STATE OF ALASKA DOT&PF

MATERIAL SITE INVENTORY STATUS & INSPECTION REPORTS

NORTHERN REGION

FAIRBANKS AREA ROADS

SECONDARY ROUTE NOS. 620, 645, 647, 651 & 665

FEDERAL PROJECT NO. STP-000S(530)
AKSAS PROJECT NO. 76174

ALASKA DEPARTMENT OF TRANSPORTATION
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STATEWIDE MATERIAL SITE INVENTORY

LIMITATIONS

The discussions of material site conditions presented in these reports has been based on the pertinent information listed herein and are intended to be used for planning purposes only. The information contained should be verified prior to use for design or construction purposes. To be sure of comprehensiveness, please check with State of Alaska DOT&PF materials staff for updated information. Every reasonable effort has been made to assure the accuracy of the maps and associated data. However, the State of Alaska DOT&PF makes no warranty, representation or guaranty as to the content, sequence, accuracy, timeliness or completeness of any of the data provided herein. The State of Alaska DOT&PF explicitly disclaims any representations and warranties, including, without limitation, the implied warranties of merchantability and fitness for a particular purpose. The State of Alaska shall assume no liability for any errors, omissions, or inaccuracies in the information provided regardless of how caused. The State of Alaska DOT&PF shall assume no liability for any decisions made or actions taken or not taken by the user of the applications in reliance upon any information or data furnished hereunder.

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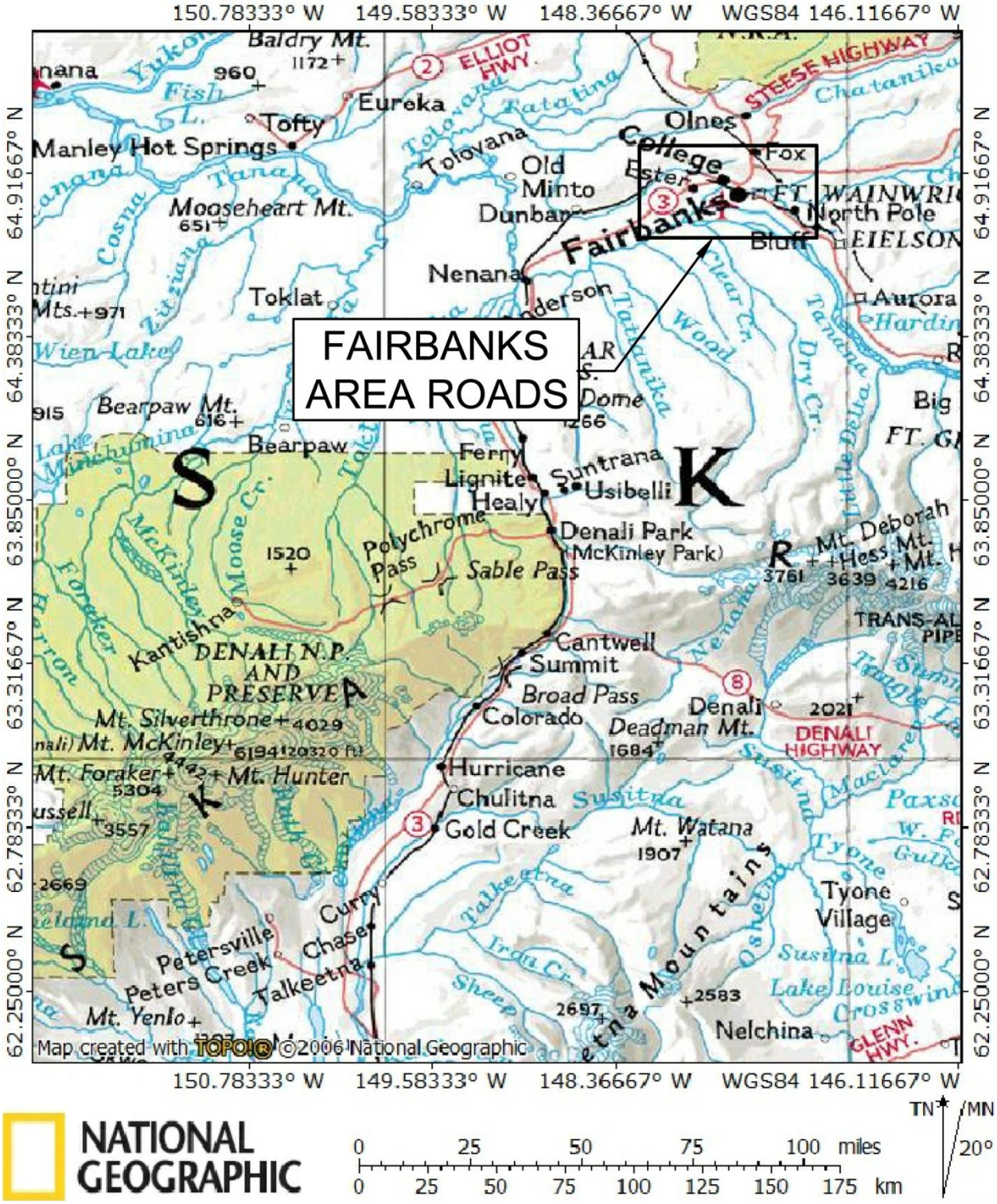
VICINITY MAP



