriocephala</i>	25 2 60 2 1	90	I I N N N	Unaffected	<i>Alnus incana</i> <i>Salix discolor</i>	20 5	49	25	N N	Unaffected			0	0		NA	27	Uniform	Smooth	Soft	<0.25	0	
May 2013	Wetland B	M-6-0	B	3241-5	0	0	<i>Acer rubrum</i> <i>Solidago canadensis</i> <i>Aralia nudicaulis</i> <i>Lactuca serriola</i> <i>Caltha palustris</i> <i>Galium asprellum</i> <i>Viola sp.</i> <i>Lycopus americanus</i> <i>Thuja occidentalis</i> <i>Phalaris arundinacea</i> <i>Impatiens capensis</i> <i>Athyrium filix-femina</i> <i>Dryopteris cristata</i> <i>Ribes hirtellum</i>	10 10 10 10 5 5 5 5 5 5 2 2	84	N N N I N N N N N N N N	Unaffected	<i>Alnus incana</i> <i>Corylus cornuta</i> <i>Acer rubrum</i> <i>Abies balsamea</i> <i>Salix discolor</i> <i>Picea mariana</i>	20 10 10 10 5 5	NA	60	N N N N N N	Unaffected	<i>Abies balsamea</i> <i>Acer rubrum</i>	20 10	NA	30	N N	Unaffected	15	None	Rough	Firm	NA	NA	0
May 2013	Wetland B	M-6-1	B	3248-52		1	<i>Lycopus americanus</i> <i>Thuja occidentalis</i> <i>Equisetum arvense</i> <i>Abies balsamea</i> <i>Impatiens capensis</i> <i>Rubus pubescens</i> <i>Solidago canadensis</i> <i>Ribes hirtellum</i> <i>Onoclea sensibilis</i> <i>Fragaria virginiana</i> <i>Viola sp.</i>	20 20 15 10 10 5 5 5 5 2 2	99	N N N N N N N N N N	Unaffected	<i>Salix discolor</i> <i>Alnus incana</i> <i>Populus balsamifera</i> <i>Abies balsamea</i> <i>Betula allegheniensis</i> <i>Betula papyrifera</i>	20 10 5 5 2 2	279	44	N N N N N N	Unaffected			0	0		Unaffected	0	Sporadic	Rough	Soft	<0.25	2-6" in 20% hollows	
May 2013	Wetland B	M-6-2	B	3183-87		2	<i>Calamagrostis canadensis</i> <i>Impatiens capensis</i> <i>Lycopus americanus</i> <i>Onoclea sensibilis</i> <i>Equisetum arvense</i> <i>Eupatorium maculatum</i> <i>Solidago canadensis</i> <i>Phalaris arundinacea</i> <i>Typha latifolia</i> <i>Typha angustifolia</i> <i>Scirpus atrovirens</i> <i>Osmunda cinnamomea</i>	20 10 10 10 10 5 5 5 2 2 2 2	83	N N N N N N N N N N N	Unaffected	<i>Alnus incana</i> <i>Salix discolor</i> <i>Abies balsamea</i> <i>Salix discolor</i> <i>Salix interior</i> <i>Betula papyrifera</i>	20 20 10 10 10 2	247	72	N N N N N N	Unaffected	<i>Abies balsamea</i>	10	1	10	N	Unaffected	7	Sporadic	Rough	Firm	<0.25	4" in channel center	
May 2013	Wetland B	M-6-3	B	3143-47		0	<i>Rubus pubescens</i> <i>Equisetum arvense</i> <i>Calamagrostis canadensis</i> <i>Lycopus americanus</i> <i>Solidago canadensis</i> <i>Cirsium arvense</i> <i>Impatiens capensis</i> <i>Galium asprellum</i> <i>Thuja occidentalis</i> <i>Dryopteris cristata</i> <i>Viola sp.</i>	20 20 10 5 5 5 2 2 1 1 1	72	N N N N N I N N N N	Unaffected	<i>Alnus incana</i> <i>Acer rubrum</i> <i>Abies balsamea</i>	35 15 10	97	60	N N N	Unaffected	<i>Betula papyrifera</i> <i>Thuja occidentalis</i> <i>Acer rubrum</i> <i>Abies balsamea</i> <i>Populus tremuloides</i>	5 5 5 2 2	7	19	N N N N N	Unaffected	5	None	Rough	Firm	<0.25	2-4" in hollows	



## Tables

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## 10.0 References

- Barr Engineering Company. 2014. Work Plan for Evaluating Wetlands Affected by Tailings Pipeline Releases of May 19, 2013 and July 30, 2013 – ArcelorMittal Minorca Mine. May 14, 2014.
- U.S. Army Corps of Engineers, Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS
- U.S. Army Corps of Engineers. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*, ed. J. S. Wakeley, R. W. Lichvar, C. V. Noble, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

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## 9.0 Schedule

All of the dates specified within this section are subject to change because they are dependent on the approval of this work plan, the receipt of all necessary permits/authorizations from the regulatory agencies, and weather conditions. The tailings and sediment removal work is expected to take approximately 8-10 weeks to complete, depending on weather conditions. The removal work will ideally be completed between October and December 2014. Should the work not be completed prior to onset of freezing conditions, the remainder will be completed by the end of 2015, once conditions have dried sufficiently to gain access. Tree planting materials will be ordered following approval of this plan and will be installed in fall 2015, provided that tailings removal has occurred. Shrub seed collection will be completed in fall of 2014 or 2015, dependent on approval of this plan, seed maturation, and sufficient time to coordinate collection. Seed will be installed following the completion of construction.

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## 8.0 Compensatory Wetland Mitigation

A total of 15.16 acres of wetland has been affected by tailings and sediment deposition in three areas at the ArcelorMittal Minorca facility, including 14.28 acres within the Rainy River watershed (Bank Service Area 2) and 0.88 acres within the St. Louis River watershed (Bank Service Area 1) (Table 4). Through implementation of the plan described in this report, 4.0 acres of affected wetland will be actively restored to conditions comparable to before the incidents. Only 0.04 acre of wetland has converted to non-wetland as a result of the incidents. That area is located within the north lobe at the upland basin and will be restored to wetland as part of this plan (Figure 11).

A total of 2.82 acres of wetland within the south lobe at the upland basin are diminished in their functions but remain wetlands. Therefore, wetland mitigation is proposed for those areas (Figure 8). Minnesota Rules 8420.0900, Subp. 6, After-the-fact replacement, states, "...the local government unit must require the landowner or responsible party to replace the impacted wetland at a ratio twice the replacement ratio otherwise required, unless the local government unit and enforcement authority concur that a lesser ratio is acceptable." In this case, a lesser ratio is warranted because the affected areas remain functioning wetlands and will sustainably continue to function as wetlands. Those areas have not converted to upland; the wetland community types have not changed; and the herbaceous, shrub, and forest vegetation present is either healthy and comparable to unaffected areas of adjacent wetlands, or is recovering to such a state. Therefore, a higher replacement ratio is not warranted because there is no loss of quantity or biological diversity of wetlands and no expected loss of wetland quality in the long-term. As replacement for the 2.82 acres of affected wetland located within the Rainy River watershed and Bank Service Area (BSA) 2, ArcelorMittal proposes to purchase 2.82 wetland bank credits from an existing wetland bank account registered with the Board of Water and Soil Resources and approved for use by the U.S. Army Corps of Engineers. There are currently over 4.5 credits that meet those criteria in BSA 2, which are currently being pursued. Should suitable credits not be available in BSA 2, credits will be pursued in BSA 1. ArcelorMittal will provide proof of withdrawal of credits by January 31, 2015 for the stated impacts.

The remaining 8.34 acres of wetlands continue to function as wetlands and are recovering to similar conditions, and of the same type, that existed prior to the incidents. None of those wetlands have converted to other wetland types as a result of the incidents. The wetland functions have been temporarily diminished in some areas, but have generally recovered to pre-incident conditions. Therefore, with no loss of wetland or wetland function, no mitigation is proposed for the 8.34 acres of remaining wetlands in which tailings will be left in place.

Following the implementation of the plan described in this report and the wetland replacement, there will be no loss of wetland quality, quantity, or biological diversity.

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5. At least 75 percent survival of planted trees and shrub cuttings after two years.
  6. At least 60 percent survival of planted trees and shrub cuttings after five years.
  7. Total shrub and tree counts at least 80 percent of those documented in this report after five years.

### **7.3 Corrective Measures Plan**

If any of the performance standards are not met following annual monitoring, measures will be implemented to correct the deficiencies. If invasive species develop in excess of the performance standards, herbicides will be applied to reduce the invasive species cover. Should insufficient native herbaceous species and areal cover develop within the restored wetlands, a seed mix appropriate to that area will be developed and installed at an appropriate time of the year for seeding. If tree survival and development does not meet the performance standards, replanting or seeding will be implemented. All corrective measures will be implemented at least within the following growing season after identification.



