As-Built Report for the Cranberry Lake, Highway 103, HADD Compensation Project: Shoreline and Slope Vegetation in 2004 and 2005

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Installation

(1) Vegetation Salvage and Transplanting During in-filling construction (2004)

During the construction phase of in-filling Cranberry Lake, large clumps of lakeshore native vegetation established in an organic muck (mud) soil were dug using excavators, and directly placed on a rock sill (east end), or the newly exposed mud wave that resulted from the in-filling (photographs are provided in three accompanying *PowerPoint® files*). The direct salvaging and replanting of vegetation took place at the eastern end from Stations 10+400 to 10+500 and at the western end from Stations 10+640 to 10+680 (see also the large format overview drawing).

Plant species transplanted with the mud from the original lake shore consisted of typical wetland species: Cattails, *Spartina* spp., other riparian grasses, sedges, Bulrush, Soft Rush, herbaceous plants (Asters, Goldenrods, and riparian wild flowers), Labrador Tea, Leatherleaf, Sweet Gale, and Meadowsweet.

Also during the construction phase, selected species of native vegetation in a drier soil which would have been grubbed in the construction zone were dug as plant community clumps and placed on the fore slope area for holding. After the slope was constructed, these clumps were placed on the rock at the bottom of the new slope from Stations 10+480 to 10+630. After placement, excavator scoops of mud were placed on the slope above the clumps to water the clumps and somewhat protect them. Much of the soil in these clumps had dried out, but it was hoped the vegetation would recover, and at minimum would provide a seed and root bank for re-generation of shrubs.

The plant community in the drier soil transplanted as clumps on top of the rock shoreline consisted of species typical of roadside mesic soils: Meadowsweet, Wild Rose, Sweet Gale, Leatherleaf, Soft Rush, Bullrush, sedges, grasses, wild flowers (Goldenrods, Asters), and various introduced weedy species.

In summary, by September 2004, the new shoreline of Cranberry Lake consisted of:

- Mud (Stations 10+400 to 10+500). 100 shoreline m of transplanted mud with dense vegetative cover
- Rock (Stations 10+480 to 10+630). 125 shoreline m of transplanted clumps of salvaged vegetation set on top of the rock shore
- Mud (Stations 10+640 to 10+680). 40 shoreline m of transplanted mud with dense vegetative cover.

Table 1 is a summary of the shoreline vegetation and its origin by station. Table 2 provides a history of photo documentation taken during construction, periodic observation and monitoring.

Table 1. Shoreline Vegetation at the End of Infilling, 2004 (Prior to Further Planting).

Station	On Slope (Length)	Shoreline
10+360	Large Rock	Undisturbed soil, native understorey vegetation
10+380	Large Rock	Undisturbed soil, native understorey vegetation
10+400	Large Rock (14 m)	Mud, water covered, occasional plants
10+420	Large Rock (13 m)	Mud, salvaged clumps of native riparian vegetation
10+440	Large Rock (12 m)	Mud, salvaged clumps of native riparian vegetation
10+460	Large Rock (10 m)	Mud, salvaged clumps of native riparian vegetation
10+480	Rock (10 m)	Mud, salvaged clumps of native riparian vegetation
10+500	Rock (8 m)	Rock, soil present, some open water, islands of mud vegetation; end of transplanted mud vegetation; Transplanted mesic soil communities on top of rock
10+520	Rock (8 m)	Rock at shore, soil on top of rock present from transplanted mesic soil communities
10+540	Rock (7 m)	Rock at shore, soil on top of rock present from transplanted mesic soil communities
10+560	Rock (5 m)	Rock at shore, soil on top of rock present from transplanted mesic soil communities
10+580	Rock (4 m)	Rock at shore, soil on top of rock present from transplanted mesic soil communities
10+600	Rock (6 m)	Rock at shore, soil on top of rock present from transplanted mesic soil communities
10+620	Rock (6 m)	Rock at shore, soil on top of rock present from transplanted mesic soil communities, ending around 10+630.
10+640	Rock (4 m)	Mud, salvaged clumps of native riparian vegetation
10+660	Rock (4 m)	Mud, salvaged clumps of native riparian vegetation
10+680	Rock (4 m)	Mud, salvaged clumps of native riparian vegetation
10+700	Gravel	Ditch leading to lake

Table 2. Photo Documentation, 2004-2005 (see also accompanying *PowerPoint® file*s).