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1.0 MATERIAL SITE NUMBERING

Alaska Department of Transportation and Public Facilities (DOT&PF) material site numbers for Fairbanks roads were assigned using the following format.

For secondary route system coding, i.e. 620-001-2:

- The first three digits represent the Secondary Federal Aid Route Number, for the Badger Road this number is 620.
- The 4th, 5th and 6th digits are the assigned site number.
- The last digit is the region in which the site is located. For the northern region the number is 2.

2.0 GEOLOGIC SETTING

The following information is general in nature and is intended to provide those who are unfamiliar with the area with a general description of the geology, and how it relates to material sites. This information is not intended to be complete. More detailed investigations should be performed before decisions are made on individual material sites.

2.1 Location

The Fairbanks roads inventory area is the area surrounding the City of Fairbanks and North Pole, including Goldstream Valley. The area includes the following State roads:

- Murphy Dome Road (15.4 miles in length)
- Goldstream Road (10.5 miles in length)
- Farmers Loop Road (2.8 miles in length)
- Ballaine Road (4.3 miles in length)
- Sheep Creek Road (5 miles in length)
- Old Steese (8.5 miles in length)
- Plack Road (3.7 miles in length)
- Chena Ridge Road (8.1 miles in length)
- Chena Pump Road (4.6 miles in length)
- Gilmore Trail (6.9 miles in length)
- Badger Road (11.2 miles in length)
- Nordale Road (5.7 miles in length)
- Johansen Expressway (4.2 miles in length)
- Other local roads (~825 miles in length)

The Fairbanks inventory area is located in the Tanana Valley, between the Chena and Tanana Rivers. Immediately north of the city is a chain of hills that rises gradually before reaching the White Mountains and the Yukon River. The southern border of the city is the Tanana River. South of the river is the Tanana Flats, an area of marsh and bog that stretches for more than 100 miles before rising into the Alaska Range. To the east and west are low valleys separated by ridges and hills up to 3,000 feet above sea level.

Koyukon Athabascans have lived in this area for thousands of years. In 1901, Captain E.T. Barnette established a trading post on the Chena River called "Barnette's Cache." A year later, gold was discovered 16 miles north of the post. The town grew as the Chena steamboat landing brought many prospectors during the Pedro Dome gold rush. Fairbanks was named in 1902 after Indiana Senator Charles Fairbanks, who became Vice President of the US from 1905 to 1909. In 1903, Judge Wickersham moved the seat of the third judicial district from Eagle to Fairbanks. The population of the area continued to increase as Fairbanks became the hub of the Interior with the addition of the court, government offices, a jail, a post office, and the Northern Commercial Company. By 1910, the official population had grown to 3,541, although more than 6,000 miners lived and worked their claims on creeks north of town. Ladd Field (now Fort Wainwright) was constructed in 1938. Construction of the Alcan Highway in the 1940s and the Trans-Alaska oil pipeline in the 1970s fueled growth and development.