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## 7.0 Monitoring and Performance Standards

### 7.1 Monitoring

Monitoring will be conducted annually for up to three years in the non-forested and non-shrub areas and for five years in areas in forested and shrub restoration areas. Vegetation monitoring will be conducted within each restored wetland area in July or August each year during the monitoring period. Monitoring will be conducted within at least two established plots and via a meander survey to document vegetation within at least 20 percent of each area. The vegetation monitoring will identify all plant species encountered and their percent areal cover. The percent cover, location, and extent of non-native and invasive species will also be documented. Within each area containing shrub and forest restoration, 10 meter by 10 meter shrub/tree plots will be included at the established plot locations to document survival and development of shrubs and trees. At least two such plots will be established within each planting area in the south lobe (Figure 12). Photographs will be taken at each sampling plot and representative areas of the restored areas during the vegetation monitoring. Fixed photo reference points will be established during the first year of monitoring, photos will be taken from those locations each year, and the locations will be documented in the monitoring report.

By January 31 following each monitoring year, a report will be submitted to the Minnesota Department of Natural Resources and the U.S. Army Corps of Engineers documenting the vegetation data collected from each restored wetland area. The vegetation monitoring data will be compiled and include measures of total vegetative cover, species richness, individual species, total cover of non-native and invasive species, species indicator status, and identification of dominant species. Photographs taken during the monitoring will also be included in the report.

### 7.2 Performance Standards

It is expected that the restored wetland areas will meet the following minimum general performance standards:

1. More than 75 percent of the vegetation in each restoration area shall be facultative (FAC) or wetter (FACW, OBL) as listed in the National Wetland Plant List (NWPL, 2012) for the Northcentral and Northeast region.
2. Invasive, non-native plant species shall not comprise more cumulative areal coverage than documented in the same locations characterized in this report.
3. The total vegetative coverage will comprise at least 90 percent areal coverage by the end of the second full growing season.
4. The diversity of native species will at least match that characterized in this report within each restored area.

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(Figure 11). The mats will be removed as work is completed and the sediment lying under the mats will be removed as work progresses.

Sediment removal will be completed with a long-reach excavator with approximately a 60 foot reach. The sediment and vegetation will be scraped towards the mats and windrowed for loading into 35-ton dump trucks. The dump trucks will haul the materials into the Upland Basin for disposal and spreading.

#### **6.6.2.2 Shrub and Tree Revegetation**

Shrub seeding and tree planting will be employed in the north lobe. Speckled alder and hazelnut seeds will be collected from approximately 0.02 acres of existing wetland on ArcelorMittal property and installed throughout the restoration area. Approximately 30 balsam fir and 20 quaking aspen trees will be planted throughout the north lobe restoration area (Table 6, Figure 12).

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## 6.6 Restoration Plan

### 6.6.1 South Lobe

#### 6.6.1.1 Tailings Removal

Removal of deposited sediment is proposed within 2.44 acres of wetland (Figure 8), much of which shows buried herbaceous vegetation and diminished wetland function. The areas outside of the planned removal areas primarily contain minimal sediment, are recovering to a pre-incident condition, and have extensive shrub and tree cover.

Access for removal of sediment will be accomplished by constructing a temporary road, approximately 650 feet long, using coarse tailings with one short segment constructed laterally to reach the entire restoration area (Figure 11). The road will be constructed to a height of 4 feet, a 30 foot driving surface width, mats placed on the driving surface, and safety berms along the sides to meet MSHA requirements. The road will encompass approximately 0.9 acres and will be removed, along with the sediment deposition underneath, upon completion of the removal work.

Sediment removal will be completed with a long-reach excavator with approximately a 60 foot reach. The sediment and vegetation will be scraped towards the access road and windrowed for loading into 35-ton dump trucks. The road will be removed along with the sediment lying under it as work progresses from west to east. The dump trucks will haul the materials into the Upland Basin for disposal and spreading.

#### 6.6.1.2 Shrub and Tree Revegetation

Shrub seeding, shrub cuttings, and tree planting will be employed in the south lobe (Table 5). Speckled alder seeds will be collected from approximately 0.6 acres of existing alder thicket wetland and installed throughout the 2.44 acre restoration area. Hazelnut seeds will be collected from about 0.2 acre of wetland and installed within approximately 0.77 acres of the south lobe in the western part (Figure 12).

Approximately 800 shrub cuttings will be collected from existing wetlands on ArcelorMittal property, including approximately 760 willow and 40 serviceberry (Table 6). The willow will be planted in the eastern part and serviceberry in the western part (Figure 12). A total of 1,200 tree seedlings will be planted in the south lobe, including five species (Table 6). Approximately 500 white cedar, 240 balsam fir, and 120 paper birch will be installed throughout the south lobe with approximately 70 red maple to be planted in the eastern part and 80 black spruce in the western part (Figure 12).

### 6.6.2 North Lobe

#### 6.6.2.1 Tailings Removal

Removal of deposited sediment is proposed within 0.05 acres of the wetland in which the herbaceous vegetation is diminished (Figure 8). The majority of the north area has minimal sediment and unaffected vegetation.

Access for removal of sediment will be accomplished by placing 8 inch by 16 foot wide double width mats on the ground surface through the center of the restoration area to within about 50 feet of the north end

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ranging from 43 to 117 percent, which serves as a primary structural and functional component of the wetland. With the exception of Plot US-1-1, no effects from the deposition were documented in the tree and shrub layers. The wetland surface is hummocky with considerable microtopography formed by the diverse vegetative adaptations to thriving in wet conditions. Removal of tailings in those areas, would result in impacts to the wetland through the complete loss of the shrub and tree canopy and a substantial loss of root structure and seed bank, which will otherwise facilitate recovery. Approximately 2.82 acres of the south lobe wetland shows diminished functioning as evidenced by the herbaceous layer health ratings (Table 3). Wetland mitigation is proposed for those diminished areas as described in Section 8.0.

#### **6.4.2 North Lobe**

Within the north lobe, the sediment deposits are uniformly spread across the ground surface near the point of origin where the deposits are the thickest. Deposition is sporadic, only present in the hollows, farther away from the point of origin, including most of the deposition area. The ground surface is noted as rough with hummocks and hollows throughout most of the area except closest to the point of origin. The soils are firm throughout most of the north lobe except at plot UN-1-2. The herbaceous vegetation is indicated as diminished or dead within Plots UN-1-3 and UN-1-4, but unaffected in the other plots where deposits are minimal. Where present, the shrub and tree cover is noted as unaffected. Tailings removal will benefit the 0.05 acre where the herbaceous vegetation is diminished, including the 0.04 acre area that has converted to upland (Figure 11). Due to the more stable soils, lower water levels, and smaller restoration area, the north lobe will be accessed using mats directly off of the existing road corridor at the south edge of the deposition area.

#### **6.4.3 Alternatives Considered**

Alternatives were evaluated that included removing all deposition in the affected upland basin wetlands. While access is feasible to all areas of deposition, due to the wetness and soft soils, the lateral extent of deposition, and the volume of material; extensive temporary roads would need to be constructed to allow for the removal of tailings. The construction of roads and tailings removal efforts would result in the loss of the extensive shrub and forest vegetation present throughout much of the affected area. Because the majority of the affected area, with the exception of the thickest deposits, shows signs of healthy recovery of the herbaceous layer and limited to no effect on the shrub and tree strata; it was determined that the construction of extensive roads and the use of heavy equipment throughout the wetland has a significant risk of causing damage within the wetland through altered flow paths and soil compaction. Therefore, the proposed restoration was determined to be the most beneficial alternative for restoring and recovering wetland functions throughout the affected areas.

### **6.5 Removal Methods**

The sediment removal methods for the upland basin deposition areas will be the same as described in Section 4.5.

majority of the north lobe plots indicate vegetation characteristic of alder thicket/shrub carr communities with components of shallow marsh and coniferous/hardwood swamp present in some areas. The shrub layer is typically dominated by speckled alder, balsam fir seedlings, and beaked hazelnut. The herbaceous layer is commonly dominated by dwarf blackberry, impatiens, bunchberry, wild sarsaparilla, gooseberry, and red raspberry. Tree cover ranged up to 40 percent areal cover in the vegetation plots. No non-native, invasive species were noted in the wetland deposition area. The herbaceous vegetation in the wetland deposition area was rated fair in the areas with deeper sediment (UN-1-3 and UN-1-4, Figure 8, Table 3) characterized by diminished vegetative cover, dead plants, and plant stress. The areas with little sediment were noted with unaffected herbaceous vegetation (UN-1-1 and UN-1-2, Figure 8, Table 3). The shrub and tree vegetation was rated as unaffected throughout the deposition area. In late July, 2014, water levels within the north lobe were generally not observed within 2 feet or more of the surface except in the center of the area, where up to 2 inches of inundation was observed in the hollows.

## 6.4 Tailings Removal Potential

The potential for sediment removal to provide greater benefits than natural recovery was evaluated through the consideration of several factors, including: plant community structure (discussed in Section 6.2), land surface features, soil stability, hydrology (see Section 6.2), and access.

### 6.4.1 South Lobe

Within the south lobe, the sediment deposits are uniformly spread across the ground surface in areas of thicker deposits, generally deeper than 6 inches and are sporadic where the deposition is generally less than 6 inches. The ground surface is characterized as rough with hummocks and hollows throughout the south lobe. The soils are firm in the two transects farthest from the point of origin and are generally soft within the other areas. The herbaceous layer within wetlands in the deposition area contain from 3 to 11 species and the shrub and tree strata contain from 4 to 7 species. Invasive species are generally present close to the tailings basin. The herbaceous vegetation is noted as diminished in cover or stressed in all areas containing at least 10 inches of sediment. The herbaceous vegetation in areas containing less than 10 inches of deposition is generally rated good to unaffected.