Date	Activity
June 8, 2004	Pre-construction
June 14, 15, 16, 17, 25, 2004	Construction, salvaging and replacement of mud vegetation
July 4, 2004	Construction, plant clumps set out on future median for storage
July 7, 8, 2004	Picking up and placing vegetation clumps; mud placed uphill from clumps to help conserve moisture
July 13, 2004	Construction finished. Station stakes at top of slope, looking down towards water
September 8, 2004	Representative photos. Approximately at Sta 10+640
September 22, 23, 2004	Station stakes at all stations
June 7, 2005	Miscellaneous photos. Willow stakes.
July 5, 2005	Median, 10+640, Willow stakes sprouting
August 23, 2005	Median, only
September 13 - 14, 2005	All Station stakes from top to down and at stake, with surrounding vegetation. Photos of spring 2005 plantings.
September 13 - 20, 2005	Hydroseeding slope contract, filling rip rap with gravel, topsoiling, adding compost
September 21 and 27, 2005	After hydroseeding and erosion control blanket
October 2005	Occasional photos

***(2) Plantings - Fall 2004 (see accompanying PowerPoint® file*s)**

Several individual transplants of native vegetation were also salvaged from 'Wetland #2' (originally located approximately 3 km west of Cranberry Lake at Watercourse H; this wetland was subsequently in-filled in October 2004). The transplants were placed on or near the shore towards the west end of the Cranberry Lake slope (near Station10+620). Major species included Spruce, Fir, Larch, Maple and Wild Raisin. Each transplant was marked with orange survey ribbon.

*(3) Plantings - Spring 2005 (see accompanying PowerPoint® file***s)**

In the spring of 2005, several dormant stakes of Willow (*Salix* spp.) and Red Osier Dogwood (*Cornus sericea*) were installed towards the western end of the slope. The Willow cuttings were installed in a sandy substrate between the water and the rock slope (near Station 10+500), and in the salvaged soil clumps near Station 10+540. The Red Osier Dogwood were planted in the salvaged soil (between Stations 10+620 and 660).

(4) Topsoil and Seeding - Fall 2005 **(***see accompanying PowerPoint® file***s)**

In September of 2005, the rock slope supporting the new lanes above the new lake shore was prepared for the establishment of seeded vegetation by filling the spaces at the western end with gravel, and the eastern end with surge rock, then gravel. The surface was then covered with about 20 cm of topsoil with compost on top and mixed in with the top centimeters of topsoil. The slope was hydroseeded with the '*Nova Scotia Highway Mix'* and immediately covered with erosion control blanket (September 20). Periodic observations following the seeding led to a few repairs of rilling that appeared after heavy rains. By mid-November, the grass cover was well established, with no bare soil exposed.

Monitoring

(1) Monitoring Station Stakes

Monitoring Station stakes were placed directly down the slope from the construction stakes (every 20 m) onto the shore vegetation. Photos of the monitoring stations are provided in two of the accompanying *PowerPoint® file*s. Shore vegetation consisted of wetland/mud communities and mesic communities on top of the rock shoreline. These stakes will serve as permanent monitoring stations for recording vegetation cover and species changes. Along with the stakes at the top of the slope, a vegetation monitoring transect can be taken from the top of the slope down and into the vegetative cover along the shoreline to give percent cover over the slope.

(2) Photo Monitoring

'Baseline' photos were taken in the fall of 2004 at each construction stake (top of slope) to the Station Stake at the bottom. Initial monitoring took place through the use of photos in the spring of 2005. Monitoring in the fall of 2005 consisted of photos from top stake to bottom and photos at the bottom stake and photos along the shore between the stakes.

(3) Percent Cover, Plant Species Present and Changes

Vegetation density (percent cover) and major species present within an approximate (estimated) two metre square at each bottom station stake were noted at each station in September 2005. This provides a baseline to record changes in species composition over the years. These will be noted annually for a five year period (2009) and with less frequency after that.

Table 3 is a summary of the type of vegetation community, whether native or not, the major plant species present and percent cover for each station in September 2005. For some stations, the percent of each species present that constitute the cover is also presented.

Table 3. Cranberry Lake Vegetation Data, Fall 2005.

Station	Vegetation Type	Percent Native	Percent Cover	Major Species*	Percent Species in Vegetation Present
10+360	Shrub, dry	100	80	Bracken Fern	80
				Huckleberry	20
				Forest floor spp. coming up	
10+380	Shrub, dry	100	100	Huckleberry	70
				Rhodora	10
				Lambkill	10
				Blueberry	5
				Fern	2
				Moss	3
10+400	Native wetland	100	Mostly large rocks	Cattail	20
				Meadowsweet	40
				Pickerel in water	40
10+420	Native wetland + Aster	100	100	Cord Grass	80
				Aster	10
				UI wetland herbaceous	10
				Some Sweet Gale, Leatherleaf, Bulrush	
10+440	Native wetland + Aster	100	100 Includes a "dead" cattail patch	Cattail	50
				Soft Rush	50
				Meadowsweet, Aster nearby	
10+460	Native wetland + Aster	100	100	Cattail	40
				Bulrush and Soft Rush, wetland grasses	20
				Sweet Gale	10
				Aster	30