The Fairbanks North Star Borough is located in the heart of Interior Alaska and is the second-largest population center in the state. Fairbanks lies 45 minutes by air from Anchorage and 3 hours from Seattle. The area encompasses 7,361.0 sq. miles of land and 77.8 sq. miles of water. Interior Alaska experiences seasonal temperature extremes. January temperatures range from -66 to 50 °F. July temperatures range from 30 to 99 °F. Annual precipitation averages 10.37 inches with 67.8 inches of snowfall. During the winter months, if the temperature drops below -20 °F, ice fog can occur. Fairbanks is known for its lingering summer days. When the summer solstice arrives, there are more than 22 hours of daylight.

On August 14, 1967, after an unprecedented record rainfall upstream, the Chena River flooded the town of Fairbanks. The results of this disaster eventually led to the creation of the Chena River Lakes Flood Control Project, which built and operates the eight-mile long, fifty-foot high Moose Creek Dam, designed to prevent a repetition of the 1967 Flood by being able to divert water in the Chena River upstream from Fairbanks into the Tanana River (and thus bypassing the city). Fairbanks is at the confluence of the Richardson Highway, George Parks Highway, Steese Highway, and Elliott Highway, connecting the Interior to Anchorage, Canada, and the lower 48 states. The Dalton Highway to Prudhoe Bay begins about 75 miles north of town. Goods are transported to Fairbanks by truck, air, and the Alaska Railroad. Regularly-scheduled jet flights are available at the state-owned Fairbanks International Airport. An 11,800' by 150' asphalt runway and a 2,900' by 75' gravel landing strip, heliport, and seaplane landing area are available. A public seaplane base is also located on the Chena River. In addition, there are several privately-owned airstrips and heliports in the vicinity.

North Pole is located 14 miles southeast of Fairbanks on the Richardson Highway. In 1944, Bon Davis homesteaded this area. Dahl and Gaske Development Company later bought the Davis homestead, subdivided it, and named it North Pole, hoping to attract a toy manufacturer that would advertise products as being made in North Pole. The Santa Claus House was subsequently

developed by Con Miller and his family. The city was incorporated in 1953. Growth from Fairbanks and the nearby Eielson Air Force Base have increased development over the years.

2.2 General Geology

Fairbanks is located in the Lower Tanana Valley, situated between the relatively young and more rugged Alaska Range and the older, more subdued hills within the Yukon-Tanana Uplands. Large alluvial fans extend out from the north side of the Alaska Range pressing the Tanana River northeast up against the hills of the Yukon-Tanana Uplands. The Alaska Range is relatively young and there is significant erosion occurring. Large bed loads are transported out of the mountains and the rivers, for the most part, are aggrading. Most active and inactive material sources in the Fairbanks area are in fluvial deposits and bedrock hills and ridges.

The hills the Yukon-Tanana Uplands surrounding Fairbanks were not glaciated during the recent Pleistocene Epoch and thus weathered bedrock was not removed by glacial action to the extent it has been scoured in the Alaska Range. The bedrock primarily consists of older metamorphic schist and gneiss with younger granitic rock intruded into the metamorphic country rock. The granitic rock is generally composed of monzonite and granodiorite. The bedrock is generally highly weathered to depths of more than 50 feet and should be proposed only for use as Type C embankment material. Types A and B material and aggregates should be obtained from fluvial sources in this area, where possible. Riprap production would likely require moving large amounts of weathered material to reach more competent rock in many of the sites located in the metamorphic rocks. There are also small basalt intrusives near Badger Road that are important sources of riprap in the Fairbanks area.

The Chena and Tanana Rivers and their overlapping floodplains are one of the most prominent features in the Fairbanks area and are major sources of material. The Chena River flows into the Tanana River between the Fairbanks International Airport and Chena Ridge. The city center of Fairbanks lies between the two rivers. The Tanana River is a braided and split channel river and the Chena River is meandering river confined to within its banks. Both rivers have flooded in the past and the Moose Creek Flood Control Project was constructed in the 1980’s to protect the City of Fairbanks. Small localized floods caused by blockages of sloughs and intermittent channels on the floodplain still occur.