The herbaceous layer within the two areas of the south lobe with 10 inches or more of deposition, has been substantially buried, resulting in vegetative cover ranging from 3 to 45 percent. It appears that the herbaceous vegetation may not naturally recover to densities present before the incident for some time. Therefore, despite the shrub and tree cover in these areas, which range from 31 to 57 percent total cover, removal of the tailings from a 2.44 acre area encompassing the deeper deposition areas is likely to benefit the restoration of wetland functions (Figure 8). Access for the equipment necessary to remove tailings will require the construction of a temporary road directly off of the existing service road due to the high water table and soft soils. Double wide mats would not provide sufficient stability for the equipment needed to complete the restoration. Because a temporary road will need to be constructed to the western deposition area (Figure 11), it will be beneficial to remove the tailings between the thicker deposition locations.

Restoration of the remaining 7.03 acres of the south lobe wetland would not be the most beneficial action for maintaining wetland function. The remaining areas of the south lobe contain shrub and tree cover

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numerous other locations to define the extent of measurable sediment. The characterization conducted in July and August 2014 represents the first accurate measurement of sediment deposition, which currently appears to be stable with little potential for migration.

### **6.2.2 North Lobe**

The extent of sediment within wetlands in the north lobe (Figure 8) has changed since the initial measurements in April 2014 because snow and frozen ground conditions were present during the initial assessment and wetlands have since been delineated within the area. The total wetland area affected by measurable soil deposition is 2.17 acres compared to 0.39 acres initially. The thickness of sediment deposition ranges from 0- 16 inches with the majority of the deeper deposits focused close to the point of origin (Figure 8). Soil deposition thickness was reevaluated in four locations (Table 3) with an apparent increase in two locations and generally the same thickness in the other locations. Sediment was measured in numerous other locations to define the extent of measurable sediment. The characterization conducted in July and August 2014 represents the first accurate measurement of sediment deposition, which currently appears to be stable with little potential for migration.

## **6.3 Vegetation/Community Health**

### **6.3.1 South Lobe**

A series of four transects containing 13 vegetation plots were characterized within south lobe, all within delineated wetland and all but one within the deposition area (Figure 8). Photos of the April 2014 vegetation plots taken during the 2014 field evaluations are included in Appendix F. The majority of the south lobe plots indicate vegetation characteristic of alder thicket/shrub carr communities with components of coniferous/hardwood swamp present in some areas. The shrub layer is typically dominated by speckled alder, black ash seedlings, willow, and beaked hazelnut with shrub cover ranging from 4 to 81 percent. The herbaceous layer is commonly dominated by narrow leaf cattail, broad leaf cattail, Canada bluejoint, horsetail, impatiens, and marsh marigold with herbaceous cover ranging from 3 to 75 percent. Tree cover ranges from 0 to 40 percent in the vegetation plots. Narrow leaf cattail and reed canary grass are the only non-native, invasive species in the wetland deposition area with narrow leaf cattail as an occasional dominant. The herbaceous vegetation health in the wetland deposition area was noted as unaffected in two plots (US-2-4 and US-3-3), generally those with thin or discontinuous deposition. The remaining plots were rated good or fair with diminished herbaceous vegetative cover, dead plants, and plant stress noted. The shrub and tree vegetation was generally rated as good to unaffected with some plant stress noted in the two areas of thickest deposition, primarily in the form of yellowing leaves or browning needles. However, balsam fir trees were observed in undisturbed wetland areas with browning needles, so it appears that may be occurring more broadly, unrelated to the sediment deposition. In late July, 2014, water levels within the south lobe ranged from 4 inches below the surface to 4 inches of inundation.

### **6.3.2 North Lobe**

Four vegetation plots within a single transect were characterized in the north lobe, all within the deposition area including two in delineated wetland and two outside of the wetland (Figure 8). The

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## 6.0 Results – April 2014 Upland Basin

Field evaluation of the affected deposition areas was conducted July 9, 2014; July 23, 2014; and August 8, 2014.

### 6.1 Wetland Delineation

The delineated wetland boundaries within the upland basin areas are shown on Figure 4. Wetland delineation data forms are included in Appendix E. The extent of wetlands was estimated immediately following the April 2014 event based primarily on the predominance of hydrophytic tree cover. However, there was snow on the ground and the growing season had not begun, so a wetland delineation could not be conducted. During 2014, a detailed wetland delineation was conducted throughout the upland basin areas. The National Wetland Inventory maps show the presence of wetlands north and west, but not within the impacted areas identified in Figure 4.

#### 6.1.1 South Lobe

A total of five wetland delineation plots were completed within and around the south deposition lobe (Figure 4 and Appendix E). The soil survey mapping indicates approximately half of the south lobe as Babbitt stony loam, 0 to 3 percent slopes, rubbly and half as Aquepts, 0 to 2 percent slopes, rubbly. The NRCS indicates that approximately 15 percent of the Babbitt stony loam is hydric and 95 percent of the Aquepts mapping is hydric. The wetland boundary along the tailings basin service road is an abrupt edge formed by the road fill slope. The other nearest upland area is approximately 400 feet west of the south lobe, which is formed by a gradual transition to forested upland. None of the wetland areas have converted to upland as a result of the sedimentation. The wetland within the south lobe contains a mix of shrub carr, hardwood swamp, and coniferous swamp communities.

#### 6.1.2 North Lobe

Three wetland delineation plots were completed within and around the north deposition lobe (Figure 4 and Appendix E). The soil survey mapping indicates the south lobe as Babbitt stony loam, 0 to 3 percent slopes, rubbly. The NRCS indicates that approximately 15 percent of the Babbitt stony loam is hydric. The wetland boundary along the road on the east side is a relatively abrupt edge formed by the road fill slope. Approximately 1,570 square feet of wetland has converted to upland as a result of the sediment release. The wetland within the north lobe is predominantly classified as alder thicket.

## 6.2 Tailings Thickness

### 6.2.1 South Lobe

The extent of sediment within wetlands in the south lobe (Figure 8) has changed since the initial measurements in April because snow and frozen ground conditions were present during the initial assessment. The total wetland area affected by measurable soil deposition is 9.47 acres compared to 5.49 acres initially. The thickness of sediment deposition ranges from 0- 18 inches (Figure 8). Soil deposition thickness was reevaluated in 13 locations (Table 3) with an apparent increase in four locations, a decrease in one location, and generally the same thickness in the other locations. Sediment was measured in

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### 5.6.1.2 Shrub and Tree Revegetation

Approximately 50 willow shrub cuttings will be installed along the western portion of the restoration area where less than two inches of inundation is present. No tree species were present in the affected wetland area, the tree species indicated in Plot J-2-3 (Table 2) are actually located within the upland area and will not be removed.



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### 5.4.1 Wetland 1

Within Wetland 1, the tailings deposits are uniformly spread across a smooth ground surface (Table 2). The soils are soft throughout Wetland 1. Vegetation within much of the wetland deposition area (Plots J-1-2, J-2-1, and J-2-2) was documented as stressed. Because of the primarily smooth soil surface, lack of shrub cover, and stressed vegetation, tailings removal has a high potential for providing benefits to 0.64 acres of Wetland 1. Attempts at removal of thin tailings deposits in the remaining portion of the wetland, where vegetation is unaffected, would unnecessarily eliminate the healthy vegetation and harm the root system, which is functioning similar to prior to the incident. Due to the soft soils and wet conditions, a temporary access road, approximately 24 feet wide and 3 feet in thickness, will be constructed over the pipeline and into the wetland to allow for the wetland restoration (Figure 10).

### 5.4.2 Area 2

Tailings removal is not considered beneficial in the area previously indicated as Wetland 2. The area still has sufficient capacity to convey runoff from the local watershed without tailings removal and no wetlands have been affected in this area.

### 5.4.3 Alternatives Considered

An alternative was considered to access Wetland 1 using mats instead of a temporary road. It was determined that due to the soft soils present in the wetland, the area of deposition, and volume of material to be removed; mats alone would not provide a suitably stable method for accessing the area. All areas of the affected wetland that showed stressed vegetation are proposed to be restored. The remaining portion of the wetland shows no negative effects so removal of tailings would not provide any benefit to wetland functions and could only result in damage.

## 5.5 Removal Methods

The tailings removal methods employed for the July 2013 release site will be the same as those described in Section 4.5.

## 5.6 Restoration Plan

### 5.6.1.1 Tailings Removal

Removal of deposited tailings is proposed within 0.64 acres of Wetland 1 where vegetation shows signs of stress (Figure 10). A temporary access road, approximately 24 feet wide and 3 feet in thickness, will be constructed over the pipeline and approximately 160 feet into Wetland 1 to allow the long reach excavator to reach the entire wetland restoration area (Figure 10). Double wide mats will be placed on top of the temporary road from which a long reach excavator will scrape tailings and windrow them near the mats for loading into dump trucks. The temporary road will be removed as work progresses along the the tailings lying under the road. The tailings will be transported to the Upland Basin for disposal.

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The area previously assumed to be wetland due to depressional nature and predominantly hydrophytic shrub and tree layers, does not meet wetland characteristics based on the detailed delineation.

