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SOURCES OF CONSTRUCTION MATERIALS IN AND NEAR THE TANANA VALLEY STATE FOREST

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Introduction

This summary is the product of a brief review and compilation of existing data on surficial deposits and bedrock exposures that may be sources of construction materials for the Tanana Valley State Forest (TVSF). For purposes of this summary, "construction materials" refers to sand-and-gravel aggregate and crushed rock for use as subfoundation material, septic-system filtrate, or road base. Because of variations in the types and scales of geologic maps available for this compilation and because many of these maps were not prepared with the objective of locating construction materials, this assessment must be considered preliminary. This level of information should be sufficient for developing the overall management plan for the TVSF. However, locating materials sources for more detailed operational plans or specific construction projects will require more exhaustive review of the data, air-photo interpretation, and field examinations.

Demand for construction materials within TVSF is expected to be primarily for forest-access and management purposes. By far the greatest need for materials will be for roads. Other construction uses of aggregate will be limited because of restrictions on most types of construction within TVSF. Outside demand for construction materials from within TVSF should be low because of the low unit value of aggregate and high transportation costs. However, there may be some demand for materials in adjacent areas where a TVSF unit contains the only sources within a reasonable transportation distance.

The accompanying 1:250,000-scale map overlays show probable sources of alluvial or glacial sand and gravel (red) and areas where bedrock is probably within several feet of the surface (green). This information was compiled from existing published and unpublished geologic maps by various authors (see Data Sources). Because mapping purposes, approaches, and degree of field checking vary substantially from project to project, the boundaries of mapping units are approximate.

Existing materials sites

Existing gravel pits and rock quarries administered by the Division of Land and Water Management in and near TVSF are indicated by stars on the accompanying overlays. In the western block (TVSF units 1-6), where alluvial sources of aggregate are rare, many existing sites are in bedrock areas. In the eastern block (units 7-14), most existing sites are in coarse alluvial and glacial deposits.

Sources of construction materials

The dominant source of construction-grade sand and gravel in and near TVSF is the flood plain of the Tanana River and its major tributaries. However, downstream from its

confluence with the Chena River, the Tanana River flood plain becomes dominantly sand and silt and is not a good source of gravel. A cover of silt or sandy silt up to several feet thick blankets the sandy gravels over much of the Tanana River flood plain upstream from the Chena River, but is generally not thick enough to preclude economic extraction of the underlying materials. Alluvial gravels are present in the smaller tributary valleys of the Yukon-Tanana upland, but are generally buried beneath thick eolian and retransported silt and are mostly frozen. Flood plains in most of these upland valleys are dominantly silt that has been eroded from the hill slopes.

Till and glacial-outwash deposits are common in and near the southern portions of TVSF units 10-13, and abundant in unit 14. Most of the till in these areas was deposited in moraines near the mouths of valleys formerly occupied by glaciers flowing northward and northeastward from the Alaska Range. Although these moraines typically contain abundant sand and gravel in size ranges used most in road construction, the material may require more extensive processing to remove unwanted large boulders and silt. Where glacial-outwash or alluvial gravels are accessible, these sources are preferable to till for road-construction purposes. The moraines may be good sources of rip-rap material where they contain abundant large, angular boulders.

Bedrock can be an acceptable alternative as a source of construction materials where alluvial or glacial gravels are inaccessible. Highly weathered metamorphic rocks of the Yukon-Tanana terrane are a source of gravel at many existing materials sites in the region between Delta Junction and Nenana and require minimal processing. Quality of bedrock as a source of construction materials varies, however, and the expense of processing may be prohibitive, especially where massive, dense rocks must be crushed. Shale and siltstone, although not common in TVSF, are poor materials for construction because they break down easily into silt and clay under natural weathering processes, becoming unstable and frost susceptible. However, shale has been used as a road-base material along portions of the Dalton highway.

Areas where bedrock is probably within several feet of the surface are shown in green on the accompanying map overlays. Because of time constraints and lack of data on engineering properties of the rock units, no attempt was made to subdivide bedrock areas according to rock types or suitability for various construction uses. Extraction of bedrock for construction purposes should not be planned in any specific area of TVSF on the basis of this information alone. The maps should be used for identifying possible rock-quarry areas and for preliminary planning of road alignments. Suitability of bedrock for construction use in an area must be determined by field inspection and sampling.

Mine tailings are excellent sources of gravel for construction purposes. Although no deposits of mine tailings are shown on existing geologic maps in areas of the TVSF, and are thus not plotted on the accompanying maps, the likelihood is high that they are present in the TVSF. Many tailings deposits are probably still within existing mining claims. Review of placer-mining claims and examination of recent aerial photographs would identify these deposits. This was not done for this preliminary review.

