

LEGEND

EARTHQUAKE INTENSITY ZONES

Hazard Zones

1

AREA SUBJECT TO GENERALLY LOWER INTENSITIES AND SHORTER PERIOD SHAKING. Estimated maximum expectable earthquake intensity at VI to VIII (modified Mercalli intensity). This zone is generally underlain by bedrock at shallow depths and will experience shorter period shaking with less potential for damage to tall structures.

2

AREA SUBJECT TO GENERALLY HIGHER INTENSITIES AND LONGER PERIOD SHAKING. Estimated maximum expectable earthquake intensity at VIII to XI. This zone is generally underlain by thick sediments, and will experience longer period shaking. Buildings with long fundamental periods would have a greater potential for damage in this area compared with Zone 1.

U

ZONE OF UNKNOWN SURFACE RUPTURE POTENTIAL RELATIVE TO THE SUSPECTED KNIK FAULT ZONE.

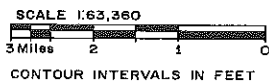
Symbols

APPROXIMATE LOCATION OF KNIK FAULT ZONE. Provides a division between Earthquake Intensity Zones 1 and 2.

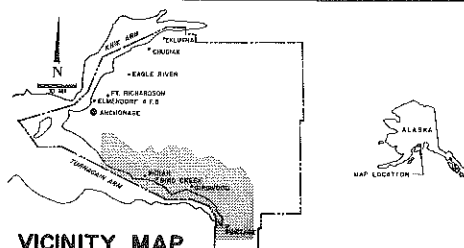
GENERAL DIVISION BETWEEN ZONE 1 (BEDROCK AREAS) AND ZONE 2 (AREAS OF THICK ALLUVIUM).

TECTONIC SUBSIDENCE

LINE OF EQUAL SUBSIDENCE RESULTING FROM THE 1964 EARTHQUAKE. Contour interval is two feet. Solid where estimated precision is $\pm 1/2$ contour interval, dashed where ± 1 contour interval. Recurrence of a large magnitude local earthquake on the Aleutian Arc Megathrust may be accompanied by a similar order of magnitude of subsidence.



**MUNICIPALITY OF ANCHORAGE
GEOTECHNICAL HAZARDS ASSESMENT
TECTONIC HAZARDS AND MAXIMUM EXPECTABLE
EARTHQUAKE INTENSITIES - TURNAGAIN ARM**



NOTES

- a) Base map origin: Municipality of Anchorage Planning Department.
- b) Limitations: Interpretive map for general planning based upon Municipality-wide geological and other data which is of varying accuracy and completeness as explained in the accompanying report titled "Geotechnical Hazards Assessment Study, Municipality of Anchorage prepared by Harding-Lawson Associates, Anchorage, Alaska. Geotechnical hazards assessment and subsurface conditions relative to construction at specific sites should be determined by qualified engineers and geologists through appropriate investigations of those sites.