## 5.2 Tailings Thickness

### 5.2.1 Wetland 1

The extent of tailings within the area previously characterized as Wetland 1 (Figure 7) has changed since the initial measurements in 2013 because additional tailings measurements were made throughout the area and a more detailed wetland delineation was performed, as described in Section 5.3 (Table 2). The total wetland area affected by tailings is 0.88 acres compared to 2.01 acres originally. Tailings thickness within Wetland 1 currently ranges from 0- 10 inches (Figure 7). Tailings thickness was reevaluated in two locations (J-1-2 and J-5-2, Table 2) with a decrease noted in one location and the same thickness in the other (Table 2). Tailings thickness was determined in 11 new locations to accurately map the current extent of tailings and assist with determining appropriate restoration. No migration of tailings was apparent since the release.

### 5.2.2 Area 2

The area previously identified as Wetland 2 has been evaluated in more detail and does not meet the definition of a wetland, as described in Section 5.1.2. The tailings deposition within the area shown on Figure 7 has decreased slightly from the original measurements, but only by a couple of inches.

## 5.3 Vegetation/Community Health

A series of five transects containing 13 vegetation plots were characterized within the area previously identified as Wetland 1, but only six of those plots lie within the delineated wetland (Figure 7). Photos of the July 2013 vegetation plots taken during the 2014 field evaluations are included in Appendix D. Four of the wetland plots are located within the deposition area, all containing vegetation indicative of a shallow marsh community dominated by narrow leaf cattail and one plot including reed canary grass as a dominant species (Table 2). One plot located outside of the deposition area has vegetation characteristic of a shallow marsh community (J-1-1) dominated by narrow leaf cattail and the other plot has a shrub carr community (J-3-1) dominated by willow, quaking aspen seedlings, and balsam poplar seedlings. Narrow leaf cattail and reed canary grass are the non-native, invasive species within the wetland deposition area with an average of 66 percent cover. The vegetation in the wetland deposition area was determined to be unaffected by the tailings deposition in one location (J-2-3) and showing signs of some stress in the other three locations. The noted plant stress was in the form of yellowing leaf tips and the lack of inflorescence, which could also be caused by the uncharacteristically deep water. In late July, 2014, Wetland 1 had inundation ranging from 12-24 inches.

## 5.4 Tailings Removal Potential

The potential for tailings removal to provide greater benefits than natural recovery was evaluated through the consideration of several factors, including: plant community structure (discussed in Section 5.2), land surface features, soil stability, hydrology (see Section 5.2), and access.

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## 5.0 Results – July 2013 Release

Field evaluation of the affected July 2013 release areas was conducted July 10-11, 2014 and August 8, 2014.

### 5.1 Wetland Delineation

The delineated wetland boundaries within the July 2013 release areas are shown on Figure 3. Wetland delineation data forms are included in Appendix C. The extent of wetlands was estimated immediately following the July 2013 release based primarily on the predominance of hydrophytic vegetation and the geomorphic characteristics of the ditch. However, efforts immediately following the release were focused on determining the extent and thickness of released tailings and not on identifying wetland extent. During 2014, a detailed wetland delineation was conducted throughout the release areas. The entire area surrounding the July 2013 release areas are mapped as Udorthents, loamy cut and fill land in the soil survey indicating broad disturbance in the area. The National Wetland Inventory does not indicate the presence of wetlands within the area.

#### 5.1.1 Wetland 1

A total of 11 wetland data forms were completed within four transects spread across the area originally identified as wetland immediately following the release in July 2013 (Figure 3, Appendix C). All data plots meet hydrophytic vegetation criteria, which is what led to the initial wetland determination. The native soils within the 11 plots are a mix of hydric and non-hydric. Soils within Plots J-3-2, J-4-2, and J-5-2 have soils that do not meet hydric soil criteria. The western part of the area (Transects 4 and 5) has soils underlain by rock at 15-26 inches depth, and no saturation was observed throughout the depth of soil despite antecedent precipitation wetter than the normal range. The wetland boundary falls predominantly between Transects 2 and 3 (Figure 3). Transect 3 is underlain by rock at 9-20 inches in depth, only 1 inch of tailings deposits in Plot J-3-2, and no saturation present within Plots J-3-2 and J-3-3. Transect 2 has inundation of 12-18 inches. The north and east boundary of Wetland 1 extends beyond the tailings deposition area. Wetland 1 is primarily composed of shallow marsh wetland. No wetland areas have converted to upland as a result of the release.

#### 5.1.2 Area 2

The area originally mapped as Wetland 2 is a constructed ditch corridor developed to manage stormwater from the surrounding areas (Figure 3). Three wetland delineation data forms were completed throughout the ditch (Plots J-6-1, J-6-2, and J-6-3, Appendix C). Plots J-6-1 and J-6-2 showed that the native soil lying under the tailings deposition did not exhibit hydric characteristics and neither location had saturation present within 40-48 inches of the ground surface, which is at least 34 inches below the top of the native soil surface. Plot J-6-3 showed the presence of native hydric soils underlying 2 inches of tailings deposition. While the dominance test was met for hydrophytic vegetation, 75 percent of the herbaceous species are non-hydrophytes which were well-established prior to the release. No saturation was observed within 25 inches of the native soil surface despite antecedent precipitation wetter than the normal range.

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#### 4.6.5 Area 4

No tailings removal is proposed within Area 4 because the field evaluations indicate the presence of healthy vegetation of similar diversity and cover to that present before the release; removal of the extensive, healthy shrub layer would have detrimental effects on the wetland; and the area has stabilized with little potential for migration of tailings.

#### 4.6.6 Area 5

No tailings removal is proposed within Area 5 because the field evaluations indicate the presence of healthy vegetation of similar diversity and cover to that present before the release and the area has stabilized with little potential for migration of tailings.

#### 4.6.7 Area 6

No tailings removal is proposed in Area 6.

#### 4.6.8 Wetland A Ditch

Removal of deposited tailings is proposed within the entire 0.87 acre deposition area in Wetland A Ditch (Figure 6). In the southern portion of Wetland A Ditch, the disturbed areas along the east side will be flattened to provide pads for the excavator. The long reach excavator will scrape tailings from the ditch and load them into dump trucks for disposal in the Upland Basin. In the northern part, a temporary access road will be constructed into the center of the deposition area from the disturbed area on the north side (Figure 9). The road will be approximately 4 feet high, will have a 30 foot wide driving surface on which mats will be placed with safety berms along the sides meeting MSHA standards. Tailings will be scraped from the extent of the deposition area and will be windrowed along the road. Windrowed tailings will be loaded into dump trucks with an excavator for transport to the Upland Basin for disposal. In the center of the Wetland A Ditch, a temporary access road will be constructed from the east to allow the long reach excavator to reach the remaining deposition areas (Figure 9). Tailings will be scraped, loaded into dump trucks, and hauled to the Upland Basin. The temporary road will be removed upon completion. Vegetation within the restored shallow marsh wetland will be allowed to regenerate naturally and if deemed unsuccessful, supplementary seeding or planting will be implemented.

#### 4.6.9 Wetland B

No restoration is proposed within Wetland B because the field evaluations indicate the presence of healthy vegetation of similar diversity and cover to that present before the release and the area has stabilized with no potential for migration of tailings.

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Where trees and shrubs are eliminated during restoration, seeding and planting will be completed. Three methods will be employed for shrub and forest restoration:

1. Installing shrub cuttings
2. Planting tree seedlings
3. Shrub seeding

The restoration details provided in Sections 4.6, 5.6, and 6.6 were developed to reestablish the shrub and tree species documented within each area as closely as possible in species, density, and location, utilizing the plot data presented in Tables 1-3. However, two species will not be replanted, black ash and American elm. Both species have been, or are expected to be severely affected by pests and therefore, plant stocks are generally not available. Planting densities are proposed to match the existing densities with the expectation that there will be some mortality but also some regeneration from root stocks.

Willow and serviceberry species regenerate successfully from cuttings. Therefore, where these species were present, cuttings will be collected from existing wetlands on ArcelorMittal property and will be installed within the restoration areas during the fall or spring. Speckled alder and hazelnut are not known to regenerate from cuttings. Regeneration of speckled alder and hazelnut will be accomplished by collecting seed from existing wetlands on ArcelorMittal property and installing seed during the fall in the restoration areas of comparable size to the collection area. All tree species present in the restoration areas are available as seedlings. Seedlings of balsam fir (*Abies balsamea*), paper birch (*Betula papyrifera*), quaking aspen (*Populus tremuloides*), red maple (*Acer rubrum*), black spruce (*Picea mariana*), and white cedar (*Thuja occidentalis*) will be planted within the restoration areas where they are removed during tailings removal.

#### 4.6.2 Area 1

No tailings removal is proposed within Area 1 because the field evaluations indicate the presence of healthy vegetation of similar diversity and cover to that present before the release. Removal of the extensive, healthy shrub layer would have detrimental effects on the wetland and the area has stabilized with little potential for migration of tailings.

#### 4.6.3 Area 2

No tailings removal is proposed within Area 2 because the field evaluations indicate the presence of healthy vegetation of similar diversity and cover to that present before the release. Removal of the extensive, healthy shrub layer would have detrimental effects on the wetland and the area has stabilized with little potential for migration of tailings.

#### 4.6.4 Area 3

No tailings removal is proposed within Area 3 because the field evaluations indicate the presence of healthy vegetation of similar diversity and cover to that present before the release and the area has stabilized with little potential for migration of tailings.