Comments on individual TVSF management units

Unit 1 - Dugan Hills. Available geologic data indicate no substantial sources of alluvial gravel in this area. Alluvial deposits are dominantly silt and sand. Shallow bedrock in the Dugan Hills is composed of Mesozoic and Paleozoic sedimentary and metamorphic rocks, including shale, sandstone, conglomerate, quartzite, chert, slate, siltstone, and limestone, and may locally yield acceptable construction materials (Chapman and others, 1971; Chapman and others, 1982; Pewe and others, 1966).

Unit 2 - Riverside. With exception of two exposures of metasedimentary rocks along the Tanana River opposite its confluence with the Kantishna River, this area is probably devoid of acceptable construction materials. The primary surficial deposits in the area are flood-plain sediments of the Tanana and Kantishna Rivers, which consist mostly of silt and sand, and extensive vegetated dunes south of the Tanana River (Pewe and others, 1966; Collins, 1985). The dunes overlie gravelly alluvium, but the dune sand is thick (several tens of feet or more) and only a few isolated exposures of the underlying alluvium have been observed. Lake gravel was observed at a depth of 2 ft on a peninsula on the southwest side of Black Bear Lake, just outside the TVSF, but probably does not represent a significant gravel deposit; otherwise, the only exposure of the gravelly alluvium below the dune sand is in a cutbank of the Kantishna River about 10 mi upstream from the southern tip of Unit 2, outside the map area. A dry oil well in T4S, R10W, Fairbanks Meridian, encountered gravel at 140 ft depth (Collins, 1985).

Unit 3 - Tolovana. Surficial deposits in this area are mostly alluvial silt and sand, eolian and retransported silt, and silty colluvium, and are not likely to yield substantial amounts of gravel. Gravel is probably present in alluvial fans along the west sides of the Tolovana and Tatalina Rivers outside Unit 3, as shown on the accompanying overlay (Waythomas and others, 1984). Bedrock is exposed or near the surface along ridges throughout much of the area and may locally be an adequate source of construction materials. The rocks consist mostly of shale, sandstone, conglomerate, and quartzite in the northern half of the area and quartzite, slate, and some igneous rocks in the southern half (Chapman and others, 1971; Albanese, 1983; Bundtzen, 1983). Because the area hosts substantial mining activity, tailings deposits may be present that are not shown on existing geologic maps.

Unit 4 - Chatanika. As in Unit 3, surficial deposits in this area consist mostly of alluvial silt and sand, and eolian and retransported silt. There are no mapped sources of alluvial gravel in this area. Tailings may be locally present. Bedrock consists almost entirely of schist of the Yukon-Tanana terrane, formerly known as the Birch Creek schist (Chapman and others, 1971; Pewe and others, 1966; Pewe and Rivard, 1961). The schist is potentially a good source of construction materials.

Unit 5 - Goldstream. Alluvial silt and sand and eolian and retransported silt dominate surficial deposits in this area. The Tanana River flood plain contains abundant gravel near its confluence with the Chena River at the extreme eastern boundary of the area, but is mostly sand elsewhere (Pewe and others, 1966; Pewe and Rivard, 1961; Kachadoorian, 1960). Bedrock consists of schist of the Yukon-Tanana terrane, and there are numerous quarries in this rock along the Parks Highway. Existing roads throughout the area provide a means of transportation of materials from existing quarries and from sources outside the area. Large deposits of tailings exist along the Parks Highway in the vicinity of Ester, several miles northeast of the area.

Unit 6 - Chena. The Little Chena River is a potential source of gravel for the northern portion of this unit, and the Chena River is a source for the southern portion. Bedrock consists of schist of the Yukon-Tanana terrane and is extensively exposed in and near the northern portion (Pewe and others, 1966; Williams and others, 1959; Lee, 1982; Weber and others, 1978; Foster and others, 1983). Because of extensive placer mining near the northern portion, tailings are abundant but are likely to be contained within active mining claims.

Unit 7 - Salcha and Unit 8 - Shaw Creek. The western segment of Unit 7 is entirely within the active and abandoned flood plains of the the Tanana River and is likely to yield excellent construction materials at almost any location (Carter and Galloway, 1978; Pewe and others, 1966; Weber and others, 1978). Two existing materials sites are within this area. A surface cover of silt and sand may need to be removed in some parts of the western segment of Unit 7 to gain access to the underlying sand and gravel.