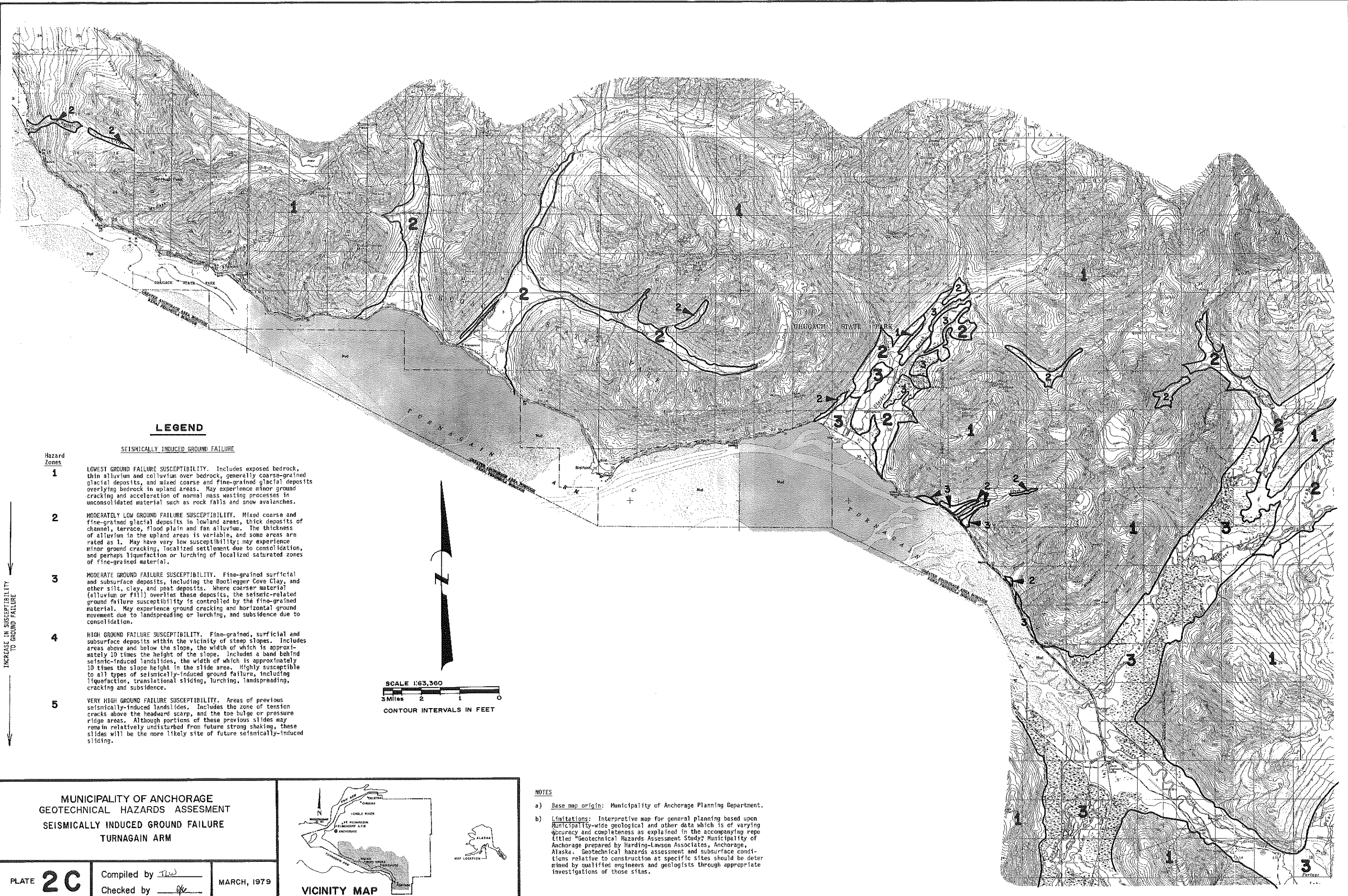
PLATE **1C**

Compiled by *TLW*
Checked by *gk*

MARCH, 1979
Rev. 6/79

VICINITY MAP

6

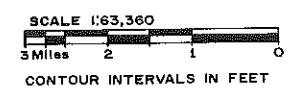


LEGEND

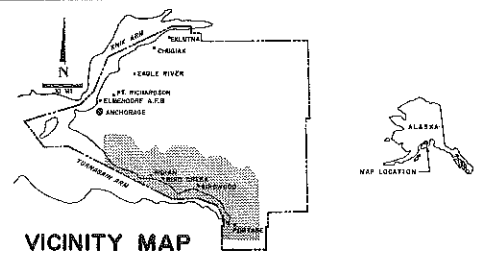
SEISMICALLY INDUCED GROUND FAILURE

- Hazard Zones
- 1** **LOWEST GROUND FAILURE SUSCEPTIBILITY.** Includes exposed bedrock, thin alluvium and colluvium over bedrock, generally coarse-grained glacial deposits, and mixed coarse and fine-grained glacial deposits overlying bedrock in upland areas. May experience minor ground cracking and acceleration of normal mass wasting processes in unconsolidated material such as rock falls and snow avalanches.
 - 2** **MODERATELY LOW GROUND FAILURE SUSCEPTIBILITY.** Mixed coarse and fine-grained glacial deposits in lowland areas, thick deposits of channel, terrace, flood plain and fan alluvium. The thickness of alluvium in the upland areas is variable, and some areas are rated as 1. May have very low susceptibility; may experience minor ground cracking, localized settlement due to consolidation, and perhaps liquefaction or lurching of localized saturated zones of fine-grained material.
