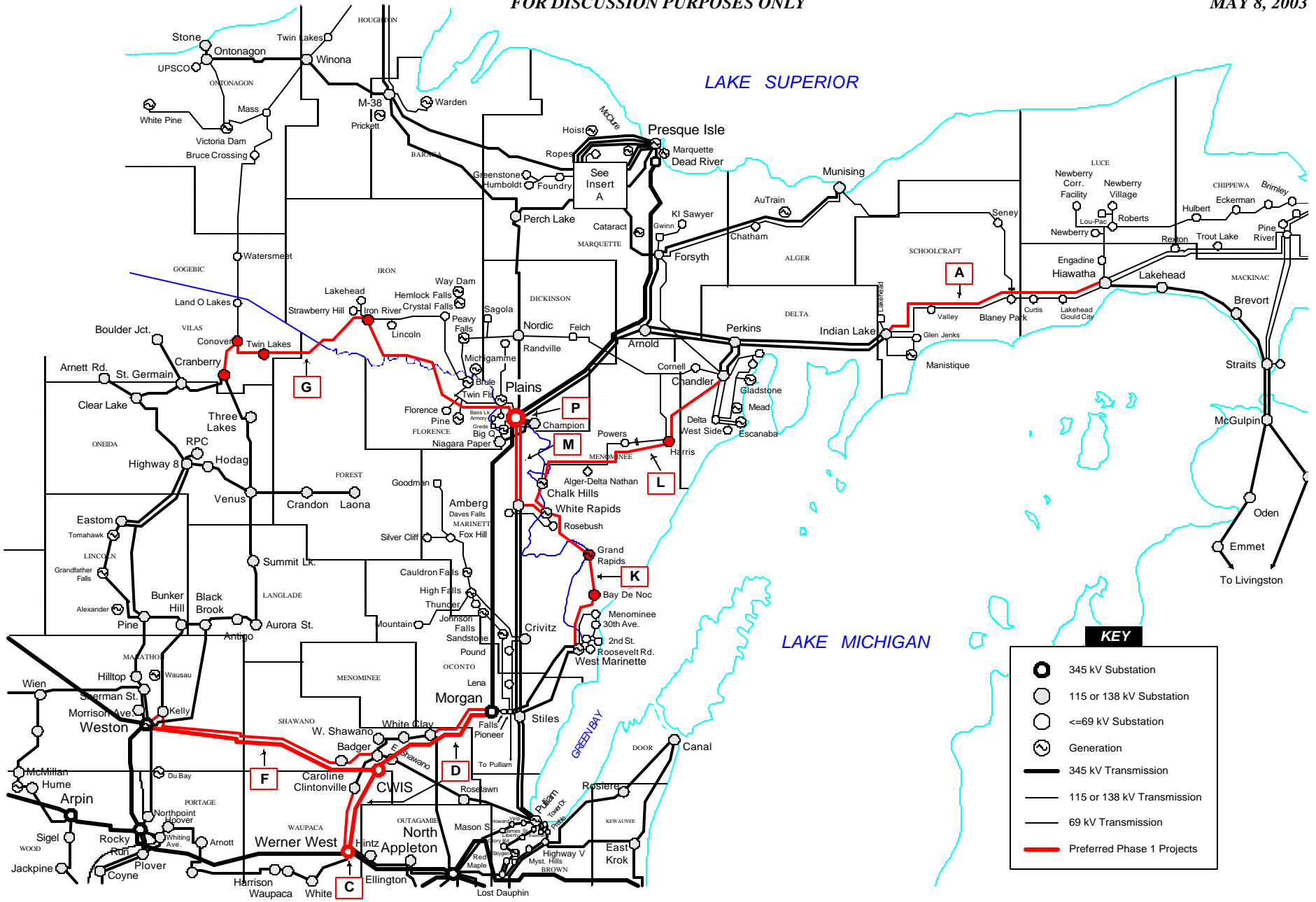


# FOR DISCUSSION PURPOSES ONLY

## Northern Umbrella Plan - Preliminary Preferred Phase 1 Projects

MAY 8, 2003

FOR DISCUSSION PURPOSES ONLY



May 8, 2003

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**Northern Umbrella Plan – Preliminary Preferred Phase 1 Projects**