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Removal of tailings from Wetland B was also considered. While access to Wetland B is possible, any access route would result in the loss of trees and shrubs from within the wetland and possibly adjacent upland areas. The 2014 field data indicate that there are no negative effects on the herbaceous, shrub, or forest vegetation within the wetland deposition areas. The tailings deposition has stabilized and has shown no signs of migration. The flow path and flow capacity within Wetland B have not been altered as a result of the incident. Therefore, attempts to remove the thin layer of tailings in Wetland B would not benefit the wetland, but would cause damage to the wetland.

## 4.5 Tailings Removal Methods

Several tailings removal methods (as described in the work plans) were evaluated in the field with the construction contractor based on the conditions observed. It was determined that the only viable method for removing tailings is using a long reach excavator to scrape tailings off the ground surface towards a stable access point for loading into 35 ton articulated dump trucks (Appendix G). Due to the soft soil conditions present, equipment will not be able to travel directly on the wetland ground surface, so temporary access roads or mats will be needed for stability. Temporary roads will be constructed using coarse tailings. Coarse tailings will be loaded into dump trucks with a front-end loader, the tailings will be dumped and spread with an excavator and dozer to form the temporary roads. Temporary roads will be constructed with a 24-30 foot driving surface, 3-4 foot thickness, double wide mats placed on the driving surface, and side safety berms meeting Mine Safety and Health Administration (MSHA) safety standards. Because the majority of the deposition areas contain primarily herbaceous and shrub vegetation with some trees, the excavator will clear the vegetation at the same time as the tailings removal. The tailings removed from the deposition areas, as well as the removal of tailings used to construct the temporary roads, will be hauled into the Upland Basin for disposal and will be spread using a dozer.

## 4.6 Restoration Plan

### 4.6.1 General Methods

This section discusses the general tailings removal and restoration methods that will be applied within those areas identified for restoration (Figures 5-8). Tailings removal will be completed by scraping the tailings off of the ground surface with a long reach excavator with approximately a 60 foot reach (Appendix G, PC390LC-10), which will include vegetation removal. To minimize the removal of native soil and root systems, a spotter will be utilized at the beginning of work in each area to help guide the operator to minimize over excavating. The overall goal will be to maintain a viable soil structure to allow for natural regeneration of the herbaceous layer, and to some degree, the shrub layer. Herbaceous vegetation is expected to recover from existing root systems, existing seedbank, and seed transport for the surrounding wetlands, therefore, no seeding is proposed immediately following construction. The restoration areas will be monitored closely the first year after restoration to determine the effectiveness of natural regeneration. Should the performance standards not be met, supplemental herbaceous seeding will be proposed targeting the native species present in adjacent, undisturbed areas, based on seed availability.

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Appendix B). Attempts at removal of tailings would likely eliminate the healthy shrub layer and set back the recovered herbaceous layer. Therefore restoration activities would not be beneficial.

#### **4.4.6 Area 6**

Within Area 6, the tailings deposits are uniformly spread across a smooth, soft ground surface. No tailings removal is proposed because only 8 square feet of tailings are located within the wetland.

#### **4.4.7 Wetland A Ditch**

Within Wetland A Ditch, the tailings deposits are uniformly spread across the smooth ground surface (Table 1). The soils are soft throughout the deposition area. With the primarily smooth soil surface, a thick tailings layer, and the dominance of invasive species (primarily narrow leaf cattail); there is a high potential for beneficial tailings removal without detrimental effects on the vegetative community. Because Wetland A Ditch is directly connected to downstream wetlands through a culvert, with open water areas, there is some potential for migration of tailings over time, so tailings removal will minimize the potential for downstream effects. Access to the southern portion of Wetland A Ditch is possible from the existing disturbed upland areas along the east side (Figure 9). Due to the extensive deposition area in the north and potentially wetter conditions, an access road will be constructed from the northern disturbed upland area through the middle of the deposition area. Access to the central portion of the deposition area will be completed by constructing a temporary road into the deposition area from the east (Figure 9).

#### **4.4.8 Wetland B**

Where tailings are present within Wetland B, they form a sporadic cover over a rough surface. The soils are generally firm throughout Wetland B except at the north end of the deposition area. The tailings deposition in Wetland B is spread within a long, narrow channel in a heavily forested area. The vegetation is recovering and is unaffected by the tailings deposition. Access would require clearing of trees and shrubs within a corridor along the channel that would result in unnecessary damage to the wetland adjacent to the channel (Figure 6, Appendix B). Tailings removal would not provide any benefits to the functioning of the wetland.

#### **4.4.9 Alternatives Considered**

Alternatives were evaluated that included removing all tailings deposited in Wetland A. While access is feasible to all areas of deposition in Wetland A, removal of tailings was determined to not be the most beneficial alternative in Areas 1-6 for several reasons. The field assessment data collected during September 2013 and July-August 2014 showed that wetland functions have been maintained; vegetation in all strata and all data plots has recovered to a healthy condition and density, similar to pre-incident conditions; no areas have converted to upland; no areas have converted to other wetland types; there has been no alteration of flow paths within the wetland; and the ground surface has stabilized so there is no apparent potential for further migration of tailings. Therefore, the proposed action is to monitor the areas again in 2015 to determine if there is any further migration of tailings. Removal of tailings is proposed within the entire Wetland A Ditch deposition area, due to the potential for downstream effects, other alternatives were not deemed beneficial.

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#### 4.4.2 Area 2

Within Area 2, tailings deposits are sporadic, only filling the hollows (Table 1). The soil surface is generally rough throughout Area 2 except near the tailings pipeline. The soils are soft throughout Area 2. Access to Area 2 is possible from the existing pipeline service road by building a road over the pipeline, which could provide access to Areas 1 and 2 but mats or a road would need to be installed to access the deposition area. However, due to the extensive vegetative cover that has developed within the wetland, a generally thick litter layer, and the lack of concentrated flows through the wetland (due to flat slopes across the nearly 0.5 mile long wetland); there is limited potential for further migration of tailings. The vegetation within Area 2 is unaffected, including the shrubs, which comprise 45 to 57 percent cover. The majority of Area 2 has a thin layer of tailings that has stabilized with healthy vegetation and attempts to remove tailings would eliminate the dense shrub layer and harm the root system due to the hummocky surface. Therefore, no restoration is proposed within Area 2, but the silt fence will be left in place and monitoring will be conducted in 2015 to determine whether or not there is further tailings migration. Upon documentation of tailings stabilization, the silt fence will be removed from the wetland.

#### 4.4.3 Area 3

Within Area 3, tailings deposits are uniformly spread across the areas where ground is smooth (within the southern two-thirds of the deposition area, M-3-4 through M-3-8) and sporadic in the northern one-third where the soil surface is rough (Table 1). The soils are soft throughout Area 3. Area 3 is recovering to conditions before the release with healthy vegetation documented throughout the area including herbaceous cover ranging from 45 to 90 percent, shrub cover ranging from 30-55 percent and total vegetative cover ranging from 75 to 145 percent (Table 1, Appendix B). Attempts at removal of the predominantly thin tailings layer would likely eliminate the healthy herbaceous and shrub vegetation and harm the root system in areas with a hummocky surface. Therefore restoration activities would not be beneficial. Upon documentation of tailings stabilization, the silt fence will be removed from the wetland.

#### 4.4.4 Area 4

Within Area 4, tailings deposits are uniformly spread across the areas where the ground surface is smooth and sporadic where the surface is rough (Table 1). There is no discernable pattern in soil roughness within the deposition area. The soils are soft throughout about one-half of Area 4 and firm in the other half. The vegetation throughout Area 4 is recovering to conditions before the release with healthy vegetation of similar density (65 to 75 percent herbaceous cover) and extensive shrub cover, ranging from 35 to 55 percent (Table 1, Appendix B). Attempts at removal of tailings would likely eliminate the healthy herbaceous and shrub layers and harm the root system due to the hummocky surface. Therefore restoration activities would not be beneficial.

#### 4.4.5 Area 5

Within Area 5, the tailings deposits are uniformly spread across the ground (Table 1). The soil surface is generally smooth throughout Area 5 with soft soils. The vegetation in Area 5 is recovering to conditions before the release with healthy vegetation of similar density and some shrub cover documented (Table 1,



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48 to 77 percent, primarily due to open water areas. The vegetation was determined to be unaffected by the tailings deposition with all vegetation of healthy appearance and similar density to before the release. In late July, 2014, the data points within the deposition area had water levels ranging from 2 inches below the ground surface to 4 inches of inundation.

#### 4.3.8 Wetland B

Five vegetation plots were characterized within Wetland B (Table 1), all within wetland and all but one within the deposition area (Figure 6). Three plots contain vegetation indicative of an alder thicket community dominated by speckled alder, willow, red maple seedlings, hazelnut, and balsam fir seedlings. The other two plots are characteristic of a conifer swamp understory; no trees within the plot area but shaded by the adjacent tree canopy. The wetland delineation data points indicate different community types because they were completed at the north extent of the deposition areas (Figure 2). Three non-native, invasive species are present within the wetland, including reed canary grass, prickly lettuce, and Canada thistle but only reed canary grass is considered dominant in one location. The vegetation was determined to be unaffected by the tailings deposition with all vegetation of healthy appearance and similar density to before the release. Inundation of 2-6 inches was documented within the ditch channel in all locations in late July 2014.