 - 3** **MODERATE GROUND FAILURE SUSCEPTIBILITY.** Fine-grained surficial and subsurface deposits, including the Bootlegger Cove Clay, and other silt, clay, and peat deposits. Where coarser material (alluvium or fill) overlies these deposits, the seismic-related ground failure susceptibility is controlled by the fine-grained material. May experience ground cracking and horizontal ground movement due to landspreading or lurching, and subsidence due to consolidation.
 - 4** **HIGH GROUND FAILURE SUSCEPTIBILITY.** Fine-grained, surficial and subsurface deposits within the vicinity of steep slopes. Includes areas above and below the slope, the width of which is approximately 10 times the height of the slope. Includes a band behind seismic-induced landslides, the width of which is approximately 10 times the slope height in the slide area. Highly susceptible to all types of seismic-induced ground failures, including liquefaction, translational sliding, lurching, landspreading, cracking and subsidence.
 - 5** **VERY HIGH GROUND FAILURE SUSCEPTIBILITY.** Areas of previous seismic-induced landslides. Includes the zone of tension cracks above the headward scarp, and the toe bulge or pressure ridge areas. Although portions of these previous slides may remain relatively undisturbed from future strong shaking, these slides will be the more likely site of future seismic-induced sliding.

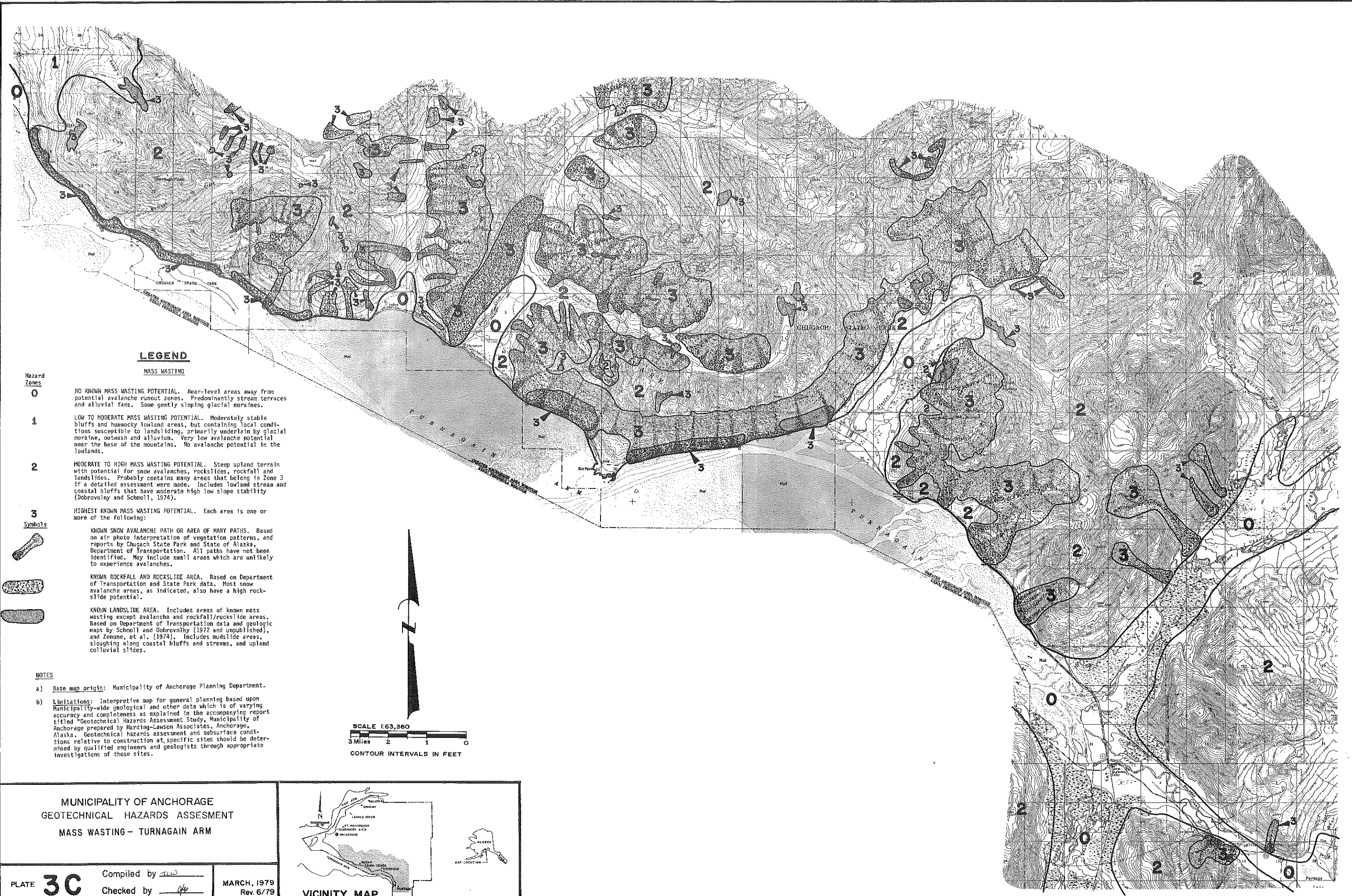
INCREASE IN SUSCEPTIBILITY TO GROUND FAILURE