The Tanana River flood plain passes through the extreme southern portions of the eastern segment of Unit 7 and Unit 8 and is a good source of construction materials for these areas. The Salcha River flood plain and adjacent alluvial terraces are also sources of sand and gravel in the extreme northwestern portion of the eastern segment of Unit 7, although the terraces are discontinuously frozen (Carter and Galloway, 1978; F.R. Weber, personal commun., 1985). However, large remaining portions of Units 7 and 8 are devoid of good alluvial sources of construction materials because the surficial deposits are dominantly alluvial silt and sand and eolian and retransported silt (Weber and others, 1978; Weber, 1971; Reger, 1976). Bedrock exposures along ridgelines and in a large area in the northeastern portion of Unit 8 consist of quartzite, granodiorite, and schist, which are likely to yield good construction materials in some areas (Weber and others, 1978).

Unit 9 - Volkmar Lake. The northwestern segment of this unit is probably devoid of signifacant alluvial sources of construction materials because of the dominance of silt on most hillslopes and in valley-fill alluvium (Weber and others, 1978; Reger, 1976). Bedrock is exposed or near the surface along ridgelines and around the 3599-ft peak in T7S, R12E, FM, and consists mostly of granitic rocks and gneiss (Weber and others, 1978). These exposures may be good local sources of crushed rock.

Flood-plain alluvium and terrace deposits occupy the extreme southern portion of the southeastern segment of Unit 9 along the Tanana River (Weber and others, 1977; Reger, 1976). These are likely sources of construction materials, although the terrace deposits are mantled with up to several feet of silt and are discontinuously frozen. Bedrock is exposed or near the surface over most of the upland, and consists of granitic rocks and gneiss in the western portion and quartzite and schist in the eastern portion (Weber and others, 1977).

Unit 10 - Gerstle River. Unit 10 lies along the Tanana River where sand and gravel are abundant in active and abandoned flood-plain deposits and glacial-outwash terraces. These terraces along Goodpaster Flats, Clearwater Creek, and Gerstle River are mantled with a thin layer of silt and are discontinuously frozen, but should be good local sources of construction materials (Weber and others, 1977; Weber and others, 1978; Holmes, 1965; Holmes and Foster, 1968; Carter and Galloway, 1978; Reger, 1976).

Unit 11 - George Creek. With exception of the flood plains of Volkmar River, Healy River, and George Creek, this unit is almost entirely a bedrock upland. Surficial deposits are eolian and retransported silt on the lower hillslopes and alluvial silt in the flood plains (Weber and others, 1975; Weber and others, 1977; Weber and others 1978; Holmes, 1965; Holmes and Foster, 1968; Foster, 1970; Reger, 1976). Although no data are available for the Mt. Hayes D-1 Quadrangle, the foregoing description is probably accurate throughout Unit 11. Bedrock consists of quartzite, schist, gneiss, and granitic rocks in areas of the unit that lie in the Big Delta Quadrangle (Weber and others, 1975; Weber and others, 1977; Weber and others, 1978), schist and granitic rocks in areas of the Mt. Hayes Quadrangle where data are available (Holmes and Foster, 1968), and granitic rocks in small areas of Unit 11 in the Tanacross Quadrangle (Foster, 1970). These rocks are potentially a good source of construction materials. The closest sources of alluvial gravels are 2-3 mi south and southwest of the area along the Tanana River in Unit 10.

Unit 12 - Tower Bluff. The southwestern margin of this area lies along the Tanana River, where sand and gravel are abundant in active- and inactive-flood-plain deposits, outwash terraces, and alluvial fans (Carter and Galloway, 1978; Holmes, 1965; Foster, 1970). Morainal deposits are common south and west of the Tanana River, and may be good sources of large, angular boulders. The remainder of this large unit is probably devoid of significant sources of alluvial or glacial gravels. Surficial deposits in most of the area consist of silty, sandy colluvium, silt and peat valley-fill deposits, and minor dune sand. Bedrock is exposed or near the surface in the uplands over much of the area, and consists mostly of schist, gneiss, and

granitic rocks. Basalt is present in Sec. 3, T20N, R10E, Copper River Meridian, and in the southcentral portion of T22N, R10E, CRM.

Unit 13 - Porcupine Creek. Alluvial and terrace deposits along the Tanana River in the southwestern portion of this area are the dominant sources of sand and gravel. Outwash-fan deposits across the Tanana River are also likely sources of construction materials and are probably a better source of coarse gravels. Surficial deposits in the remainder of the area are mostly silty, sandy colluvium, silt and peat valley-fill deposits, and dune sand. Bedrock is exposed or near the surface in the uplands over much of the area, and consists of basalt, felsic (silicic) volcanic rocks, granitic rocks, gneiss, and schist (Holmes, 1965; Foster, 1970).