### 4.4 Tailings Removal Potential

The potential for tailings removal to provide greater benefits than natural recovery was evaluated through the consideration of several factors, including: plant community structure (discussed in Section 4.2), land surface features, soil stability, hydrology (see Section 4.2), and access.

#### 4.4.1 Area 1

Within Area 1, the thicker tailings deposits are uniformly spread across the ground (M-1-2 and M-1-3) while the tailings at M-1-1 only fill the hollows in the rough surface (Table 1). The soil surface ranges from smooth to rough throughout Area 1 and the soils are soft. Access to Area 1 is possible from the existing pipeline service road by building a road over the pipeline between Areas 1 and 2, but mats or a road would need to be installed to access the deposition area. There is some evidence of tailings migrating from the initial deposition between May 2013 and July 2014. However, due to the extensive vegetative cover that has developed within the wetland, a generally thick litter layer, and the lack of concentrated flows through the wetland (due to flat slopes across the nearly 0.5 mile long wetland); there is limited potential for further migration of tailings. The vegetation within Area 1 is unaffected, including the shrubs, which comprise 30 to 65 percent cover. Area 1 is recovering to conditions before the release and attempts at removal of tailings would likely eliminate the healthy and relatively dense shrub vegetation and harm the root system due to the hummocky surface in some areas. Therefore, no restoration is proposed within Area 1, but the silt fence will be left in place and monitoring will be conducted in 2015 to determine whether or not there is further tailings migration. Upon documentation of tailings stabilization, the silt fence will be removed from the wetland.

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area ranges from 30 to 55 percent, the herbaceous cover ranges from 45 to 90 percent, and the total vegetative cover ranges from 75 to 145 percent. The limited herbaceous cover in Plot M-3-1 is primarily due to the thick cattail litter layer and open water. The vegetation was determined to be unaffected by the tailings deposition with all vegetation of healthy appearance and similar density to before the release. Two of the nine data points had inundation up to 6 inches deep in late July 2014 and the remaining seven locations were saturated to the surface.

#### **4.3.4 Area 4**

Four vegetation plots were characterized within Area 4, all within wetland (Table 1). One plot contained vegetation indicative of a shrub carr community dominated by speckled alder and balsam poplar seedlings and the other three plots are characteristic of a shallow marsh community dominated by narrow leaf cattail, broad leaf cattail, Canada bluejoint, and field horsetail. Shrubs are present in all plots, predominantly composed of willow with some speckled alder and balsam poplar seedlings. Narrow leaf cattail is the only non-native, invasive species within the wetland, a dominant in most plots. Shrub cover within the deposition area ranges from 35 to 55 percent, the herbaceous cover ranges from 65 to 75 percent, and the total vegetative cover ranges from 100 to 130 percent. The vegetation was determined to be unaffected by the tailings deposition with all vegetation of healthy appearance and similar density to before the release. Three of the 15 data points in which hydrology was characterized had inundation up to 4 inches deep in late July 2014 and the remaining locations had the water table at the surface.

#### **4.3.5 Area 5**

Two vegetation plots were characterized within Area 5, one within the deposition area and one outside (Table 1). The plot within the wetland contains vegetation indicative of wet meadow and shallow marsh communities with some shrub cover. The understory was dominated by water horsetail and narrow leaf cattail with speckled alder and willow shrubs. Narrow leaf cattail and prickly lettuce were the non-native, invasive species within the wetland, which comprised 27 percent cover. Shrub cover within the deposition area is 25 percent, the herbaceous cover is 90 percent, and the total vegetative cover is 115 percent. The vegetation was determined to be unaffected by the tailings deposition with all vegetation of healthy appearance and similar density to before the release. In late July, 2014, the data point within the deposition area had water levels at the ground surface and the point outside of the deposition area had no saturation to a depth of 30 inches.

#### **4.3.6 Area 6**

Area 6 was not reevaluated due to the limited deposition within wetland (8 square feet).

#### **4.3.7 Wetland A Ditch**

Four vegetation plots were characterized within the Wetland A Ditch area, three within the deposition area and one outside (Table 1, Figure 6). The plots within the wetland contain vegetation indicative of a shallow marsh community with little shrub cover. The area was dominated by cattail and field horsetail. Narrow leaf cattail, reed canary grass, and thistle were the non-native, invasive species within the wetland, which comprised 30-60 percent cover. The total vegetative cover within the deposition area ranges from

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#### 4.2.8 Wetland B

The extent of measureable tailings currently in Wetland B is 0.74 acres (Figure 6), the same as originally characterized, and 0.71 acres is within delineated wetland. The tailings thickness currently ranges from 0-2 inches. Tailings thickness was determined in four new locations to accurately map the current extent of tailings. No migration of tailings was apparent since the release.

### 4.3 Vegetation/Community Health

#### 4.3.1 Area 1

A series of four vegetation plots were characterized within Area 1 (Table 1). Photos of the May 2013 vegetation plots taken during the 2014 field evaluations are included in Appendix B. The three plots within the wetland contain vegetation indicative of a shallow marsh community dominated by narrow leaf cattail and field horsetail and the plot on the wetland boundary (M-1-4) is characteristic of a wet meadow community dominated by field horsetail. Shrubs within the wetland comprised 30 to 65 percent cover including several willow species and balsam poplar seedlings. Narrow leaf cattail is the only non-native, invasive species within the wetland, which comprised 50 percent cover. The total vegetative cover ranges from 110 to 140 percent in all strata within the data plots. The vegetation was determined to be unaffected by the tailings deposition with all vegetation of healthy appearance and similar density to before the release. In late July, 2014, all five data points contained within the wetland had water levels within 8 inches of the ground surface with the wettest point containing 8 inches of inundation. The data point at the wetland boundary had no saturation within 12 inches of the ground surface.

#### 4.3.2 Area 2

A total of six vegetation plots were characterized within Area 2, all within wetland (Table 1). Two plots within the wetland contain vegetation indicative of a shrub carr community dominated by willow and the other four plots are characteristic of a shallow marsh community dominated by narrow leaf cattail and Canada bluejoint. Narrow leaf cattail and prickly lettuce comprise the two non-native, invasive species within the wetland, of which cattails were dominant throughout. Shrub cover within the deposition area ranges from 45 to 57 percent, the herbaceous cover ranges from 75 to 91 percent, and the total vegetative cover ranges from 105 to 135 percent. The vegetation was determined to be unaffected by the tailings deposition with all vegetation of healthy appearance and similar density to before the release. Four of the nine data points in which hydrology was characterized had inundation up to 8 inches deep, four locations were saturated to the surface, and the one location close to the wetland boundary had a water table 6 inches below the ground surface.

#### 4.3.3 Area 3

Four vegetation plots were characterized within Area 3, all within wetland (Table 1). One plot contains vegetation indicative of a shrub carr community dominated by willow and the other three plots are characteristic of shallow marsh and wet meadow communities dominated by narrow leaf cattail, Canada bluejoint, and meadow horsetail. Shrubs are present in all plots, predominantly composed of willow with some speckled alder, paper birch seedlings, and tamarack seedlings. Narrow leaf cattail is the only non-native, invasive species within the wetland, a dominant in most plots. Shrub cover within the deposition

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reevaluated in six locations (M-2-5 through M-2-10, Table 1) where the thickness increased in two locations and diminished in the other four locations. Tailings thickness was determined in four new locations to accurately map the current extent of tailings (Figure 5). It appears that there was some migration of tailings to a slightly larger area since the release, which has stabilized. Silt fence has been installed along the northern extent of the deposition area to prevent any further migration.

#### **4.2.3 Area 3**

The extent of measureable tailings currently in Area 3 is 0.2 acres compared to 0.17 acres originally characterized, and 0.18 acres is within delineated wetland (Figure 1). The tailings thickness currently ranges from 0-6 inches, almost all of which is less than 2 inches thick. Tailings thickness was reevaluated in two locations (M-3-8 and M-3-9, Table 1) where the thickness decreased slightly in both locations. Tailings thickness was determined in seven new locations to accurately map the current extent of tailings. It appears that there was minimal migration of tailings area since the release, but that has currently stabilized. Silt fence has been installed along the northern extent of the deposition area to prevent any migration.

#### **4.2.4 Area 4**

The extent of measureable tailings currently in Area 4 is 0.5 acres compared to 0.43 acres originally characterized, and 0.49 acres is within delineated wetland (Figure 5). The tailings thickness currently ranges from 0-9 inches, about half of which is less than 2 inches thick. Tailings thickness was reevaluated in two locations (M-4-15 and M-4-16, Table 1) where the thickness increased in one location and diminished in the other. Tailings thickness was determined in 13 new locations to accurately map the current extent of tailings. It appears that there was some migration of tailings to a slightly larger area since the release, but is currently stable.

#### **4.2.5 Area 5**

The extent of measureable tailings currently in Area 5 is 703 square feet (Figure 5); the same as originally characterized, but only 567 square feet is within delineated wetland. The tailings thickness currently ranges up to 6 inches. Tailings thickness was determined in two new locations to accurately map the current extent of tailings. No migration of tailings was apparent since the release.

#### **4.2.6 Area 6**

The extent of measureable tailings currently in Area 6 is 111 square feet (Figure 5); the same as originally characterized, but only 8 square feet is within delineated wetland. No additional characterization was conducted within Area 6.