The active floodplain of the Tanana River is over one mile wide in places. Due to the high bed loads within the river, the main channels shift relatively frequently with channel configurations changing significantly over decades. Thus, portions of previous DOT&PF material sites laid out in the 1960’s or even the 1980’s so as to be accessed without crossing the main channels have lost this access as the river shifted. Portions of these sites have become difficult to access today. The corollary of this is that areas previously inaccessible are now accessible. DOT&PF currently has no material sites remaining in the active floodplain. The only active DOT&PF material sources are on the inactive floodplain near the Fairbanks International Airport.

The Fairbanks area lies on the north side of the Alaska Range. Therefore permafrost may be encountered anywhere in the area. Generally, permafrost ranges from isolated masses to discontinuous. Where permafrost occurs in fine-grained or organic soils, it may be ice-rich. Permafrost is generally absent under the active floodplain of the rivers, but may be present under some vegetated islands.

Groundwater is shallow in many of the material sites associated with the Tanana River floodplain and bailing operations are more common in this area than elsewhere in the state. Large drag lines and sauermans are commonly used to excavate sites in the Fairbanks area.

Erosion caused by the Tanana River being thrust to the north toward Fairbanks and North Pole has created a significant demand for riprap. The only source of high quality riprap in the area has been Brown's Hill on Badger Road.

2.3 Tanana - Chena River Floodplains

The major source of materials in the Fairbanks area is the terraces and abandoned floodplains of the Chena and Tanana Rivers. DOT&PF has only four remaining highway sites on the floodplain in this area including two on the Richardson Highway (Route 62), one near North Pole (Route 620) and one near the Fairbanks International Airport (Route 37). MS 62-4-085-2 lies within the Moose Creek Flood Control Project and is probably not useable. MS 62-4-084-2 has been worked to a depth of approximately 20 feet or more over its entire area. It would likely be minable only by a sauerman. MS 620-006-2 lies at the intersection of Plack and Nelson Roads. MS 37-1-158-2 lies on the inactive Tanana River floodplain near the Fairbanks International Airport. In the past there were large material sites in the active Tanana River floodplain near Fairbanks but these have all been closed. There is sporadic to discontinuous permafrost on the terraces and abandoned floodplains. Permafrost is generally absent under the active floodplain of the Tanana River. High water tables will be encountered in the unfrozen areas. Most of the sites in this area require bailing or dewatering.

Degradation test results were not found for this area. Los Angeles Abrasion losses were generally less than 30 percent. These test results indicate that material for producing crushed aggregates is available in this area.

2.4 Dredge Tailing

Dredge tailings near Fox, along Cripple Creek and along Goldstream Creek have been extensively mined for projects in the past. However, due to development, there is little of this material still available. Reworked gravels can also be found along several small creeks but they are of limited extent. The dredge tailings typically consist of coarse sand and gravel with cobbles and boulders. They typically form low hummocky ridges in creek valleys. The dredging method typically creates an inverted soil profile where the coarser material is on the top and the finer material on the bottom, thus limiting the depth they can be worked.

The coarser material in the tailings is generally composed of fluvial material in small creek valleys. The material has not been extensively reworked and the engineering characteristics tend to mirror the bedrock in the surrounding hills. Degradation test results were not found for tailings in this area. Los Angeles Abrasion losses were generally between 35 and 50 percent. These test results indicate that material for producing crushed aggregates is not available from dredge tailings.

2.5 Bedrock Ridges

Surrounding Fairbanks on the west and north are steep bedrock ridges, the sides of which are mantled with deep deposits of eolian silt. Generally, the bedrock is composed of highly weathered schist and quartzite with minor greenstone and marble. The loess deposits in the Fairbanks area are typically are deeper on the north side of the ridges than on the south sides. In some cases, such as near Eielson Air Force Base, the crests of the ridges actually represent loess dunes. The crest of the bedrock ridge underlying the loess is found on the south side of the ridge. Depths of more than 150 feet to bedrock have been recorded on the north side of the ridge top.

There are intrusive igneous rocks scattered throughout the area, the largest group of which lie along Gilmore Trail northeast of Fairbanks. Weathering in this rock is similar to that found in the schist. DOT&PF has two material sites of unknown status on Tungsten Hill in granitic material, MS 670-074-2 and MS 670-110-2. Closed material site MS 651-007-2 on Murphy Dome road also contained this type of material.