Unit 14 - Tok River. Sand and gravel are abundant in flood-plain, terrace, and outwash deposits and in gravelly colluvium along the Tok River valley in this unit (Foster, 1970). Gravelly colluvium and outwash-fan deposits are sources of construction materials in the northwestern portion. Schist and gneiss comprising the hillslopes northeast of Clearwater Creek may be good sources of crushed rock, but fine-grained phyllites and schist southwest of Clearwater Creek are probably not good sources of construction materials.

Data Sources and References Cited

Albanese, M.D., 1983, Bedrock geologic map of the Livengood B-4 Quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-3, scale 1:40,000.

Bundtzen, T.K., 1983, Bedrock geologic outcrop map of the Livengood B-3 Quadrangle, Alaska: Alaska Division of Geological Surveys Report of Investigations 83-6, scale 1:40,000.

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., scale 1:125,000, 3 sheets.

Chapman, R.M., Weber, F.R., and Taber, Bond, 1971, Preliminary geologic map of the Livengood Quadrangle, Alaska: U.S. Geological Survey Open-file Report 71-66, scale 1:250,000, 2 sheets.

Chapman, R.M., Yeend, Warren, Brosge, W.P., and Reiser, H.N., 1982, Reconnaissance geologic map of the Tanana Quadrangle, Alaska: U.S. Geological Survey Open-file Report 82-734, scale 1:250,000.

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

Foster, H.L., 1970, Reconnaissance geologic map of the Tanacross Quadrangle, Alaska: U.S. Geological Survey Misc. Geologic Investigations Map I-593, scale 1:250,000.

Foster, H.L., Laird, Jo, Keith, T.E.C., Cushing, G.W., and Menzie, D.W., 1983, Preliminary geologic map of the Circle Quadrangle, Alaska: U.S. Geological Survey Open-file Report 83-170A, scale 1:250,000.

Holmes, G.W., 1965, Geologic reconnaissance along the Alaska Highway, Delta River to Tok Junction, Alaska: U.S. Geological Survey Bulletin 1181-H, 19 p., scale 1:125,000.

Holmes, G.W., and Foster, H.L., 1968, Geology of the Johnson River Area, Alaska: U.S. Geological Survey Bulletin 1249, 49 p., scale 1:63,360.

Kachadoorian, Reuben, 1960, Engineering and surficial geology of the Nenana-Rex area, Alaska: U.S. Geological Survey Misc. Geologic Investigations Map I-307, scale 1:63,360.

Lee, D.E., 1982, Photointerpretive map of the surficial geology of the north Fairbanks D-1 and south Livengood A-1 Quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Open-file Report 156, scale 1:24,000, 5 sheets.

Pewe, T.L., Wahrhaftig, Clyde, and Weber, F.R., 1966, Geologic map of the Fairbanks Quadrangle, Alaska: U.S. Geological Survey Misc. Geological Investigations Map I-455, 5 p., scale 1:250,000.

Reger, R.D., 1976, Photointerpretive geologic maps of the Big Delta A-2, A-3, A-4, A-5, B-4, B-5, B-6, C-6, Fairbanks C-1, and Mt. Hayes C-2 and D-2 Quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys, unpublished, scale, 1:63,360, 11 sheets.

Waythomas, C.F. , Ten Brink, N.W., and Ritter, D.F., 1984, Surficial geology of the Livengood B-3, B-4, C-3, and C-4 Quadrangles, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 84-6, scale 1:63,360.

Weber, F.R., 1971, Preliminary engineering geologic maps of the proposed trans-Alaska pipeline route: U.S. Geological Survey Opoen-file Report 71-317, scale 1:125,000, 2 sheets.

Weber, F.R., Foster, H.L., and Keith, T.E.C., 1977, Reconnaissance geologic map of the Big Delta A-2 and A-3 Quadrangles, Alaska: U.S. Geological Survey Misc. Field Studies Map MF-869, scale 1:63,360.

Weber, F.R., Foster, H.L., Keith, T.E.C., and Cantelow, A.L., 1975, Reconnaissance geologic map of the Big Delta A-1 and B-1 Quadrangles, Alaska: U.S. Geological Survey Misc. Field Studies Map MF-676, scale 1:63,360.

Weber, F.R., Foster, H.L., Keith, T.E.C., and Dusel-Bacon, Cynthia, 1978, Preliminary geologic map of the Big Delta Quadrangle, Alaska: U.S. Geological Survey Open-file Report 78-529A, scale 1:250,000.

Williams, J.R., Pewe, T.L., and Paige, R.A., 1959, Geologic map of the Fairbanks (D-1) Quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map GQ-124, scale 1:63,360.