Item	Project Description	Project Description	Needed Date	Expected In-Service Date	Project Benefits	Estimated 2008 Cost (\$x1,000,000)
A	Indian Lake -Hiawatha 69 kV	Construct a new 69 kV circuit from Indian Lake SS to Hiawatha SS on new double-circuit structures built for 138 kV operation (40 mi). Add one 69 kV bus position at Indian Lake, use old T6912 position at Hiawatha.	2005		System reliability U.P. import capability Future 138 kV expansion	18.7
C	Werner West 345/138 kV	Construct a 345/138 kV switchyard at a new Werner West SS. Install a 500 MVA 345/138 kV transformer. Loop the existing Rocky Run to North Appleton 345 kV and existing Werner to White Lake 138 kV lines into Werner West.	2007		Fox Valley 345 kV transformer loadings/service limiters Required for Weston G4 Voltage support	13.9
G	Plains-Conover-Cranberry 138 kV	Rebuild the existing Plains-Iron River-Conover 69 kV line (43 mi) to 1-ckt 138 kV. Add 1 138 kV position at Plains. Add a 3-position 138 kV substation and 138/69 kV transformer each at Iron River and Conover. Construct new 14-mi 138 kV 1-ckt line on new ROW from Conover to Cranberry. Add 138/115 kV transformer and 115 kV line position at Cranberry.	2007		Rhineland load serving U.P. import capability Aging 69 kV infrastructure Voltage support Relieves Plains 138/69 kV transformers Improved U.P. Stability	<sup>3</sup> 54.4
K	West Marinette-Amberg 138 kV	Convert 69 kV to 138 kV from West Marinette to White Rapids. Reconnector 138 kV from Amberg to White Rapids.	2007		U.P. import capability Voltage support Aging 69 kV infrastructure Serve large proposed T/D interconnect Improved U.P. Stability	<sup>3</sup> 23.9
M	Rebuild Plains-Amberg 138 kV	Rebuild “hot” the 2-ckt 138 kV from Plains to Amberg with 795 ACSR.	2007		U.P. import capability Aging 138 kV infrastructure Improved U.P. Stability	17.5
L	Amberg-Chandler 138 kV	Reconnector White Rapids-Chalk Hill 138 kV w/795 ACSR (11 mi). Rebuild 1-ckt 69 kV from Chalk Hill to Harris (45 mi) to 2-ckt 138/69 kV. New 1-ckt 138 kV from Harris to Chandler. 1 138 kV position at Chalk Hill and Chandler. 3-position 138 kV substation and 138/69 kV substation at Harris.	2007		U.P. import capability Aging 69 kV infrastructure Voltage support Remove radial feeds to Harris and Powers Improved U.P. Stability	<sup>3</sup> 32.9
P	Plains 345/138 kV Transformer	Add a second 250 MVA 345/138 kV transformer at Plains, and one new 138 kV and 345 kV bus position.	2007		U.P. import capability	<sup>3</sup> 4.9
D	Morgan-Werner West 345 kV	Convert 13-mi 1-ckt 138 kV from Morgan to White Clay to 2-ckt 345/138 kV. Extend 18-mi new 345 kV 1-ckt from White Clay to Clintonville. Add new 2-ckt 345/138 kV from Clintonville to Werner West.	2008		Required for Weston G4 Relieves Green Bay area loadings/service limiters 138 kV voltage/loading support by removing radial feed to Clintonville and Belle Plaine South-to-north transfer capability Reduced system losses Improved U.P. Stability	102.7
F <sup>1</sup>	Weston-Central WI 345 kV	Rebuild 68-mi 1-ckt 115 kV from Weston to Badger to 2-ckt 345/138 kV operated at 345/115 kV. Add a new 3-position 345 kV Central WI Substation, tying in the 345 kV lines to Weston, Morgan, and Werner West. Add 1 345 kV line position at Weston.	2008		Required for Weston G4 Voltage support System reliability Reduced system losses 2 <sup>nd</sup> 345 kV west-east ckt for diversity	105.0
<b>Total Cost</b> <sup>2</sup>						<b>\$ 341.0</b> <b>\$ 356.4</b>