Weathering has penetrated deeply into much of the bedrock and degradations are generally less than 10 and L.A. Abrasion losses are generally greater than 35. Aggregate production may not be possible in these rock units.

2.6 Commercial Sand, Gravel and Bedrock Sources

There has been extensive development in the area and, with the exception of the military reservations, land for gravel extraction is becoming more difficult to obtain. There are numerous commercial gravel sources in this area and DOT&PF has reportedly obtained all of its material in the recent past from these commercial sources. There is probably no reason for DOT&PF to obtain additional sites in this area for the foreseeable future. As time goes on, and land prices escalate, it may not be economical to mine gravel in the area. At that time gravel may have to be imported from a great distance as is presently being done in Anchorage. DOT&PF in conjunction with the North Star Borough may consider creating gravel reserves for future use.

There is also a commercial riprap site at Brown’s Hill on Badger Road near North Pole. This site has supplied large amounts of rock for erosion control projects in the Fairbanks area.

3.0 LAND USE PLANNING – TANANA BASIN AREA PLAN

State lands in the Fairbanks area are being managed by the State of Alaska Department of Natural Resources (DNR) under the Tanana Basin Area Plan adopted in 1985 and updated in 1991. DNR is presently in the process of separating the Tanana Basin Area Plan into the Yukon – Tanana Area Plan and the Eastern Tanana Area Plan. The Fairbanks area would lie within the Eastern Tanana Planning Area. The complete plan and information about the new plan revisions are available on the internet at the following address:

http://www.dnr.state.ak.us/mlw/planning/areaplans/tanana/index.cfm

The introduction to the plan states that the "The plan designates the uses that will occur on state lands within the Tanana Basin. It shows areas to be sold for private use and area to be retained in state ownership. It does not direct land uses for private, borough, or federal land, nor does it direct land uses for areas already legislatively designated for specific purposes, such as parks or wildlife refuges."

The section on Materials in Chapter 2: Goals of the Plan, list one of the goals of the plan as "Maintain in state ownership and make available to public and private users sufficient, suitably located material sites to economically meet the area's long term need for materials".

The following are the Management Guidelines from the plan:

> "**A. Preferred Material Sites.** When responding to a request for a material sale or identifying a source for material, the highest priority should be to use existing material sources. Using materials from wetlands and lakes should be avoided unless no feasible alternative exists. Sales or permits for sand, silt, or gravel extraction will not be permitted in fish spawning areas identified by DF&G unless extraction would enhance the site for rearing and DF&G determines that the activity is compatible with fish habitat values.
>
> **B. Material Sites.** To minimize the construction and maintenance cost of transportation facilities, material sites should be located as near as is feasible to the site where the material will be used.
>
> Design of projects will be on a case by case basis in consultation with other agencies. The following are general guidelines for extracting materials:
>
> > **1. Material Sources.** Consideration should be given to all potential material sources. Location and design of sites should take into account factors such as scenic quality, transportation to the site, and effects to fish and wildlife habitat.
> >
> > **2. River Size and Recharge Rates.** Selection of gravel sites in floodplains should take into account the volume of gravel available

from various stream types. Generally, the largest river feasible, or the one with the largest gravel recharge rates should be chose.

3. Reclamation. Reclamation of material sites will be accomplished consistent with AS 17.15.

4. Extraction from Active Channels. When extracting gravel in active or inactive floodplains, maintain buffers that will minimize sedimentation and will contain active channels in their original locations and configurations in the short term.

C. Maintaining Other Uses and Resources when Siting and Operating Material Sites. Before allowing the extraction of materials, the manager will ensure that the requirements of the permit or lease give adequate protection to other important resources and uses including existing water rights, water resource quantity and quality, navigation, fish and wildlife habitat and harvest, commercial forest resources, recreation resources and opportunities, historic and archaeological resources, adjacent land uses, and access to public or private lands. Disposal of materials should be consistent with the applicable management intent statement and management guidelines of the plan.

The manager should also determine if other existing material sites can be vacated and rehabilitated as a result of opening a new material site.

D. Screening and Rehabilitation. Material sites should be screened from roads, residential areas, recreational areas, and other areas of significant human use. Sufficient land should be allocated to the material site to allow for such screening. Where appropriate, rehabilitation of material sites will be required. For additional guidelines affecting material extraction see policies under the subsurface resources section.