Station	Vegetation Type	Percent Native	Percent Cover	Major Species*	Percent Species in Vegetation Present
10+480	Native wetland	100	100	Cattail	40
				Wetland grasses	40
				Bulrush	10
				Soft Rush	5
				UI herbaceous wetland, Aster spp.	5
Between 480 and 500				Willow stakes from spring 2005; 2 well established, 4 with no sprouts. Willow stake in with dense wetland vegetation	
10+500	Mixed	?	Rock = 50% of cover	Soft Rush, Aster, Weeds, dead sticks	
10+520	Mixed	?	10	Goldenrod, Aster, weeds , dead sticks	
Between 520 and 540				Willow wattle from spring 2005 with live growth at one end	
10+540	Mixed: weedy to wetland	?	30	Clover, Plantain and other weeds (thistle), grasses, Soft Rush, Bulrush, Leatherleaf sprouts, Aster	
				Willow stakes from spring 2005: 1 alive, 13 dead	
10+560	Mixed: weedy to wetland	?	10	Mostly dead twigs Aster sp. Narrow leaf Goldenrod, Bulrush, grasses	
10+580	Mixed: Weedy to wetland	?	50	Aster sp., Soft Rush, weeds (Hawkweed, Knapweed), grasses (Timothy); Leatherleaf, Cranberry, Aronia	
10+600	Old Field	70	70	Aster spp.	60
				Grass, Spirea, weeds	40
10+620	None	0	5	Weeds	
Near 620 station				Fall 2004 plantings: Spruce, Fir, Larch, Maple, Wild Raisin	
Between 620 and 640				Spring 2005 planting: Red Osier Dogwood: 4 live ones found. Sensitive Fern near.	

Station	Vegetation Type	Percent Native	Percent Cover	Major Species*	Percent Species in Vegetation Present
10+640	Native Wetland	100	100	Diverse, 13 - 15 species: Narrow-leaf Goldenrod, Aster spp., Leatherleaf, Sweet Gale, grasses, Sphagnum, Cranberry, Labrador Tea	
Between 640 and 660				Spring 2005 planting: Red Osier Dogwood	
10+660	Native Wetland	100	100	Sweet Gale	60
				Cattail	20
				Riparian grasses	20
				Other nearby: Narrow leaf Goldenrod, leatherleaf, herbaceous wetland	
10+680	Native wetland	100	100	Riparian grasses	90
				Sweet Gale	10
				Other nearby: Spirea, Cattail	

