APPENDIX E-1

Terrain Unit Descriptions and Interpretations

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[a]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for Thaw and/or Freezing Induced Displacement[b]/ Aggregate Suitability
1	sWr to gWr likely over Mb	Relict beach ridges likely overlying till, occasionally with minor areas of bedrock or weathered (frost-shattered) bedrock.	Limited, but may occur at depth. W	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate variable deposit thickness
2A	sWrbvt to gWrbvt likely over Mb	Relict beach deposits of varying depth likely overlying till and locally weathered or frost-shattered bedrock and/or bedrock. May form blankets, single or multiple terraces, beach platforms, or flights of low, subdued beach ridges.	Limited near surface, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable to Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate may be relatively shallow
2B	sWbvt to gWbvt likely over Mb	Relict beach deposits of varying depth likely overlying till and locally weathered (frost-shattered) bedrock and/or bedrock. May include minor areas of washed till.	Limited near surface, likely at depth. MW/I.	Frost Heave Frost Sorting Frost Jacking Thaw Settlement	Stable Minor thaw settlement possible.	Stable to Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	M	L-M Adequate, ground water may be encountered near surface
2C	sWbvt to gWbvt likely over Mb	As above	Possible near surface, likely at depth. I or I/P	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M Poor due to high water table, likely overlying till
2D	sWbvt to gWbvt likely over Mb	As above	Limited near surface, but likely at depth. P or P/I	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M-H Poor due to high water table, likely overlying fine-textured till
2E	sWbvt to gWbvt likely over Mb	As above.	Possible near surface and likely at depth. P/VP or VP/P	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	H Poor due to high water table, likely overlying fine-textured till

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3A	sWlp to gWlp	Sandy to gravelly deltaic terrace and or ridges. May include moderately to steeply sloping areas Locally may include beach deposits or wave washed morainal surfaces.	Limited near surface, but may occur at depth. W	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate may be relatively shallow
3B	sWlp to gWlp	Sandy to gravelly deltaic levels and/or plains, locally undulating. May include gently to moderately sloping areas. Locally may include beach deposits and/or wave washed morainal surfaces.	Limited near surface, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	M	L-M Good to adequate may be relatively shallow
3C	sWlp to gWlp	Sandy to gravelly deltaic level and/or plain. Shallow, discontinuous organic veneers may be present locally. Locally may include beach deposits.	Limited near surface, but likely at depth. I/P	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M Poor
3D	sWlp to gWlp	Sandy to gravelly deltaic level and/or plain. Shallow, discontinuous organic veneers may be present locally. Locally may include beach or stream deposits.	Limited near surface, but likely at depth. P, but locally may be I or VP	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	H Poor
4A	Wbv/Mbv-W to Mbv/Wbv-W	Mixtures of sandy to gravelly marine sediments and sandy to gravelly marine washed tills. The washed till surface often comprises a sandy to gravelly material but locally may comprise a silty fine sandy material. In either case these materials likely overlie finer textured till.	Limited near surface, but likely at depth. W/MW	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Minor to moderate thaw settlement possible under loading	Frost heave may result in some uplift of ground surface	Frost creep may occur under loading	M	L- M Adequate to poor, likely quite shallow over fine-textured till

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4B	Wbv/Mbv-W to Mbv/Wbv-W	As above	Limited near surface, but likely to occur at depth MW/I or I/MW or I	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Minor to moderate thaw settlement possible under loading	Frost heave may result in some uplift of ground surface	Frost creep may occur under loading	M-H	M Adequate to poor, likely quite shallow over fine-textured till
4C	Wbv/Mbv-W to Mbv/Wbv-W	As above	Likely present I/P, P/I, P	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M-H Poor, likely overlying fine-textued till.
4D	Wbv/Mbv-W to Mbv/Wbv-W	As above	Likely present P/VP. VP/P	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	H-VH Poor, likely overlying fine-textued till
5A	Mbv-W and/or Mb-W	Blankets and/or veneers of marine washed, gravelly to lesser sandy till, or marine sands and/or gravels overlying till. Occasional very minor areas of weathered bedrock and/or very minor bedrock outcrops. Likely in a high energy shoreline environment for a period of time.	Limited near surface, but likely at depth W-MW	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	L- M Adequate to poor. Likely shallow veneers over fine-textured till.
5B	Mbv-W and/or Mb-W	As above	Likely present MW/I	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M Adequate to poor. Likely quite shallow over fine-textured till.