E. Other Guidelines Affecting Materials. Other guidelines may affect materials. See in particular the following sections of this chapter:

- Fish and Wildlife Habitat and Harvest
- Settlement
- Subsurface Resources
- Transportation”

4.0 RELEVENT PUBLICATIONS

The following is a list of publications that may be useful for understanding the geology and material sources in the Fairbanks area. (Note: references describing the Fairbanks area are listed in the Fairbanks section; references including the Parks Highway appear in the "area-wide" section).

<u>Fairbanks Quadrangle</u> (Quadrangles C-1, C-2, D-1, D-2 & D-3)

Bundtzen, T.K., 1982, Bedrock geology of the Fairbanks Mining District, western sector: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 155, 2 sheets, scale 1:24,000.

Cameron, C.E., Thoms, E.E., and Gallo, C.A., 2002, Engineering-geologic database of the proposed Alaska Natural Gas Transportation System (ANGTS) corridor from Prudhoe Bay to Delta Junction, Alaska: Alaska Division of Geological & Geophysical Surveys Miscellaneous Publication 125, 1 DVD.

Carter, L.D., and Galloway, J.P., 1978, Preliminary engineering geologic maps of the proposed natural gas pipeline route in the Tanana River valley, Alaska: U.S. Geological Survey Open-File Report 78-794, 26 p., 3 sheets, scale 1:125,000.

Collins, F.R., 1985, Map showing a vegetated dune field in central Alaska: U.S. Geological Survey Miscellaneous Field Studies 1708, 20 p., 1 sheet, scale 1:250,000.

Combellick, R.A., and Bundtzen, T.K., 1996, Preliminary derivative geologic materials map of the Fairbanks mining district, Alaska: Alaska Division of Geological & Geophysical Surveys Public Data File 96-17, 1 sheet, scale 1:63,360.

Forbes, R.B., and Weber, F.R., 1982, Bedrock geologic map of the Fairbanks mining district, Alaska: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 170, 2 sheets, scale 1:63,360.

Metz, P.A., 1982, Bedrock geology of the Fairbanks Mining District, northeast sector: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 154, 1 sheet, scale 1:24,000.

Newberry, R.J., Bundtzen, T.K., Clautice, K.H., Combellick, R.A., Douglas, Tom, Laird, G.M., Liss, S.A., Pinney, D.S., Reifenstuhl, R.R., and Solie, D.N., 1996, Preliminary geologic map of the Fairbanks mining district, Alaska: Alaska Division of Geological & Geophysical Surveys Public Data File 96-16, 17 p., 2 sheets, scale 1:63,360.

Pewe, T.L., 1958, Geology of the Fairbanks (D-2) Quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Maps 110, 1 sheet, scale 1:63,360.

Pewe, T.L., and Bell, J.W., 1975, Map showing distribution of permafrost in the Fairbanks D-2 NW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 668-A.

Pewe, T.L., and Bell, J.W., 1975, Map showing construction materials in the Fairbanks D-2 NW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 668-C, 1 sheet, scale 1:24,000.

Pewe, T.L., Bell, J.W., Forbes, R.B., and Weber, F.R., 1975, Geologic map of the Fairbanks D-2 NW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 907, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1975, Map showing distribution of permafrost in the Fairbanks D-2 SE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 669-A, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1975, Map showing construction materials in the Fairbanks D-2 SE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 669-C, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1975, Map showing foundation conditions in the Fairbanks D-2 SE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 669-D, 2 sheets, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1975, Map showing distribution of permafrost in the Fairbanks D-2 NE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 670-A, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1975, Map showing ground water conditions in the Fairbanks D-2 NE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 670-B, 1 sheet, scale 1:24,000.

Pewe, T.L., Bell, J.W., Forbes, R.B., and Weber, F.R., 1976, Geologic map of the Fairbanks D-2 SW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 829-A, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1974, Map showing distribution of permafrost in the Fairbanks D-2 SW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 829-B, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1976, Map showing ground-water conditions in the Fairbanks D-2 SW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 829-C, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1976, Map showing construction materials in the Fairbanks D-2 SW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 829-D, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1976, Map showing foundation conditions in the Fairbanks D-2 SW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 829-E, 2 sheets, scale 1:24,000.