* Common and Scientific Names of Native Species Noted

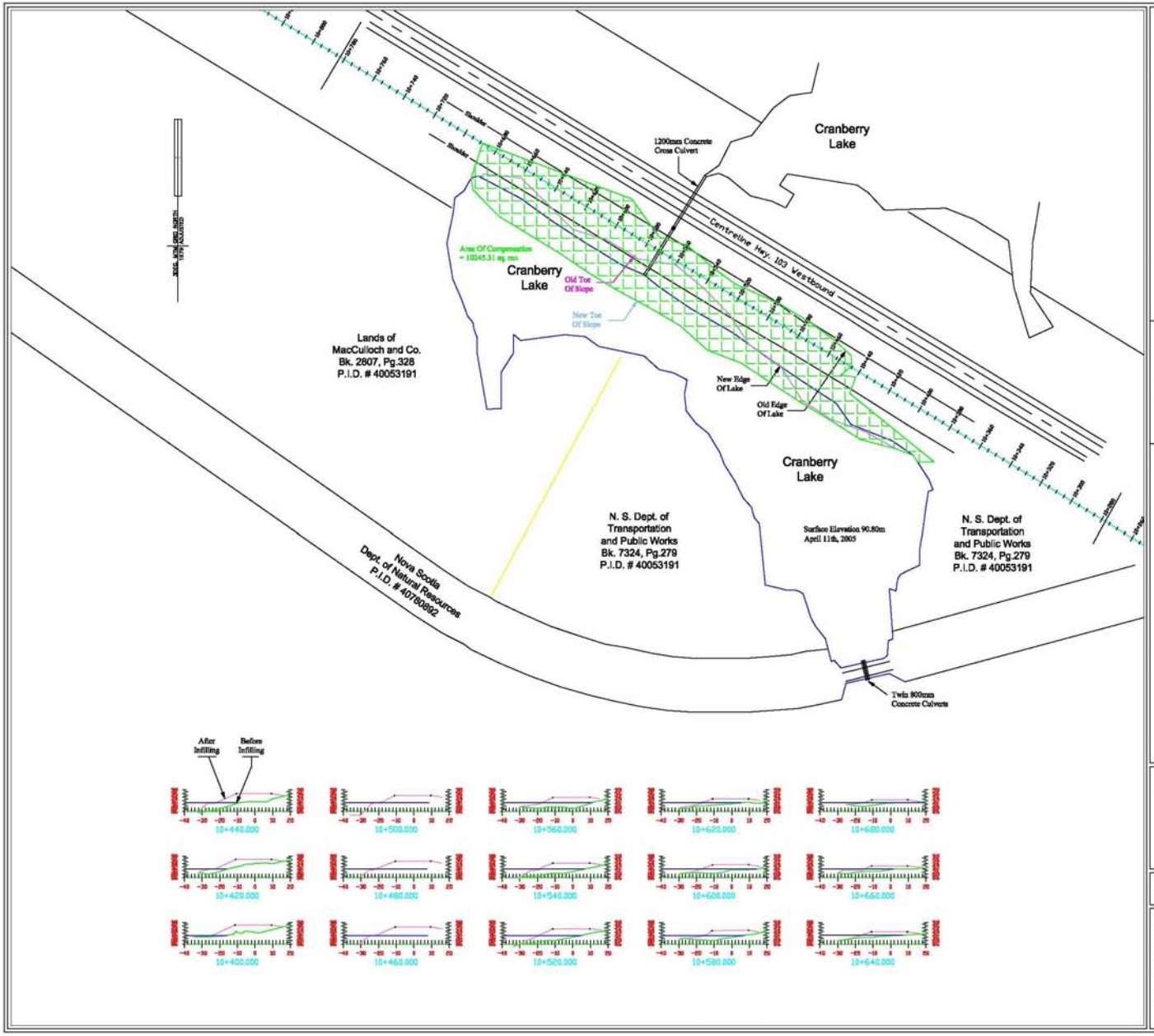
Ferns
Bracken Fern *Pteridium aquilinum*
Sensitive Fern *Onoclea sensibilis*

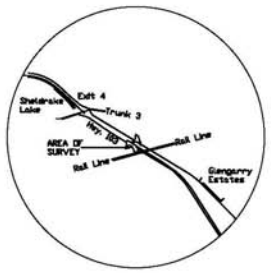
Monocots
Cattail *Typha* spp.
Bulrush *Scirpus cyperinus*
Soft Rush *Juncus effusus*
Sedges *Carex* spp.
Cord Grass *Spartina* spp.
Pickerel-weed *Pontederia cordata*
Riparian Grasses - not identified

Wild Flowers
Narrow-leaf Goldenrod *Euthamia graminifolia* (L.) Nutt.
Aster *Aster* spp.

Shrubs
Black Chokeberry *Aronia melanocarpa*
Blueberry *Vaccinium* spp.
Cranberry *Vaccinium* spp.
Huckleberry *Gaylussacia baccata*
Labrador Tea *Ledum groenlandicum*
Lambkill *Kalmia angustifolia*
Leatherleaf *Chamaedaphne calyculata*
Meadowsweet *Spirea alba*
Red Osier Dogwood *Cornus sericea*
Rhodora *Rhododendron canadense*
Sweet Gale *Myrica gale*
Wild Raisin *Viburnum nudum*
Wild Rose *Rosa virginiana*
Willow *Salix* spp.

Trees
Red Maple *Acer rubrum*
Spruce *Picea* spp.
Fir *Abies balsamea*
Larch *Larix laricina*





Key Plan

Scale - 1:50,000

Legend

- Control Point
- Centreline of Hwy.
- Catch Basin Cover

SCALE 1:1000

20 0 20 40 60 80 100

Cranberry Lake Infill
Highway 103
As-Built

COUNTY Halifax HIGHWAY 103

SURVEYED BY P.F.
DRAWN BY P.F.
TRACED BY
DATE OF PLAN May 10, 2005
CHECKED
APPROVED 200

A.F.E. No.

APPROVED 200
APPROVED 200

NSDOT FILE No.
NSDOT PLAN No.