**MUNICIPALITY OF ANCHORAGE
GEOTECHNICAL HAZARDS ASSESSMENT
SEISMICALLY INDUCED GROUND FAILURE
TURNAGAIN ARM**



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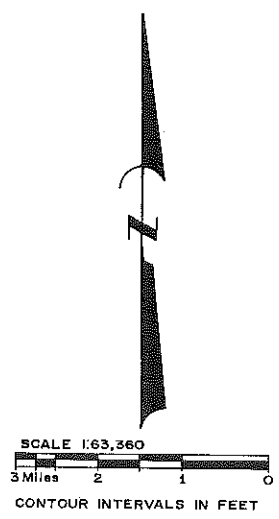


LEGEND
MASS WASTING

- Hazard Zones**
- 0** NO KNOWN MASS WASTING POTENTIAL. Near-level areas away from potential avalanche runout zones. Predominantly stream terraces and alluvial fans. Some gently sloping glacial moraines.
 - 1** LOW TO MODERATE MASS WASTING POTENTIAL. Moderately stable bluffs and hummocky lowland areas, but containing local conditions susceptible to landsliding, primarily underlain by glacial moraine, outwash and alluvium. Very low avalanche potential near the base of the mountains. No avalanche potential in the lowlands.
 - 2** MODERATE TO HIGH MASS WASTING POTENTIAL. Steep upland terrain with potential for snow avalanches, rockslides, rockfall and landslides. Probably contains many areas that belong in Zone 3 if a detailed assessment were made. Includes lowland stream and coastal bluffs that have moderate high low slope stability (Dobrovolsky and Schmoll, 1974).
 - 3** HIGHEST KNOWN MASS WASTING POTENTIAL. Each area is one or more of the following:

- Symbols**
- KNOWN SNOW AVALANCHE PATH OR AREA OF MANY PATHS. Based on air photo interpretation of vegetation patterns, and reports by Chugach State Park and State of Alaska, Department of Transportation. All paths have not been identified. May include small areas which are unlikely to experience avalanches.
 - KNOWN ROCKFALL AND ROCKSLIDE AREA. Based on Department of Transportation and State Park data. Most snow avalanche areas, as indicated, also have a high rockslide potential.
 - KNOWN LANDSLIDE AREA. Includes areas of known mass wasting except avalanche and rockfall/rockslide areas. Based on Department of Transportation data and geologic maps by Schmoll and Dobrovolsky (1972 and unpublished), and Zenone, et al. (1974). Includes mudslide areas, sloughing along coastal bluffs and streams, and upland colluvial slides.