Pewe, T.L., and Rivard, N.R., 1961, Geologic map and section of the Fairbanks D-3 quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 340, 1 sheet, scale 1:63,360.

Pewe, T.L., Wahrhaftig, Clyde, and Weber, F.R., 1966, Geologic map of the Fairbanks quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 455, 5 p., 1 sheet, scale 1:250,000.

Pewe, T.L., and Bell, J.W., 1975, Map showing construction materials in the Fairbanks D-2 NE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 670-C, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1975, Map showing foundation conditions in the Fairbanks D-2 NE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 670-D, 2 sheets, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1975, Map showing distribution of permafrost in the Fairbanks D-1 SW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 671-D, 1 sheet, scale 1:24,000.

Pewe, T.L., and Bell, J.W., 1975, Map showing foundation condition in the Fairbanks D-1 SW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies 671-D, 2 sheets, scale 1:24,000.

Pewe, T.L., Bell, J.W., Forbes, R.B., and Weber, F.R., 1976, Geologic map of the Fairbanks D-2 SE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 942, 1 sheet, scale 1:24,000.

Pewe, T.L., Bell, J.W., Williams, J.R., and Paige, R.A., 1976, Geologic map of the Fairbanks D-1 SW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 949, 1 sheet, scale 1:24,000.

Pewe, T.L., Bell, J.W., Forbes, R.B., and Weber, F.R., 1976, Geologic map of the Fairbanks D-2 NE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations 950, 1 sheet, scale 1:24,000.

Reger, R.D., Stevens, D.S.P., and Smith, R.L., 2003, Survey of geology, geologic materials, and geologic hazards in proposed access corridors in the Fairbanks Quadrangle, Alaska: Alaska Division of Geological & Geophysical Surveys Miscellaneous Publication 69, 5 sheets, scale 1:250,000.

Robinson, M.S., Smith, T.E., and Metz, P.A., 1990, Bedrock geology of the Fairbanks Mining District: Alaska Division of Geological & Geophysical Surveys Professional Report 106, 2 sheets, scale 1:63,360.

Area-wide

Brown, J., Ferrians, O. J., Heginbottom, J. A., and Melnikov, E. S., 1997, Circum-Arctic map of permafrost and ground-ice conditions: U.S. Geological Survey Circum-Pacific Map, 1 map, scale 1:10,000,000.

Capps, S.R., 1940, Geology of the Alaska Railroad region: U.S. Geological Survey Bulletin 907, 201 p., 3 sheets, scale 1:250,000.

Coulter, H. W., Hopkins, D. M., Karlstrom, T. N. V., Péwé, T. L., Wahrhaftig, C., and Williams, J. R., 1965, Map showing extent of glaciations in Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-415, 1 map, scale 1:2,500,000.

Ferrians, O. J. (comp.), 1965, Permafrost map of Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-445, 1 map, scale 1:2,500,000.

Foster, H.L., Keith, T.E.C., and Menzie, W.D., 1987, Geology of east-central Alaska: U.S. Geological Survey Open-File Report 87-188.

Fuglestad, T.C., 1986, Guidebook to permafrost and engineering problems along the Alaska Railroad between Anchorage and Fairbanks: Alaska Division of Geological & Geophysical Surveys Guidebook 6, 82 p., 2 sheets, scale 1:31,680.

Gallant, A. L., Binnian, E. F., Omernik, J. M., and Shasby, M. B.,1995, Ecoregions of Alaska: U.S. Geological Survey Professional Paper Report Number 1567, 73 p. 1 map, scale 1:5,000,000.

Hamilton, T.D., Reed K.M., Thorson, R.M., 1986. Glaciation in Alaska, the geologic record. Alaska Geological Society, p. 265.

Jones, D.L., Silberling, N. J., Berg, H. C., and Packer, G., 1981, Map showing tectonostratigraphic terranes of Alaska, columnar sections, and summary description of terranes: U.S. Geological Survey Open File Report 81-792, 21 p., 1 sheet.

Karlstrom, T.N.V., et al., 1964, Surficial geology of Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-357, scale 1:584,000.

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