SHEET 1 OF 1

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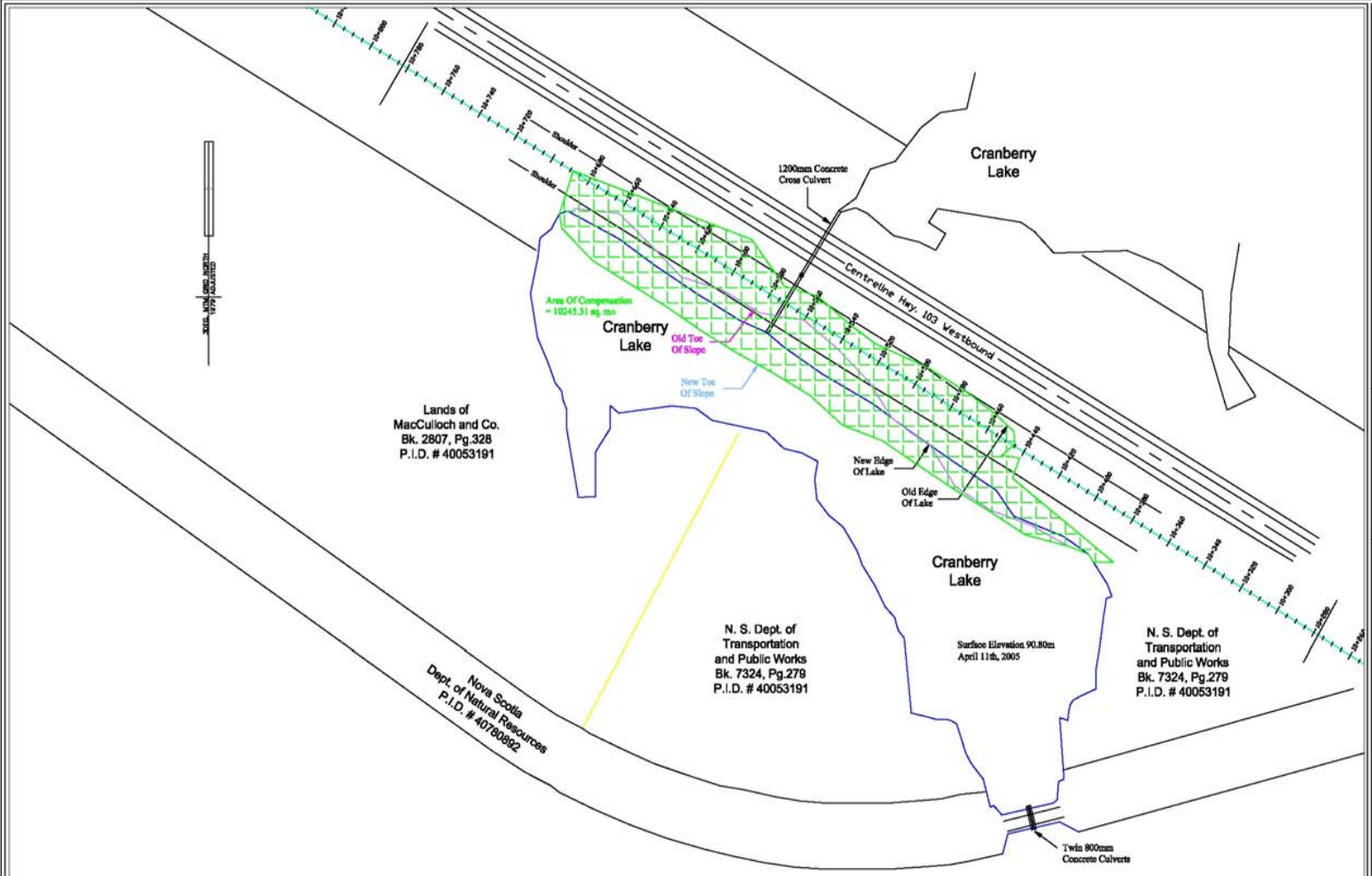
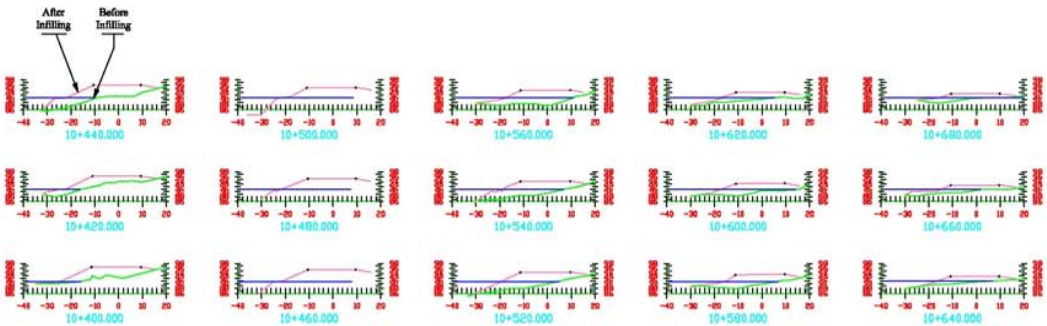
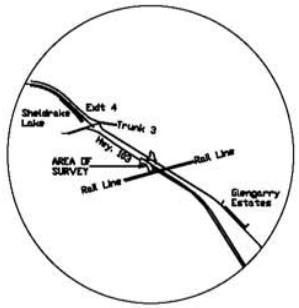
Pre-Construction – June 2004