1 This item is a combination of a portion of the original Project F plus a new CWIS 345 kV SS.

2 The first Total Cost represents the selection of Item M, while the second represents the selection of Item L.

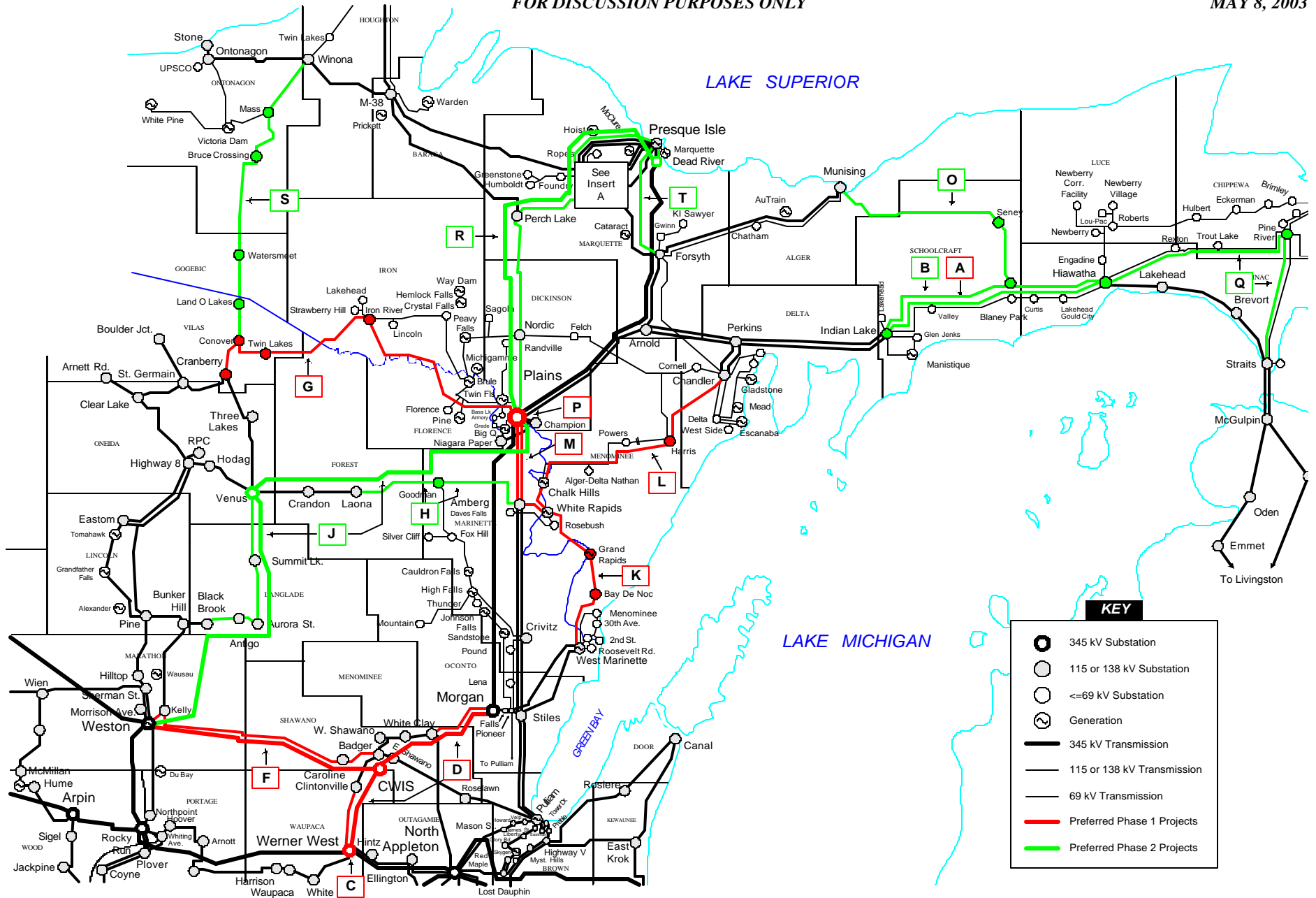
3 Estimated cost developed using a gross estimating tool (versus more accurate estimating).