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5C	Mbv-W and/or Mb-W	Blankets of wave washed, silty fine sandy to fine sandy silty till, and/or marine sands or gravels overlying till. Occasional very minor areas of weathered bedrock, rarely with very minor bedrock outcrops. Shallow, discontinuous organic veneers may be present These areas were likely in a near-shore environment for a period of time (*i.e.*, below the low-tide line).	Likely present I/P	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M-H Poor, likely shallow veneers overlying fine-textured till.
5D	Mbv-W and/or Mb-W	As above.	Likely present/ P/I	Frost creep Frost heave Frost sorting Thaw settlement	Thaw settlement likely under loading.	Frost heave will result in uplift of ground surface	Frost creep may occur under loading	M-H	H Poor, likely shallow veneers overlying fine-textured till.
5E	Mbv-W and/or Mb-W	As above.	Likely present P, P//I	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading.	Frost heave will result in uplift of ground surface	Frost creep may occur under loading	M-H	H-VH Poor, likely shallow veneers overlying fine-textured till.
5F	Mbv-W and/or Mb-W	Blankets and veneers of marine washed till and/or marine sands or gravels overlying till. Lag boulders often present, shallow, discontinuous organic veneers usually present. Likely a near-shore environment. In some areas washing may have occurred in fresh water.	Likely present P/VP or VP/P small ponds or streams often present.	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading.	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	VH Poor

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6A	F^{G}r-W	Gravelly glaciofluvial ridges (eskers) washed or altered by wave action.	Limited, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate
6B	F^{G}bs-W	Sandy to gravelly glaciofluvial slopes washed or altered by marine wave action. Slope gradients can range from gently to steeply sloping.	Limited, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate
7A	Flt	Gravelly fluvial levels and or terraces, occasionally flooded.	Limited, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Not applicable.
7B	gFl-sFl	Gravelly fluvial levels and or terraces. Subject to periodic flooding and/or tidal inundation.	Likely present I or I//P	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M Not applicable.
8	arDbv	Veneers and blankets of weathered (frost-shattered) bedrock and occasionally minor washed till or marine veneers or minor bedrock outcrops.	Limited W, locally MW or I	Frost Shattering Frost Wedging	Stable	Stable to Minor Instability	Stable	L	L Adequate to poor with bedrock likely at shallow depths
9A	Dbv/Mbv/R Dbv/Wbv/R	Veneers and/or blankets of weathered bedrock with lesser veneers and/or blankets of washed till or marine sands and gravels Minor bedrock outcrops.	Limited, but may occur at depth in deeper soils W/MW locally may be I	Frost Shattering Frost Wedging	Stable	Stable to Minor Instability	Stable	L-M	L-M Bedrock at or near surface
9B	Dbv/Mbv/R Dbv/Wbv/R	As above.	Likely present MW-I and/or I-P	Frost Shattering Frost Wedging Frost Jacking Thaw settlement	Stable Thaw settlement possible.	Stable to Minor Instability	Frost creep may occur under loading	L-M	M Bedrock at or near surface

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10	Dbv/Wv//R or Dbv/Mv//R	Dominated by areas of weathered bedrock with lesser discontinuous veneers or blankets of washed till or sandy or gravelly marine sediments. Very minor bedrock outcrops,	Limited, but may occur at depth in deeper soils W/MW, locally may be I	Frost Shattering Frost Wedging	Stable	Stable to Minor Instability	Stable	L	L-M Bedrock at or near surface
11	Rri//Dv	Irregular bedrock outcrops and/or ridges and minor areas of weathered bedrock and/or colluvium.	Unlikely R/W	Frost Shattering Frost Wedging	Stable	Stable	Stable	L	L Bedrock at or near surface
12A	Mbv/Dbv or Wbv/Dbv or Mbv•Wbv/Dbv	Blankets and veneers of marine washed till and/or marine sands and or gravels and locally with weathered bedrock occasionally with minor bedrock outcrops	Limited, likely at depth in deeper soils W/MW	Frost Shattering Frost Wedging	Stable	Stable to Minor Instability	Stable	L-M	L-M Bedrock may be near surface
12B	Mbv/Dbv or Wbv/Dbv or Mbv•Wbv/Dbv	Blankets and veneers of marine washed till and/or marine sands and or gravels and locally with weathered bedrock occasionally with minor bedrock outcrops	Likely present MW/I or I/MW	Frost Shattering Frost Wedging Frost Jacking Thaw settlement	Stable Thaw settlement possible.	Stable to Minor Instability	Frost creep may occur under loading	L-M	M Bedrock may be near surface
12C	Mbv/Dbv or Wbv/Dbv or Mbv•Wbv/Dbv	Blankets and veneers of marine washed till and/or marine sands and or gravels and locally with weathered bedrock occasionally with minor bedrock outcrops	Likely present I/P or P/I	Frost Shattering Frost Wedging Frost Jacking Thaw settlement	Stable Thaw settlement possible.	Stable to Minor Instability	Frost creep may occur under loading	M-H	H Bedrock may be near surface

[a] Soil drainage class R=rapidly, W=well, MW=moderately well, I=imperfectly, P=poorly, VP=very poorly., Slashes (/) indicate dominance as for terrain symbols

[b] Note that the hazard ratings for thaw and freezing induced displacement are generalized interpretations. Conditions may vary substantively across map units. For example, bedrock dominated areas containing areas of weathered bedrock or washed till are classified as a low hazard but may contain localized areas with a moderate or high displacement hazard. Assume various periglacial and/or permafrost processes are active on all terrain types