Original shoreline with stake marking future shoulder







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SHEET 1 OF 1

Preparing Sill for Vegetation Clumps


Rock Fill, Sill for Vegetation on Right,
Vegetation to Salvage in Foreground
Wetland
Vegetation
Mesic-Soil
Vegetation

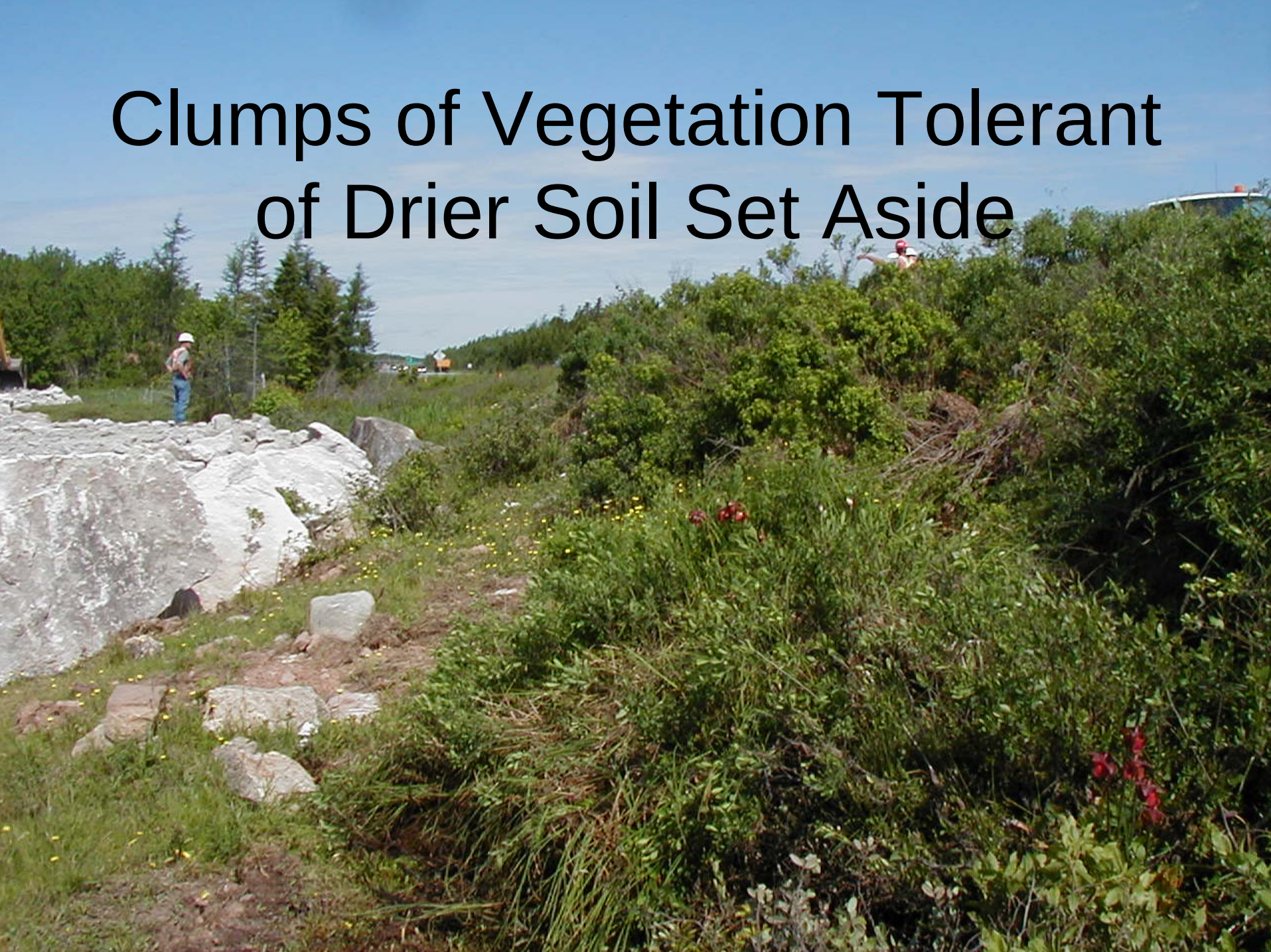

Lifting Clumps (Mud and
Wetland Vegetation

Carrying Clumps for Placement

Clump Placement on Sill