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Northern Umbrella Plan - Preliminary Preferred Phase 2 Projects

MAY 8, 2003

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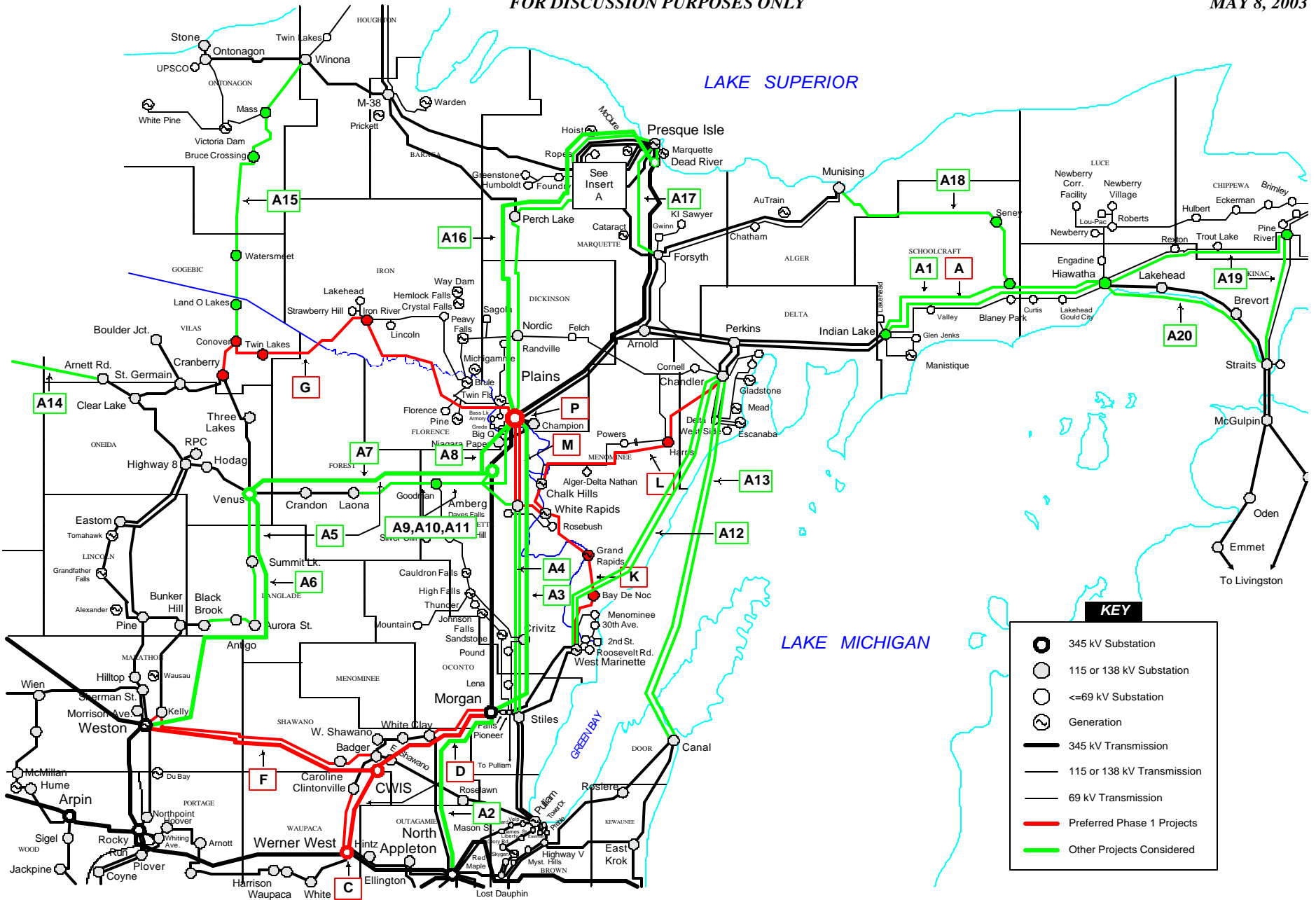
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Northern Umbrella Plan - Preliminary Preferred Phase 1 And Other Considered Projects