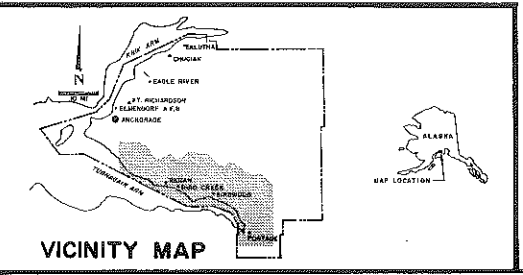
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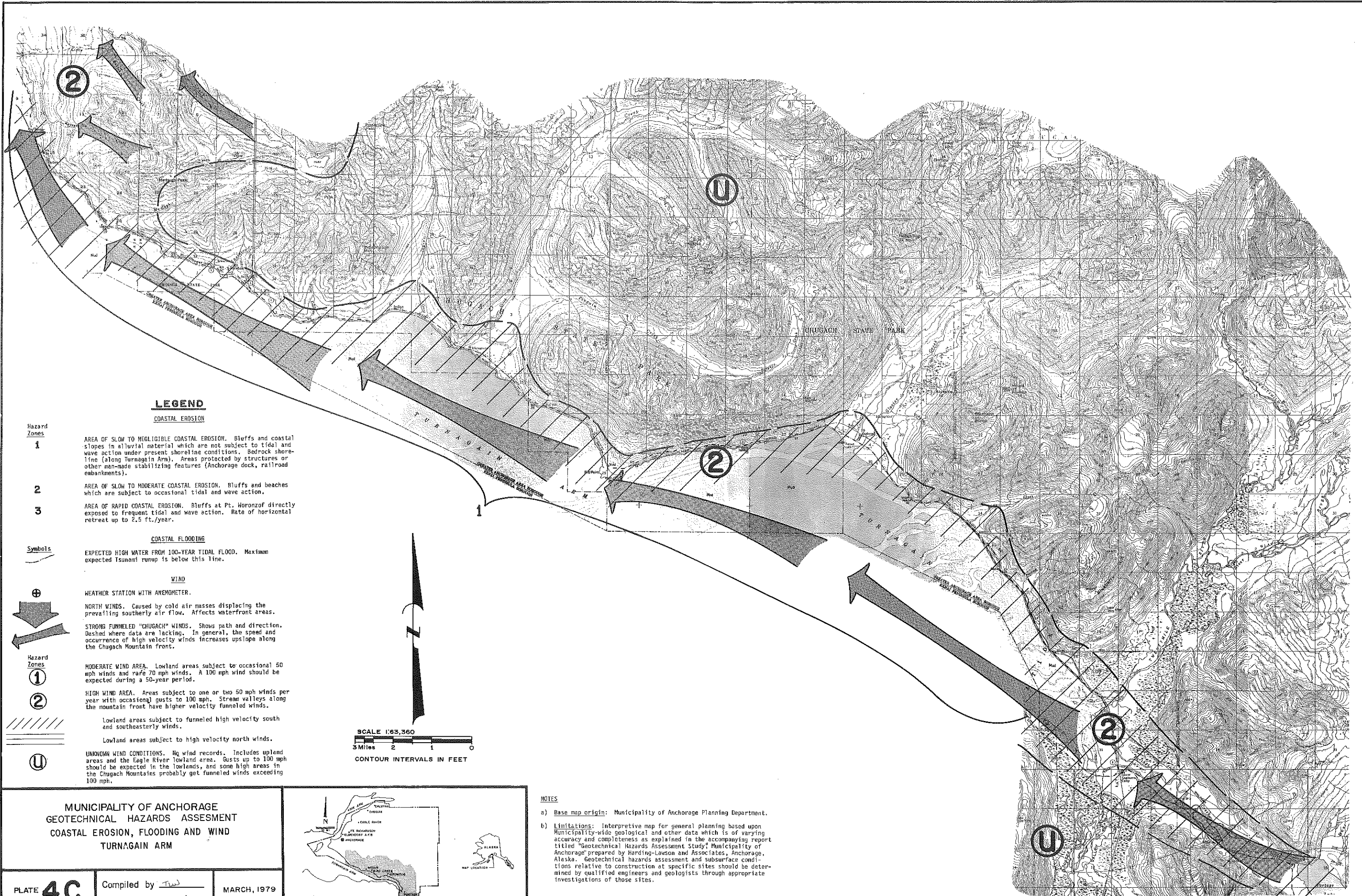


MUNICIPALITY OF ANCHORAGE
GEOTECHNICAL HAZARDS ASSESMENT
MASS WASTING - TURNAGAIN ARM

PLATE **3C** Compiled by SLW
Checked by AK

MARCH, 1979
Rev. 6/79





LEGEND

COASTAL EROSION

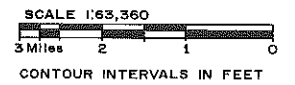
- Hazard Zones**
- 1** AREA OF SLOW TO NEGLIGIBLE COASTAL EROSION. Bluffs and coastal slopes in alluvial material which are not subject to tidal and wave action under present shoreline conditions. Bedrock shoreline (along Turnagain Arm). Areas protected by structures or other man-made stabilizing features (Anchorage dock, railroad embankments).
 - 2** AREA OF SLOW TO MODERATE COASTAL EROSION. Bluffs and beaches which are subject to occasional tidal and wave action.
 - 3** AREA OF RAPID COASTAL EROSION. Bluffs at Pt. Woronzof directly exposed to frequent tidal and wave action. Rate of horizontal retreat up to 2.5 ft./year.