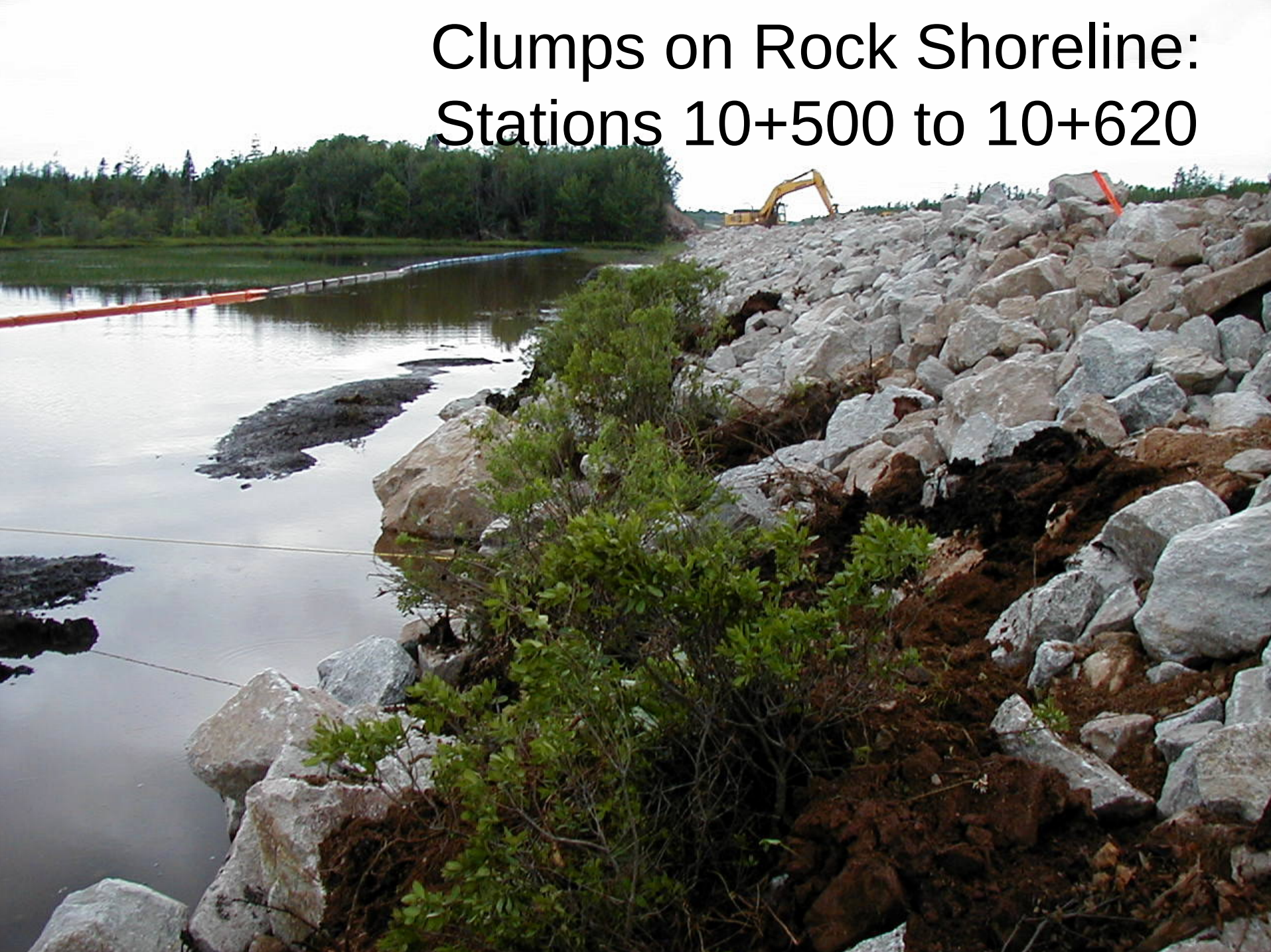
New Shoreline, East End: Stations 10+400 to 10+500

Clumps of Vegetation Tolerant of Drier Soil Set Aside



Lifting of Salvaged Clumps and Placement on Top of Rock Shoreline

Clumps on Rock Shoreline: Stations 10+500 to 10+620



Transplanted Wetland Clumps: Stations 10+630 to 10+680


New
Shoreline,
West End

July 2004 -End of Construction Planting
(view near Station 10+530)