MAY 8, 2003

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May 8, 2003

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**Northern Umbrella Plan – Other Considered Projects**

Item	Project Scope	Comments/Project Benefits
A1	Double-circuit 138 kV from Indian Lake to Hiawatha	Needed as part of 138 kV “conduit” to provide double-circuit 138 kV transmission to lower Michigan
A2	345 kV line from Morgan to North Appleton	Relieves Green Bay area loadings/service limiters, increases south-north transfer capability, improves U.P. stability, reduced losses
A3	Plains-Stiles 345/138 kV + Stiles-Morgan 138 kV	Increases south-north transfer capability, reduced losses
A4	Rebuild Plains-Amberg-Stiles 138 kV	Increases south-north transfer capability, reduced losses
A5	Plains-Venus-Weston 345 kV + Venus 345/115 kV	Rhineland loop load serving, increases south-north transfer capability, reduced losses
A6	Weston-Venus 345 kV + Venus 345/115 kV	Rhineland loop load serving
A7	Dunbar-Venus 345 kV + Venus 345/115 kV	Rhineland loop load serving, increases south-north transfer capability
A8	Plains-Venus 345 kV + Venus 345/115 kV	Rhineland loop load serving, increases south-north transfer capability
A9	Venus-Plains 138 kV + Venus 138/115 kV	Rhineland loop load serving, increases south-north transfer capability
A10	Venus-Dunbar 138 kV + Venus 138/115 kV	Rhineland loop load serving, increases south-north transfer capability
A11	Venus-Amberg 138 kV + Venus 138/115 kV	Rhineland loop load serving, increases south-north transfer capability
A12	West Marinette-Chandler double-circuit 138 kV	Increases south-north transfer capability
A13	Canal-Chandler double-circuit 138 kV	Increases south-north transfer capability, voltage support
A14	Arnett Rd.-Park Falls 138 kV	Rhineland loop load serving
A15	Winona-Conover-Cranberry 138 kV + Venus 138/115 kV	Rhineland loop load serving, aging 69 kV infrastructure
A16	Plains-Perch Lake-Plains 345/138 kV	Improves U.P. stability, ultimate U.P. import capability
A17	Presque Isle-Forsyth 138 kV	Improves U.P. stability
A18	Munising-Blaney Park 138 kV	Improves U.P. stability, aging 69 kV infrastructure
A19	Hiawatha-Pine River-Straits 138 kV	Needed as part of 138 kV “conduit” to provide double-circuit 138 kV transmission to lower Michigan, aging 69 kV infrastructure
A20	Hiawatha-Straits 138 kV	Needed as part of 138 kV “conduit” to provide double-circuit 138 kV transmission to lower Michigan

*May 8, 2003*