COASTAL FLOODING

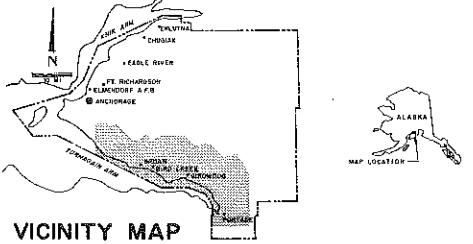
- Symbols**
- EXPECTED HIGH WATER FROM 100-YEAR TIDAL FLOOD. Maximum expected Tsunami runup is below this line.

WIND

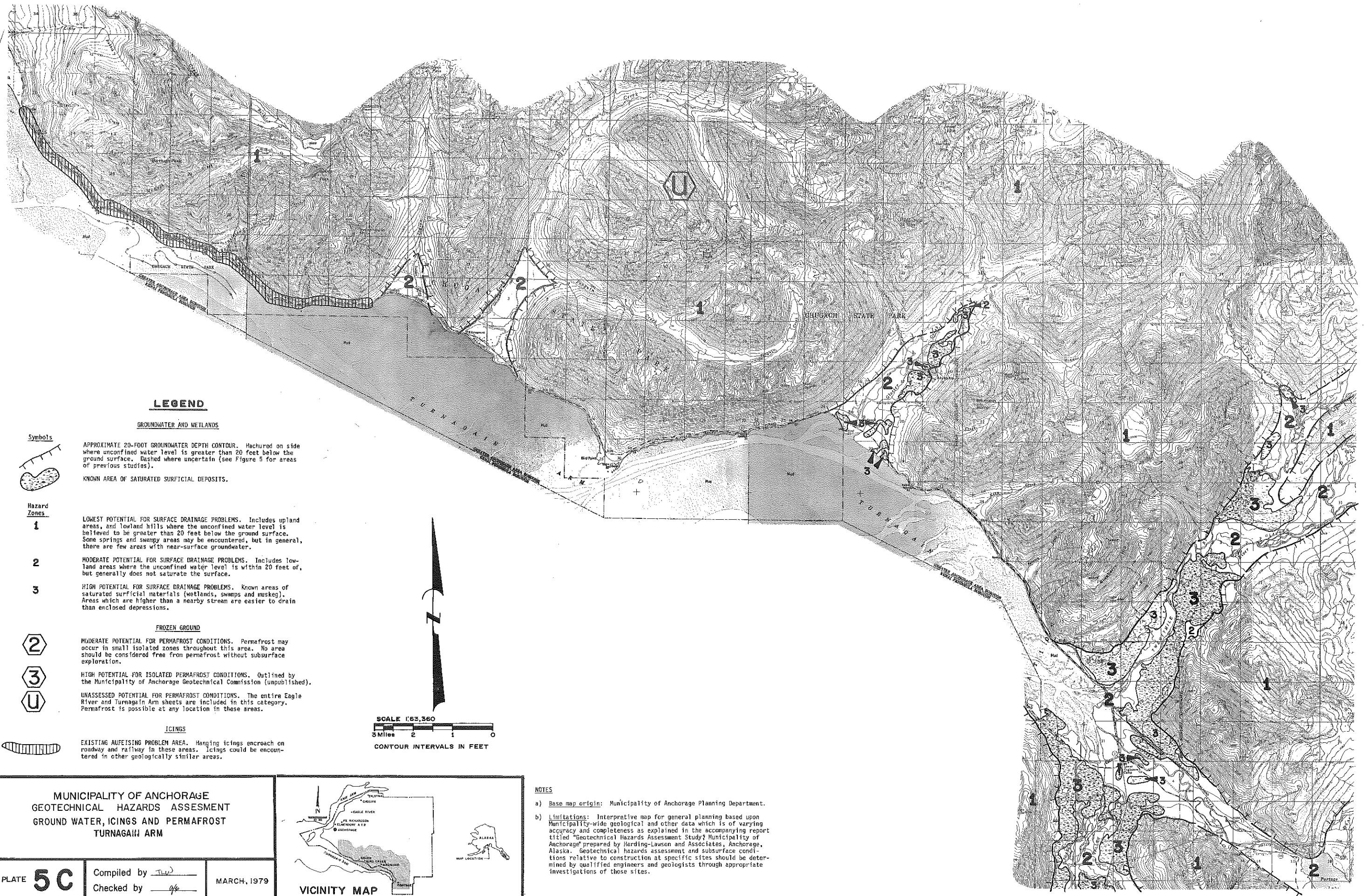
- WEATHER STATION WITH ANEMOMETER.
 - NORTH WINDS. Caused by cold air masses displacing the prevailing southerly air flow. Affects waterfront areas.
 - STRONG FUNNELED "CHUGACH" WINDS. Shows path and direction. Dashed where data are lacking. In general, the speed and occurrence of high velocity winds increases upslope along the Chugach Mountain front.
- Hazard Zones**
- 1** MODERATE WIND AREA. Lowland areas subject to occasional 50 mph winds and rare 70 mph winds. A 100 mph wind should be expected during a 50-year period.
 - 2** HIGH WIND AREA. Areas subject to one or two 50 mph winds per year with occasional gusts to 100 mph. Stream valleys along the mountain front have higher velocity funneled winds.
 - Lowland areas subject to funneled high velocity south and southeasterly winds.
 - Lowland areas subject to high velocity north winds.
 - U** UNKNOWN WIND CONDITIONS. No wind records. Includes upland areas and the Eagle River lowland area. Gusts up to 100 mph should be expected in the lowlands, and some high areas in the Chugach Mountains probably get funneled winds exceeding 100 mph.