Fall 2004

East:
New Shoreline of
Dense Wetland
Vegetation on Mud

West:
New Shoreline of
Dense Wetland
Vegetation on Mud and
Mesic-Soil Species on
Rock

Fall 2004 East to West


Fall 2004, West to East

Fall 2004, Individual Plantings Near Station 10+620 (plants from Wetland #2)


Spring 2005, Dormant Willow Stakes and
Cuttings Near Station 10+500


Spring 2005, Dormant Willow
Stakes and Cuttings Near
Station 10+540

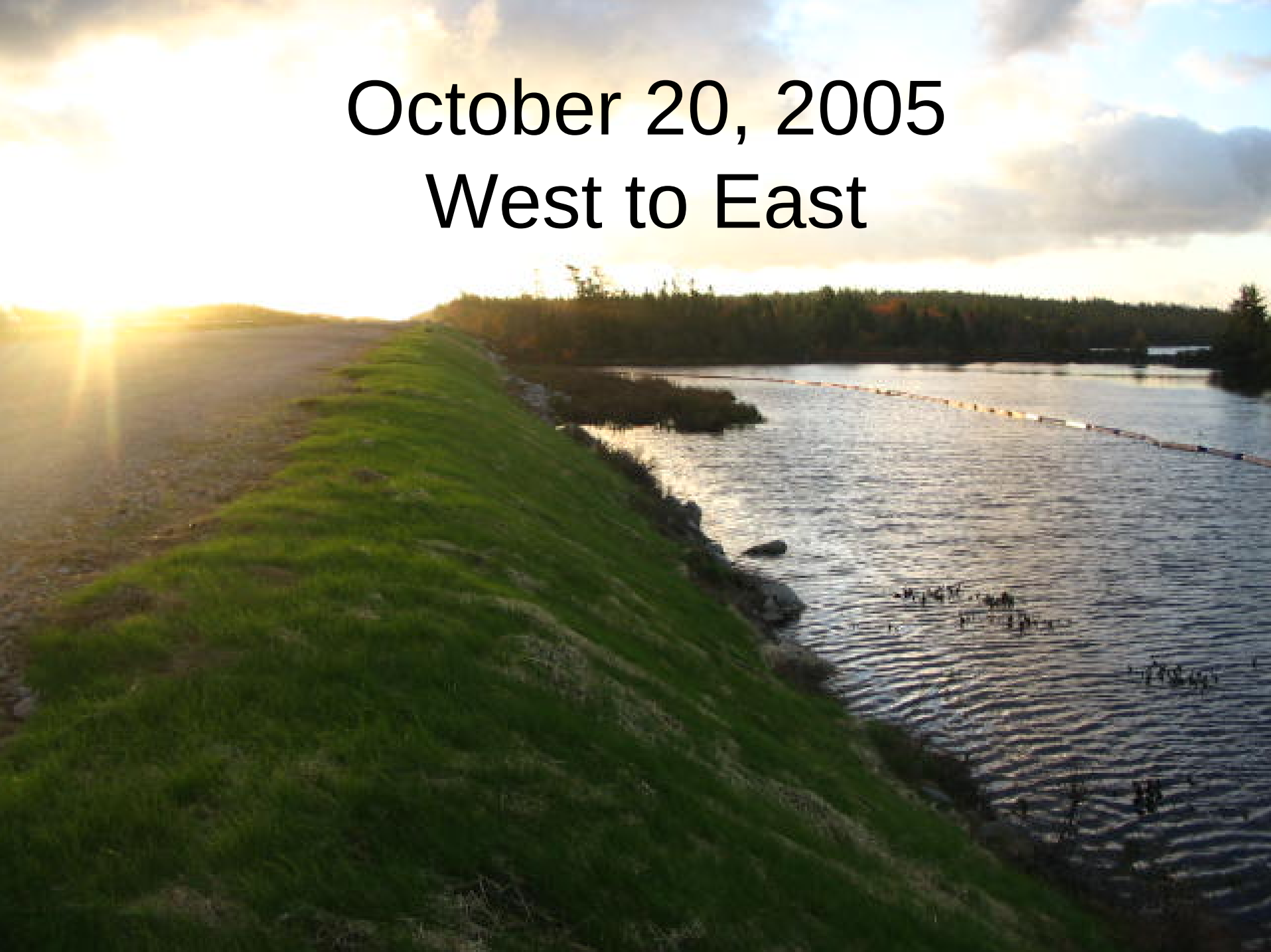
September 2005 - Slope Vegetation: Gravel Fill Prior to Topsoil/Compost

Topsoil

Adding Compost

Finished September 21, 2005


October 20, 2005
East to West


October 20, 2005
West to East