#### **4.2.7 Wetland A Ditch**

The extent of measureable tailings currently in the Wetland A Ditch area is 0.89 acres (Figure 6), the same as originally characterized, and 0.87 acres is within delineated wetland. The tailings thickness currently ranges from 0-30 inches. Tailings thickness was determined in six new locations to accurately map the current extent of tailings. No migration of tailings was apparent since the release.

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## 4.0 Results – May 2013 Release

Field evaluations of the affected May 2013 release areas were conducted July 15-16, 2014; July 22-23, 2014; and August 5-8, 2014. Precipitation data for the three months prior to the field evaluations were obtained from the Minnesota Climatology Work Group using the gridded database precipitation worksheet. Precipitation during June and May were both wetter than the normal range (using the current normal period 1981-2010) and April was within the normal range. Therefore, the three-month score was 17 out of 18, indicating the assessments were conducted under wetter than normal conditions.

### 4.1 Wetland Delineation

The delineated wetland boundaries within the May 2013 release areas are shown on Figures 1 and 2. The entire Wetland A area is mapped as Water, miscellaneous in the soil survey indicating predominantly inundation. The soil survey mapping for Wetland B indicates the area as almost entirely Babbitt, bouldery-Aquepts, which the Natural Resources Conservation Service (NRCS) indicates contain approximately 50 percent hydric soils. The National Wetland Inventory (NWI) indicates the entire area of Wetland A as PFO4B, a saturated conifer swamp. The NWI mapping was completed prior to impoundment of Wetland A, which has resulted in the conversion to primarily shallow marsh and shrub swamp. Wetland delineation data forms are included in Appendix A. Wetland A is primarily composed of shallow marsh, alder thicket, and shrub carr communities. The south boundary of Wetland A is primarily represented by a gradual, natural transition to upland while the east boundary is formed primarily by the fill slopes of the adjacent mine road features. Wetland B is primarily composed of coniferous swamp and fresh wet meadow with a ditch channel running through much of the wetland. The boundaries of Wetland B are naturally-occurring with a less gradual transition at the south end where the road forms the boundary. The wetland boundaries were initially delineated in May 2013 and were rechecked in July and August 2014. No wetland areas have converted to upland as a result of the release.

### 4.2 Tailings Thickness

#### 4.2.1 Area 1

The tailings thickness and extent within Area 1 (Figure 5) have changed slightly since the initial characterization in 2013. The total wetland area affected by tailings is 0.09 acres compared to 0.06 acres originally and the depths currently range from 0- 10 inches. Tailings thickness was reevaluated in two locations (M-1-5 and M-1-6, Table 1) where the thickness increased in one location and diminished in the other. Tailings thickness was determined in four new locations to accurately map the current extent of tailings (Figure 5). It appears that there was some migration of tailings to a slightly larger area since the release, which has stabilized. Silt fence has been installed along the northern extent of the deposition area to prevent any further migration.

#### 4.2.2 Area 2

The extent of measureable tailings currently in Area 2 is 0.31 acres compared to 0.28 acres originally characterized, but only 0.28 acres is within delineated wetland (Figure 5). The tailings thickness currently ranges from 0-12 inches, the majority of which is less than 2 inches thick. Tailings thickness was

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### **3.1.5 Removal Method Evaluation**

The specific tailings removal methods described in the work plans were discussed with a contractor in the field to assist with developing the restoration plan details.

### **3.1.6 Develop Restoration, Monitoring, and Replacement Plan**

A wetland restoration plan was developed after evaluating all of the characteristics described above. Following the development of a draft restoration plan, the areas were again field-checked to verify and refine the proposed restoration areas. A monitoring plan, restoration performance standards, and a schedule for the restoration work have also been developed. Finally, the need for a compensatory mitigation plan was evaluated based on the proposed restoration activities.

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### 3.1.3 Vegetation/Community Health Characterization

A series of transects were established throughout each deposition area with several data points in each transect to document the vegetation community and health of the vegetation. The purpose of this evaluation was to document the progress of natural recovery in returning wetland functions as well as documenting the specific herbaceous, shrub, and tree cover to assist with planning restoration efforts. The health of vegetation within each stratum was assessed using the following criteria:

- Fair – dead plants, diminished vegetative cover
- Good – some stress noted in color or vigor
- Unaffected – vegetation healthy and similar to unaffected wetland areas

### 3.1.4 Tailings Removal Potential

The feasibility of environmentally beneficial tailings removal was evaluated in all deposition areas. Several factors, including: plant community structure, land surface features, soil stability, hydrology, and access; were evaluated to determine areas that would benefit from restoration efforts and those areas that would not. The areal vegetative cover was estimated within each vegetation stratum, including herbaceous, shrub, and tree layers.

The nature of the deposition layer was evaluated to help understand where removal efforts may have greater impact on the overall vegetative recovery. Two categories were developed for this evaluation:

- Uniform – a uniform and contiguous layer of tailings is present across the ground surface
- Sporadic – tailings only deposited within the hollows or depressions in the land surface

The soil surface characteristics were also evaluated to provide a measure of surface roughness, which was also deemed valuable for understanding the benefits or effects of removal efforts. Two categories were developed to assess the soil surface:

- Rough – undulations (hummocks and hollows) greater than 3 inches
- Smooth – surface roughness less than 3 inches

A general assessment of soil stability was conducted to determine the need for special measures to allow for equipment access. Soils were generally deemed soft where organic soils were present and firm where mineral soils were present and walking did not result in sinking into the soil surface.

- Soft – Predominantly organic soil or waterlogged mineral soil
- Firm – Predominantly mineral soil

Finally, accessibility to the deposition areas was evaluated in the field with a contractor to identify potential methods and constraints for restoration.

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## 3.0 Methods

The Work Plans were developed to evaluate the natural recovery of affected wetlands, the feasibility of tailings removal from wetlands, the potential for wetland restoration, and the development of a restoration and mitigation plan. The purpose of the study was to document affected wetland areas in more detail, determine beneficial restoration methods and extents, and plan for restoration efforts.

### 3.1 Work Plan Components

The Work Plan included six major components:

1. Wetland Delineation
2. Tailings Deposition Characterization
3. Vegetation/Community Health Characterization
4. Tailings Removal Potential
5. Removal Method Evaluation
6. Develop Restoration, Monitoring, and Replacement Plan

#### 3.1.1 Wetland Delineation

The boundaries of wetlands affected by the releases were delineated in 2013 and 2014 to ensure the extent of affected wetlands and to determine if any areas had converted to non-wetland or other wetland community types as a result of the releases. Wetland delineations were conducted using guidance from the USACE, including the Routine On-Site Determination Method as specified in the *1987 Wetlands Delineation Manual* (USACE, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)* (USACE, 2012). Wetland boundary points were located with a Trimble GeoXH 6000 Global Positioning System (GPS) unit, capable of recording positions with sub-foot horizontal accuracy. These points were digitized in ArcView© 10.2 Geographic Information System software to determine the extent of wetlands and deposition.

#### 3.1.2 Tailings Deposition Characterization

The intent here was three-fold: 1) to remeasure tailings thicknesses to evaluate migration, 2) evaluate areas beyond the documented deposition to assess migration, and 3) to provide more detailed documentation of tailings thicknesses and extent.

Approximately 25 percent of previously characterized areas were selected and tailings thicknesses were remeasured using a Dutch auger and measuring the thickness of tailings over the soil layer with a tape measure. Generally, one to four additional monitoring locations were added adjacent to the various deposition lobes to document the current extent and depth of tailings within wetlands. Finally, between two and 12 additional data points were established to add detail to the tailings thickness distribution within each of the deposition areas.



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## 2.0 Introduction

On May 19, 2013, a pipeline coupling failure at ArcelorMittal Minorca Mine Inc. (ArcelorMittal) resulted in an accidental release of fine taconite tailings between the Plant Site and the Upland Tailings Basin. The tailings were released into the tailings pipeline ditch containment system, which overflowed into a ditch through Wetland A and a ditch within Wetland B.

On July 30, 2013, at ArcelorMittal, a short section of steel pipe on the odd tailings line developed a hole in the bottom section, which resulted in an accidental release of fine taconite tailings approximately 2,000 feet from the Plant Site towards the Upland Tailings Basin. The tailings were released into the tailings pipeline corridor, which overflowed through low areas into an adjacent wetland and ditch.

On April 7, 2014, ArcelorMittal discovered a washout of the access road and main perimeter dam along the west abutment of the Upland Tailings Basin (Upland Basin). Based on the investigation into the cause of this incident, it has been determined that a failure occurred at the main perimeter dam along the west abutment. Materials composed of a mixture of fine tailings, coarse tailings, and overburden soils that were used to construct the dam and roadway were deposited into nearby wetland areas.

In response to correspondence from the Minnesota Department of Natural Resources (MNDNR) on February 18, 2014, correspondence from the U.S. Army Corps of Engineers (USACE) on March 18, 2014, and subsequent meetings and discussions with both agencies; ArcelorMittal developed work plans for evaluating affected wetlands and developing a restoration plan (Work Plan). This report contains the results of the field evaluations and restoration planning efforts stemming from those work plans.

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## 1.4 Monitoring and Performance Standards

Vegetative performance standards have been developed to guide management activities and ensure adequate restoration. Annual monitoring will be conducted for up to five years in shrub and forested areas and three years in other habitats. Vegetation data will be collected along with photographs to document compliance with the performance standards and to determine the need for corrective actions. A monitoring report will be submitted by January 31 in the year following each monitoring event.