**MUNICIPALITY OF ANCHORAGE
GEOTECHNICAL HAZARDS ASSESMENT
COASTAL EROSION, FLOODING AND WIND
TURNAGAIN ARM**



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LEGEND

GROUNDWATER AND WETLANDS

Symbols

APPROXIMATE 20-FOOT GROUNDWATER DEPTH CONTOUR. Hachured on side where unconfined water level is greater than 20 feet below the ground surface. Dashed where uncertain (see Figure 5 for areas of previous studies).

KNOWN AREA OF SATURATED SURFICIAL DEPOSITS.

Hazard Zones

1 LOWEST POTENTIAL FOR SURFACE DRAINAGE PROBLEMS. Includes upland areas, and lowland hills where the unconfined water level is believed to be greater than 20 feet below the ground surface. Some springs and swampy areas may be encountered, but in general, there are few areas with near-surface groundwater.

2 MODERATE POTENTIAL FOR SURFACE DRAINAGE PROBLEMS. Includes lowland areas where the unconfined water level is within 20 feet of, but generally does not saturate the surface.

3 HIGH POTENTIAL FOR SURFACE DRAINAGE PROBLEMS. Known areas of saturated surficial materials (wetlands, swamps and muskeg). Areas which are higher than a nearby stream are easier to drain than enclosed depressions.

FROZEN GROUND

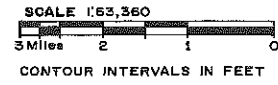
MODERATE POTENTIAL FOR PERMAFROST CONDITIONS. Permafrost may occur in small isolated zones throughout this area. No area should be considered free from permafrost without subsurface exploration.

HIGH POTENTIAL FOR ISOLATED PERMAFROST CONDITIONS. Outlined by the Municipality of Anchorage Geotechnical Commission (unpublished).

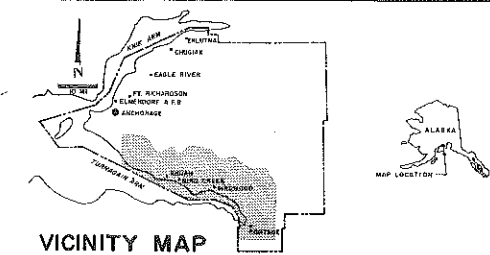
UNASSESSED POTENTIAL FOR PERMAFROST CONDITIONS. The entire Eagle River and Turnagain Arm sheets are included in this category. Permafrost is possible at any location in these areas.

ICINGS

EXISTING ICEING PROBLEM AREA. Hanging icings encroach on roadway and railway in these areas. Icings could be encountered in other geologically similar areas.



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GROUND WATER, ICINGS AND PERMAFROST
TURNAGAIN ARM**



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