## 1.5 Compensatory Wetland Mitigation

A total of 4 acres of substantially diminished quality wetland will be restored through the removal of tailings and sediment and reestablishing wetland vegetation, including the restoration of 0.4 acres that has converted to upland. Compensatory wetland mitigation will be provided at a 1:1 ratio for 2.82 acres of wetland affected by the incidents through the purchase of existing wetland bank credits, preferably within Bank Service Area 2, but if suitable credits are not available, potentially from within Bank Service Area 1. The remaining 8.34 acres of wetlands in which deposition occurred, have recovered or are expected to recover to provide similar functions to nearby, unaffected wetlands. Therefore, no compensatory mitigation is proposed for those areas.

## 1.6 Schedule

Proposed restoration activities are planned for October 2014 to December 2014, weather conditions permitting. Vegetative restoration activities are planned for to start in 2014 and be completed by the end of 2015. Monitoring will be started in 2015, following the completion of construction.

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Land slopes in the south lobe average about 1.5 percent with the southeast side a headwater area with no contributing watershed other than from the adjacent access road. There is no potential for tailings migration due to the lack of contributing watershed, flat slopes, and no evidence of concentrated flows. The affected wetland area is relatively diverse with 3-12 herbaceous layer species and 4-7 shrub and tree species. Cattails are the most commonly found invasive species, but generally do not exceed 25 percent cover. In the south lobe, water levels ranged from 4 inches below the ground surface to 4 inches of inundation in July 2014.

In the south lobe, herbaceous vegetation was noted as unaffected in two locations, stressed in half of the plots, and reduced in cover or dead in one-third of the plots, Shrub vegetation was noted as unaffected in over half of the plots, stressed in one-third of the plots, and substantially diminished in one plot. Trees in the south lobe were noted as unaffected in over 70 percent of the plots, stressed in two locations, and substantially diminished in one plot. The thickest deposits will be removed and wetland restored over an area of 2.44 acres encompassing the two areas of the thickest deposition. Access will be gained by constructing a temporary access road approximately 650 feet long, which will be removed upon completion. Herbaceous vegetation will be allowed to reestablish from root stocks and the seed bank, Shrub vegetation will be restored by planting approximately 800 willow and serviceberry cuttings and collecting and planting speckled alder and hazelnut seed. Trees will be planted as bare-root stock, including four species and approximately 1,200 plants.

### **1.3.2 North Lobe**

In the north lobe, a wetland boundary is present along the east side of the deposition area and through the southern part of the deposition. A total of 1,570 square feet of wetland has been converted to upland in the north lobe as a result of the deposition. Sediment was deposited in 2.17 acres of wetland within the north lobe. The north lobe wetlands are classified primarily as alder thicket with some shallow marsh and forested swamp habitats with shrub and tree cover ranging from 44 to 100 percent and herbaceous cover ranging from 40 to 65 percent. Approximately 80 percent of the north lobe is covered by 2 inches or less of sediment with up to 16 inches in one area.

Land slopes in the north lobe average about 1.5 percent and is a headwater other than contributions from the adjacent access road. There is no potential for tailings migration due to the lack of contributing watershed, flat slopes, and no evidence of concentrated flows. The affected areas are relatively diverse with 5-11 herbaceous layer species and 4-5 shrub and tree species. Invasive species were generally not present with the north lobe. In the north lobe, water levels in July 2014 ranged from nearly 2 feet below ground to 2 inches of inundation.

In the north lobe wetland, herbaceous vegetation was noted as unaffected in two locations and reduced in cover or dead in one plot, Shrub and tree vegetation were noted as unaffected in all locations. The thickest deposits will be removed and wetland restored within 0.05 acre, including the area that has converted to upland. Access will be gained by placing mats into the wetland restoration area. Herbaceous vegetation will be allowed to reestablish from root stocks and the seed bank, Shrub vegetation will be restored by collecting and planting speckled alder and hazelnut seed. Trees will be planted as bare-root stock, including two species and approximately 50 plants.

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Wetland B is located north and downstream of Wetland A. The wetland is fairly diverse with 11-14 herbaceous species and 4 species in the herbaceous layer. The 2 inches or less of tailings have stabilized in a flow channel containing 2-4 inches of water. The vegetation is healthy and similar in density and diversity to adjacent wetland areas not affected by the release. Access to the area would result in damage to shrub and tree vegetation within the wetland. No restoration is proposed because the field assessment shows that the area has recovered wetland functions to pre-incident conditions.

## 1.2 July 2013 Release

A short section of steel pipe developed a hole resulting in the accidental release of tailings into a constructed ditch and Wetland 1. The ditch was initially identified as wetland following the release, but a 2014 wetland delineation determined that the area does not have wetland characteristics. Wetland 1 was initially mapped in 2013 based primarily on the presence of hydrophytic vegetation. A wetland delineation was conducted in 2014 and portions of the previously mapped area were determined to not be wetland. Tailings were deposited in 0.88 acres of Wetland 1, a shallow marsh community. Tailings thicknesses range up to 10 inches in the western part of the wetland.

There is no outlet from the wetland, so there is no potential for tailings migration. The affected area is low in diversity with only 3 to 4 species and a predominance of invasive cattails with some reed canary grass. Water levels ranged from 12 to 18 inches of inundation in July 2014. The cattails showed signs of some yellowing in the thicker deposition areas but at similar densities to adjacent areas not affected by the release. The 0.64 acres of wetland that showed vegetative stress will be restored by removing tailings. Herbaceous vegetation will be allowed to reestablish from root stocks and the seed bank. Approximately 50 willow shrub cuttings will be installed and 50 bare-root trees will be planted to restore the small component of shrub and forest habitat along the edge of the affected area. Access will be gained by constructing a temporary access road, which will be removed upon completion.

## 1.3 April 2014 Upland Basin

A failure of a section of the main perimeter dam, west abutment at the Upland Tailings Basin resulted in an access road washout and material deposition into two adjacent wetland areas. Immediately following the incident, the affected areas were characterized to the degree feasible, but detailed evaluations were not possible due to snow cover. Therefore, wetland delineations and detailed characterization of the areas were completed in July and August 2014.

### 1.3.1 South Lobe

The entire south lobe deposition area is contained within wetland and the nearest natural upland area is located approximately 400 feet west of the deposition. Sediment was deposited in 9.47 acres of wetland in the south lobe. Wetlands within the south lobe are classified as alder thicket, shrub carr, hardwood swamp, and conifer swamp communities with shrub and tree cover ranging from 31 to 117 percent and herbaceous cover ranging from 3 to 75 percent. Sediment thicknesses range up to 18 inches in the south lobe with over half of the area covered by less than 6 inches.

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## 1.0 Executive Summary

This report was prepared to address three incidents that occurred in 2013 and 2014, in which tailings and sediment were deposited in wetlands. The format follows approved work plans developed to assist in further evaluating conditions in the wetlands and developing restoration and mitigation plans. The components of the work plans include:

- delineating wetlands,
- characterizing the extent and thickness of deposition,
- documenting the wetland vegetative composition and health,
- assessing the potential for beneficial tailings removal and wetland restoration,
- evaluating methods for restoration,
- developing a wetland restoration plan and replacement plan,
- providing monitoring provisions, and
- presenting a schedule

### 1.1 May 2013 Release

A pipeline coupling failure resulted in the accidental release of tailings into 7 areas of Wetland A, including a constructed ditch, along with a second wetland, Wetland B. The wetlands were delineated in 2013 and the boundaries were checked again in 2014. Tailings were deposited in 1.93 acres of Wetland A and 0.71 acres of Wetland B. Wetland A is a combination of shallow marsh and shrub carr community types and Wetland B is predominantly alder thicket. Tailings thicknesses ranged up to 12 inches in the western part of Wetland A, 30 inches in the Wetland A ditch, and 2 inches in Wetland B.

There are 6 areas of deposition in the western part of Wetland A, characterized as shallow marsh and shrub carr. The 2014 field data showed some migration of tailings in two areas between 2013 and 2014. Silt fence was installed along the downgradient edge of those areas in 2014 to prevent any further migration. The affected areas are low in diversity with a predominance of invasive cattails and willow predominant in shrub carr areas. Water levels ranged from being present at the ground surface to 8 inches of inundation. The vegetation within all 6 areas was documented as healthy and at similar densities to adjacent areas not affected by the release. While access is possible to the 6 deposition areas, no restoration is proposed because the field assessment shows that the area has recovered wetland functions to pre-incident conditions.

The Wetland A ditch is located in the eastern part of Wetland A, composed entirely of shallow marsh. By 2014, the tailings have stabilized under a thick litter layer and there was no evidence of tailings migration. The area is low diversity with a predominance of healthy, invasive cattails and water levels in July 2014 ranging from 2 inches below the surface to 4 inches of inundation. Because of the thick tailings deposition and connection to downstream wetlands, the entire 0.87 acre Wetland A ditch deposition area is proposed to be restored. Herbaceous vegetation will be allowed to reestablish from root stocks and the seed bank. Access in the southern half will be gained from the adjacent road berm. Access to the northern half will be gained by constructing a temporary access road, which will be removed upon completion.

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# Pipeline Tailings Release and Upland Basin Sediment Release Evaluation and Restoration Report

September 19, 2014

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